

Capstone project
**Maximizing evidence-based teaching and learning,
assessment and homework practices at NYC school**

By Joaquín Fernández-Castro
EdD candidate in Education Leadership and Learning
Peabody College of Education and Human Development, Vanderbilt University

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Advisor: Professor Cynthia Nebel, PhD Cognitive Psychology & Learning Science
Peabody College of Education and Human Development, Vanderbilt University



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Abstract

This capstone project is a case study addressing several problems of practice inside NYC school: homework, assessment, teaching, professional development effectiveness and the school's trust climate. The purpose of this project is to design an improvement proposal that can inform the school leaders regarding its climate of trust, guide professional development and the creation of improvement teams for enhancing evidence-based teaching and learning strategies in the classrooms with a focus on assessment and homework practices. This capstone project is based on the four-dimensional school learning model adapted from synthesizing Bronfenbrenner's ecological model with the classical multi-level analysis from social sciences to explore the underlying NYC school's problems of practice and the respective critical research questions. First, to what extent does NYC school's leadership reinforce a climate of learning, support and trust, psychological safety and experimentation for its faculty? Second, how does NYC school implement an effective professional development program and how do teachers perceive its relative impact on their teaching craft? Third, to what extent do classroom instructional practices utilize evidence-based teaching and learning strategies in their pedagogical approaches? Fourth, how do current assessment and homework practices use high-quality design consistent with evidence-based learning and subject matter standards? These questions also guide the research design and the outline for a set of interventions and recommendations based on the evidence found through a mixed sequential methods approach of qualitative semi-structured interviews, quantitative survey research and open source public documents collected, as well as with the insights from experimental, quasi-experimental and scholarly research.

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Executive summary

This capstone project is a case study with the purpose of addressing how NYC school (a pseudonym) can improve assessment and homework practices through evidence-based teaching and learning strategies and effective professional development within a school climate of trust. This capstone project is based on the four-dimensional school learning model adapted from the synthesis of Bronfenbrenner's ecological model with the classical multi-level analysis from the social sciences to explore the underlying NYC school's problems of practice. The dimensions of this model articulate the four critical research questions addressed in this capstone project:

- First, to what extent does NYC school's leadership reinforce a climate of learning, support and trust, psychological safety and experimentation for its faculty?
- Second, how does NYC school implement effective professional development and how do teachers perceive its impact on their instructional practices?
- Third, to what extent do teachers at NYC school utilize evidence-based learning strategies in their pedagogical approaches?
- Fourth, how do current assessment and homework practices use high-quality design consistent with evidence-based learning strategies and course standards?

This capstone project utilized a case study design through a sequential mixed methods approach. First, nine qualitative semi-structured interviews were conducted with department chairs and senior school administrators. I analyzed the contents of these interviews by coding the major insights through the themes outlined in the four-dimensional school learning model. For the second sequential method, I created a quantitative survey instrument using insights and inputs from the qualitative semi-structured interviews, related scholarly research, and my own experience as a classroom teacher. This Survey on Teaching, Assessment and Homework (SOTAH) was administered to NYC school teaching faculty and it included 80 questions in five sections: instruction, assessment, homework, PD and school climate plus a demographic section. Finally, I did two follow-up interviews with senior leaders and collected publicly available documents about NYC school. The evidence analyzed by the triangulation of these methods underpins a set of findings and recommendations for each of the areas explored through the four research questions of this capstone project.

The macro-level dimension: *Research question #1. To what extent does NYC school's leadership reinforce a climate of learning, support and trust, psychological safety and experimentation for its faculty?*

Strengths: The leadership at NYC school reinforces a positive professional school climate with distributed leadership, autonomy and self-efficacy for teachers. There is a strong professional development and teacher growth support program. Similarly, there is among its teaching faculty an environment of psychological safety and experimentation with instructional practices.

Weaknesses: There are also some areas that need further improvement. The school climate of trust, respect and identification with the mission is slowly being established. The school leadership is perceived by teaching faculty as having limited impact on instructional guidance, having limited knowledge about the strengths of individual teachers or providing helpful feedback for instructional improvement. There is high teacher turnover in a few departments.

Recommendation #1: *Craft a strategic instructional plan and teacher evaluation system including all stakeholders in the design and implementation process. This can be done in the context of crafting or revising a new mission or school strategic plan. A component of that strategic plan will be an instructional plan with an emphasis on evidence-based learning strategies for the next accreditation cycle. Another critical element will be the development of an effective and fair teacher evaluation system as well as establishing a teaching fellows' program to leverage recruitment and retention.*

The meso-level dimension: Research question #2. *How does NYC school implement effective professional development and how do teachers perceive its impact on their practice?*

Strengths: NYC school has a robust supportive teacher professional development program with many components and high to moderate levels of participation. PD activities are generally helpful and aligned with faculty teaching and subject contents. Teachers do rely on and support each other for practical instructional guidance outside the professional development program which points out some areas needing improvement.

Weaknesses: Teachers and department chairs perceive the school's robust PD program as more informational than practical for their instructional strategies. The mandated and narrowly focused nature of some components of the professional development program might have very little instructional impact for improving the teaching craft. There seems to be limited evidence-based training resources for students and learning support specialists. School student accessibility and support structures to the most rigorous courses seem limited to maximize student outcomes.

Recommendation #2: *Focus on instructional self-directed professional development. This requires several steps. First, distinguish between school legally required training and teacher PD. Focus practical PD components on evidence-based instructional strategies but provide structured time for teachers and teaching teams to apply those strategies to their specific courses over the yearly curricular and instructional planning. Allow teachers to self-direct their own PD and increase the available options especially long-term programs. Enhance the opportunities for teachers supporting each other through informal and non-evaluative coaching and mentoring. Provide learning support specialists and fellow teaching trainees with PD support for students improving their learning strategies and studying skills.*

The micro-level dimension: *Research question #3.* *To what extent do teachers at NYC school utilize evidence-based learning strategies in their pedagogical approaches?*

Strengths: NYC school teaching faculty use a varied and wide combination of instructional approaches. Teachers collaborate extensively, formally and informally, for instructional planning. Teachers are cognizant and use high levels of metacognitive strategies as well as most evidence-based teaching and learning strategies as compared to the levels used by teachers in a national sample. Teachers at NYC school have an ample variety of professional backgrounds, instructional skills and experience and apply their instructional approaches equally to all ability grouping classes.

Weaknesses: There are some areas needing further improvements. Teachers at NYC school could maximize their instructional effectiveness through a deeper training on all evidence-based teaching and learning strategies, with a special emphasis on retrieval practice. Two additional evidence-based strategies misunderstood on their application are interleaving and the use of different concrete examples to illustrate an underlying abstract concept. Students need further academic support and training on effective learning and studying strategies to improve educational outcomes and performance.

Recommendation #3: *Maximize instruction by creating teaching evidence-based improvement teams (TEBITs) within each department. Schedule time for TEBITs to apply these learning strategies in their curricular and instructional plans and execute them in the classroom. Support TEBITs with focused PD for those teams as they request it. Provide evidence-based learning strategies training for all students and provide enhanced school support structures in the form of space, schedule, sponsored mentoring or tutoring for underprivileged and struggling students, including the possible resource of a newly created teaching fellow trainees program.*

The granular-level dimension: *Research question #4.* *How do current assessment and homework practices use high-quality design consistent with evidence-based learning strategies and course standards?*

Strengths: Teachers at NYC school use various formats and approaches in their assessments to evaluate student understanding of course contents, creativity, critical thinking and problem-solving skills and effectively use their homework assignments to reinforce student learning. Teachers have a great deal of autonomy and self-efficacy designing and using assessments and homework assignments as both formative and summative learning tools. They comply with school policies on homework time limits. The majority of teaching faculty clearly understand and apply metacognition and most of the six evidence-based learning strategies, especially elaboration and application of skills, to their assessment and homework assignments and do so at a higher rate than a national sample of teachers. Teachers collaborate with each other and widely use departmental, professional organizations and textbook materials and resources relevant to their respective course practices and standards. Teachers use similar criteria for assessments and homework assignments for all their courses regardless of student ability grouping.

Weaknesses: There are areas within both, assessment and homework, that could be enhanced by strengthening the application of otherwise thoughtful current practices. That is the case of assessment categories and their relative grading weight, which varies too widely among and within departments. Teachers at NYC school infrequently use multiple-choice questions together with the widely used elaborative and skill application questions. Although most teachers assign homework frequently, about half use it mainly for current materials but less frequently for spaced retrieval and application of skills of previous or upcoming materials. Similarly, teachers have a limited understanding on how to effectively use Learning Management Systems (LMS) on assessment and homework than they do with instruction in the context of the pandemic.

Recommendation #4: *Refine assessment and strengthen quality of homework practices. This will require a set of steps. Establish departmental assessment categories and guidance ranges for their relative grading weight. Increase the use of similar formats and questions to standardized outside exams in formal class assessments. Provide a flexible schedule for departmental teams and the needed targeted PD they request, to refine assessment criteria and strengthen homework assignments to increase quality and impact on learning. Articulate a flexible homework policy limit and/or establish a tier for highly rigorous courses requiring extra-time and those regular courses requiring a standard amount of homework time. Include PD on the use of school LMS for assessment and homework as part of the overall school targeted professional development on evidence-based learning and provide support for teaching teams applying it to their courses.*

School improvement recommendations

The findings of this capstone project and their related sets of recommendations can be synthesized into four overarching recommendations for a school improvement proposal:

- 1. Craft a strategic instructional plan and teacher evaluation system*
- 2. Focus on instructional self-directed professional development*
- 3. Maximize evidence-based learning strategies through teaching teams*
- 4. Refine assessment and strengthen quality of homework practices*

Should NYC school administration choose to implement the recommended interventions, I would advise to create improvement teams within each department to address their specific needs. The rapid improvement cycles of Plan-Do-Study-Act (PDSA) from learning science are critical for assessing progress. These PDSA cycles focus on analyzing how the interventions, inputs and outputs could be added, continued, eliminated or modified for further improvement. This process will provide a solid evidence-based guidance to maximize instructional impact of teaching and learning, assessment and homework practices on students' educational outcomes and performance.

CHAPTER I

NYC school, problems of practice, context and conceptual framework

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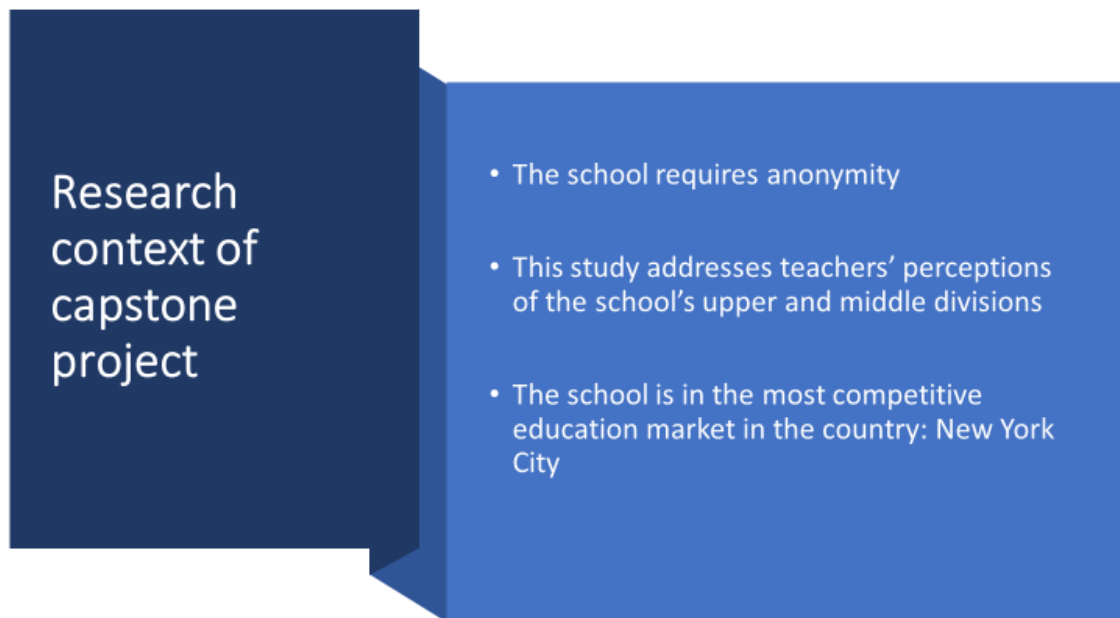
Chapter I. NYC school description, problems of practice and conceptual framework

I.1. Introduction and context

The purpose of this capstone project is to design an improvement proposal and recommendations that can inform NYC school stakeholders how to incorporate effective evidence-based teaching and learning strategies into assessment and homework practices for the school to achieve its mission and strategic goals. A secondary purpose of this capstone project is to inform the school of the current effectiveness of its faculty professional development practices and the teaching faculty's perception of NYC school's leadership and climate of trust. This capstone project outlines a set of recommendations for further improvement after each of the four problems of practice and related levels of analysis of the school's instructional operations.

The school senior administrators and I, as the principal researcher, agreed on the topic for this project. I would design a capstone project addressing how to maximize effective assessment and homework practices within its middle and upper school divisions in the context of evidence-based teaching and learning. The underlying assumption was that this would improve student outcomes while reducing the time students dedicate to homework, allowing more time for other school co-curricular work. Maximizing evidence-based teaching and learning, especially regarding assessment and homework practices, can allow for more balance in student lives, while freeing more time to develop other critical skills for college and life through the rich co-curricular programs offered by the school. NYC school would like to improve the proportion of its graduates accepted into the top ranked colleges and believes that providing greater balance to student curricular and co-curricular commitments and time will support achieving that goal.

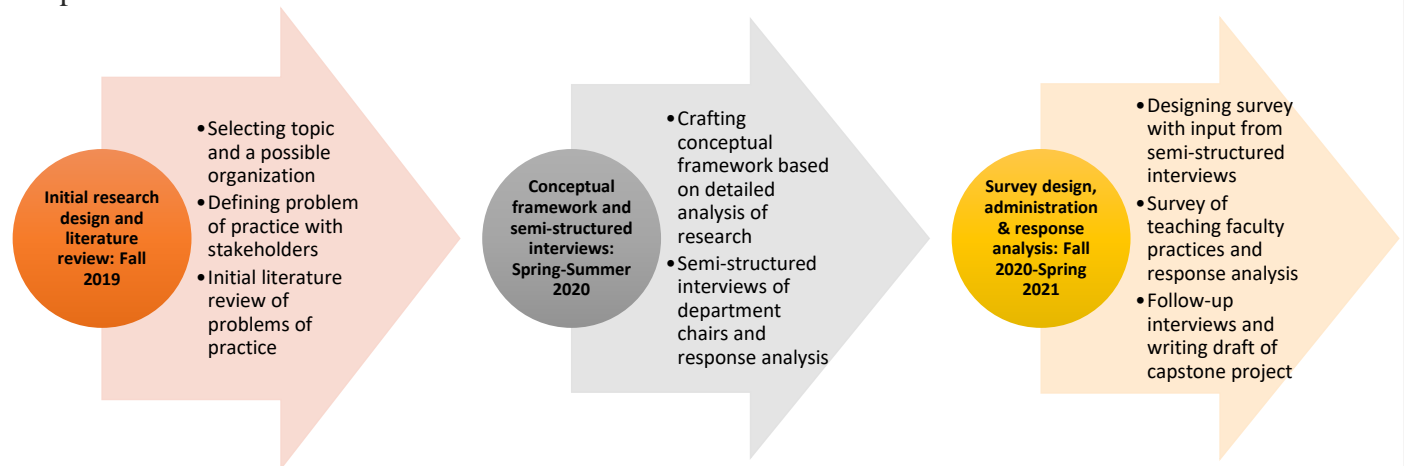
Image I.1



Source: own elaboration from conversations with NYC school senior leadership

I, as the principal researcher, contacted NYC school in the Fall of 2019 to explore and choose a problem of practice with the input of the Associate Head of School. After several exchanges we agreed to focus on the problem of practice of assessment and homework in the context of teaching and learning practices at the school. The Associate Head of School suggested for me to establish rapport and create trust with department chairs to enhance faculty engagement with this project. The school requested to remain anonymous and thus, this capstone masks its name as “NYC school.” I have also masked any possible description of the school that might identify it, including rounding up numbers of teachers and students when describing it. The school also wishes to limit the research of this project to the perspectives and practices of its teaching faculty members. More specifically, NYC school suggested to focus the research on their high and middle school divisions’ teaching, assessment and homework practices, since these are the divisions with a higher need to improve student outcomes and achieve greater balance in their curricular and co-curricular commitments. Through subsequent interviews with department chairs, it became apparent that the robust school’s professional development program was not as effective as assumed and thus, this became an additional area of inquiry for this project. Improving the effectiveness of its professional development practices and the school trust climate are critical elements to maximize teaching and learning. NYC school’s needs shaped both the design and implementation sequence of this research project.

Graphic I.2



Source: own elaboration from capstone project execution sequence

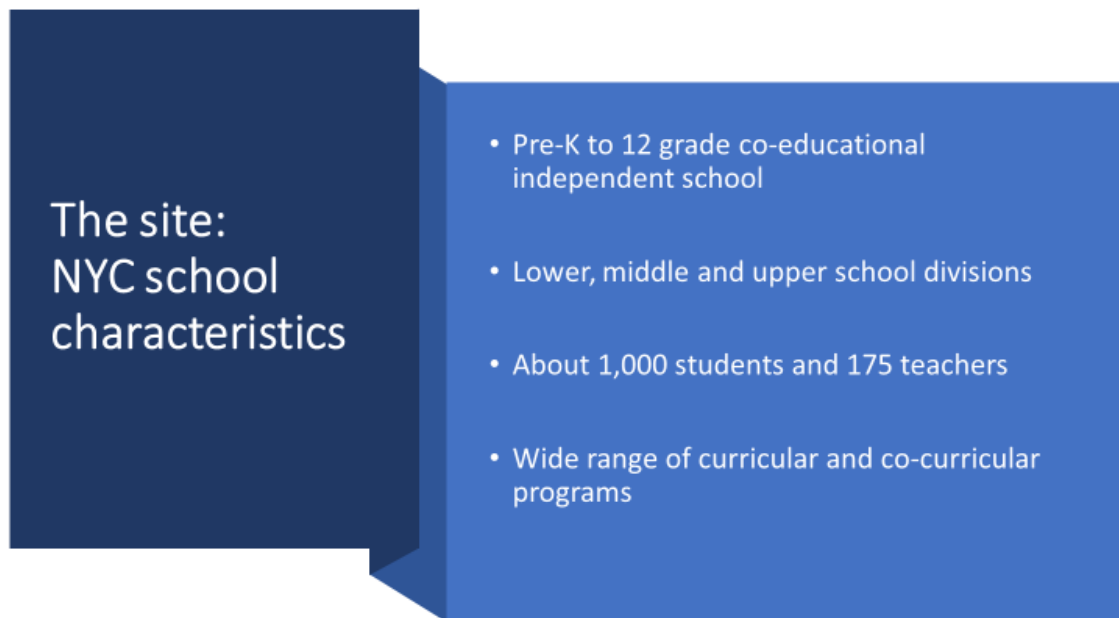
The research project began by initially contacting the school while subsequently exploring the relevant research literature related to NYC school’s problems of practice during the Fall of 2019. This initial exploration resulted in the design of a case study for improvement purposes using mixed sequential methods. The first method was qualitative semi-structured interviews with department chairs and school administrators and analysis of their responses during the Spring and Summer of 2020. The second method was the design of a quantitative survey instrument for NYC school teaching faculty during the Summer and Fall of 2020, which I called Survey on Teaching, Assessment and Homework (SOTAH). The survey was administered anonymously online in November 2020, and the responses analyzed thereafter, during December of that year and January 2021. The third method initially planned was for a school visit to do class

observations and collect documents, but it was cancelled due to the COVID-19 pandemic's related school closures and restrictions on traveling. Instead, I limited the third method to the collection of publicly available documents online during the Fall of 2020 and two follow-up interviews with senior leaders after SOTAH's data analysis.

I.2. NYC school site description and problems of practice

NYC school is an independent pre-K through 12 grade school with a highly diverse community of students, faculty and staff committed to educational excellence in the metro area of New York City. This is a highly competitive educational market with dozens of elite private independent schools, as well as some top magnet public schools, many of them considered among the very top in the nation. Like many other independent schools, the focus of NYC school is on the whole-child's education and development: academics, arts, athletics, character and service. This commitment to curricular and co-curricular programs as an essential part of the school's educational philosophy is part of the motivation to address the need of balancing student learning outcomes and extra-curricular commitments. The school believes that this greater balance can enhance the chances for its graduates to be accepted and enroll in the most competitive colleges.

Image I.3



Source: own elaboration from available public data and conversations with NYC school senior leadership

The school enrolls slightly over 1,000 students and has three divisions: Roughly 500 students in the upper division, 300 in the middle division and 200 at the lower division. NYC school accepts new students at each grade-level, but the three major student cohorts entrance points are pre-K at the lower school, 5th and 6th grades at the middle school and 9th grade at the upper school. NYC school includes a diverse student population with close to 40% students of color and with 20% of the students speaking a language other than English at home.

The school's mission is developing students as engaged global citizens and leaders with outstanding character and integrity. The school graduation class is about 100 students, typically 100% attending four-year colleges, including some elite and top-ranked colleges and universities. NYC school offers a great variety of courses and signature programs, including about 20 College Board Advanced Placement courses as well as accelerated or honor tracks for selective students, global studies opportunities and broad co-curricular, sports and summer programs. The school has a dean system: students are assigned to a specific dean from middle school on until graduation, to advise and advocate for them through their upper school career and guide them in their college application process.

NYC school has a great amount of financial resources and facilities. The school had an annual budget above 50 million dollars in 2019-2020, about 500 full-time and part-time employees, including administrators and support staff, coaches, security and teaching faculty. Of this total number of employees, about 175 are teachers working within the school's various divisions. About 100 teachers work at the upper and middle divisions and the remaining 75 teachers work at the Pre-K and elementary divisions. The school has a relatively diverse teaching faculty with similar demographics to the school's student population: about 35% of the teaching faculty are from different racial or ethnic backgrounds. Slightly above 55% of the teachers are female.

NYC school students earned an ACT average composite score of 31 and a SAT average composite score around 1370 in 2019-2020. NYC school places their graduates among top colleges and universities, including placing around 10% in Ivy league colleges plus MIT and Stanford according to Prep Review (2020). Niche.com places NYC school at #63 in the nation and #20 in New York state (Niche, 2021) and Prep Review also ranks NYC school among the top 100 independent schools. NYC school's high level of achievement needs to be put into perspective since the New York metro education market is the most competitive in the nation.

The New York metro area in fact includes many of the top independent schools in the nation according to Prep Review ranking (2020). For instance, the students in the first and very top ranked independent school in the nation, which is also in New York, earned an average composite ACT score of 35 and an average SAT composite score above 1500. This first and very top school has a selectivity rate below 10% in its admission process and places above 45% of its graduates in Ivy league colleges plus MIT and Stanford according to Prep Review. There are an additional top 7 independent schools in New York City that have students with an average composite ACT scores of 33-34, SAT composite scores of 1400 and above. These other top schools typically have admission rates below 15% and place above 30% of their graduates in Ivy League plus MIT and Stanford according to Prep Review (2020).

Although there are different rankings of US high schools and these rankings are not perfect, they provide insightful clues about the availability of resources, the background of students accepted at top colleges and the quality of the educational programs offered (Fernández-Castro, 2018). Rankings also allow us to compare schools through the same type of measure or scale. Prep-Review ranking illustrates that even if NYC school is very competitive and has a very high-quality educational program by the overall national standards, it faces uphill local competition. Indeed, the New York local market competition is fierce and includes eight schools of the very

top 10 schools in the country and around 20 schools among the top 50 independent schools. These competitors of NYC school have even more resources, student selectivity and educational program success at placing higher proportions of their graduates at the very top elite colleges.

Image I.4



Source: own elaboration from conversations with NYC school senior leadership

NYC school would like to maximize students' outcomes on the AP exams or other standardized tests needed for successful acceptance of its graduates into the most competitive colleges. NYC school would also like to have a more effective learning and less time-consuming homework load for its students, so they can have more balance in their lives and the opportunity to develop other co-curricular skills critical for admission to the most competitive colleges. The school does not have survey data regarding their students' practices, preferences and views about assessment and homework (or overall school climate for that matter) and would like to explore the possibility of designing and conducting a student survey eventually.

At this juncture, NYC school chooses to focus on exploring its faculty's views on teaching, assessment and homework while building trust with department chairs and faculty. The suggestion by the school leadership that I needed to build trust with department chairs was a positive indicator of the administrator's awareness and attitude. It was also an implicit indicator that there might be some trust issues and I decided to include and explore this in the project. Similarly, the school administrators were proud of the school's robust professional development program. This was confirmed by department chairs during the interviews, but they also pointed to the limitations of the school's robust PD program. This contributed to my decision to also explore professional development practices as part of this capstone project.

I.3. NYC school's problems of practice and their relevance in the research literature

NYC school strives to maximize effective assessment and homework practices through evidence-based teaching and learning strategies and in conversations with me, the school requested to focus the research on those problems of practice. The goal is to increase effective assessment and homework practices for improving student learning and outcomes while reducing the amount of time students dedicate to schoolwork and academic tasks. The rationale is that more effective teaching and learning will also allow students to have more time for extra-curricular activities that are important for keeping some balance in their lives while enhancing their social and emotional skills and improving their odds of getting accepted into the most competitive colleges.

Moreover, I decided that to accomplish the main explicit objectives for this project, I should also understand department chairs and faculty perceptions of the school's professional development practices and their perceptions of the school leadership and climate. I believe those implicit aspects are additional problems of practice that I need to address for the school to build up feedback and trust with department chairs and faculty for future improvements. I am going to examine each of the four problems of practice explicitly or implicitly stated by the school and put them in the context of the broader scholarly research and literature within education and related disciplines.

I.3.1. Problem of practice #1: Homework and assessment

NYC school is concerned with the lack of balance of available time in its students' academic and co-curricular commitments and would like to improve its homework effectiveness for student learning and redefine the school's homework policy if needed. The major focus of concern is related to the fact that the current school's policy establishes 45 minutes of homework per day/subject at the upper school and 20 to 30 minutes of homework per day/subject at the middle school. At the elementary school, homework is expected beginning at 3rd grade but none before. The upper and middle schools' homework policy translates into roughly 3 to 4 hours of homework per day at the upper school for most students taking all 5 required academic subjects and about 2 to 3 hours per day at the middle school, which would be towards the high end of that range or higher when considering time commitment to performing art courses' preparation time and sports commitments. Homework does not seem to be a major issue at the elementary division.

Given the upper and middle school divisions' requirements of co-curriculars and sports obligations, students do not have enough time to complete their assignments and lack balance in their life contributing to lack of sleep and increased stress. This situation seems to call for reconsidering the current status quo. School leaders acknowledge that most teachers do not require students to do as much homework as established under current policies, but the school would like to have an overall view of the current practices to re-define its homework policies. Administrators and faculty are trying to also explore how each division and department sees homework's purpose, how it is used for learning and how effective it is. Some faculty and other school constituents even raise the question of whether homework is even necessary for learning at all according to school leaders.

There is a large body of literature and research regarding homework practices and their usefulness for learning as well as many controversies. Scholarly case-studies, meta-analytic studies and correlational research provided insights into the time and quality of homework to be an effective and useful learning tool. For practical purposes regarding time required, most researchers seem to suggest the principle that homework is effective when it requires about 10 minutes overall per each grade beginning in first grade and to a maximum of 2 hours by 12th grade: multiplying 10-minutes per the respective student grade level. Similarly, homework is more effective as measured in learning outcomes for grades 7-12 and less effective in grades K-6 but still needed for creating solid studying habits (Cooper, 2015, Cooper, Robinson & Patall, 2006).

Within public schools, the National Parent Teacher Association and the public teachers' union, the National Education Association, have adopted these recommendations in their stated public position documents: 10 minutes of homework per grade beginning in first grade, and increasing it by 10 additional minutes every grade, with not more than 2 hours of homework overall by 12th grade (NEA, 2019; NPTA, 2019b). These parent and teacher organizations as well as student advocates also support the argument for quality over quantity and they value homework even for lower grades since this helps to build up needed studying and working habits for high school, college and life. Within top ranked and privileged private schools, one of the most influential scholarly articles based on survey research emphasizes the negative impact of excessive homework. In many of those top schools, students dedicate an average of about 4 hours per day, having a negative impact on student balance, learning and stress levels (Galloway, Conner, & Pope, 2013). This article was qualified with other correlational research and meta-analytic studies with ambiguous and even contradictory findings regarding Galloway et al. claims.

Despite some divergent results from various studies, the most relevant evidence-based findings from meta-analytic, case-studies and correlational research are that moderate and high-quality homework assignments support learning and it is more effective as a student's age increases. We can summarize these findings as supporting that homework assignments become more effective from grade 6 on and in moderate but progressive quantity (the 10 minute increase per grade principle). More than 2 hours of homework daily seem to have no or negative effects on learning even in more mature students. Similarly, homework is more effective as measured in learning outcomes for grades 7-12 and less effective in grades K-6. Smaller and shorter homework assignments before grade 6 can help at enhancing student discipline and work-habits but the direct impact on learning seems more limited.

Most of the meta-analytic and correlational studies also qualify that the main mechanism for a positive impact of homework on learning is not so much a large quantity and length of time needed to complete homework. Instead, research shows rather that it is the progressive introduction and increase in quantity of homework and time needed to complete it as a student matures (Bas, Sentürk, & Cigerci, 2017; Cooper, Robinson & Patall, 2006; Terada, 2018). Some of the studies also point out to the positive impact of high-quality homework assignments focusing on standards and subject matter concepts on learning (Boser, Benner & Smithson, 2019). Most teaching practitioners and parents see homework as a formative or instructional tool for reinforcing learning, check for understanding and instill discipline or hard-work habits. Thus, teachers tend to use homework as a no-stake or very low-stake type of task. Homework is

usually graded as a low percentage of the total grade or not counting towards the overall grade and mainly checking for task completion and student understanding of the materials studied.

There is a robust body of experimental and quasi-experimental research exploring the conditions under which homework has a positive effect on learning. Their findings point to the effectiveness and positive impact of homework for learning when contents, design, purpose, quality and timing of assignments are evidence-based (Kontur, de La Harpe, & Terry, 2015; Ramdass & Zimmerman, 2011; Roschelle, Feng, Murphy & Mason, 2016; Valle, Regueiro, Núñez, Piñeiro &, Rosário, 2016). Effective homework practices incorporate several of the evidence-based proven learning strategies highlighted by cognitive psychology. The two most effective strategies are assignments involving retrieval and spaced practice of previous and currently learned concepts. Impactful homework assignments also include several of the other four evidence-based learning strategies: interleaving, elaboration and dual coding as well as concrete and abstract examples. Since these evidence-based proven learning strategies are the most effective for classroom teaching, I will explore them in the instructional practices section in more detail.

Regarding assessments at NYC school, the situation is very complex since the actual practices by divisions do not align with each other. According to school leaders, the middle school uses more traditional formats of formative assessments and mainly traditional tests for summative assessments and grading while the elementary and upper schools tend to be more progressive in the types of assessments teachers use to evaluate learning. For instance, NYC school uses the College Board's Advanced Placement courses system, whose assessments are a combination of traditional and innovative assessment methods, but this approach seems inconsistent with the more progressive assessment practices in most courses at the upper school. This inconsistency translates into a pattern where many of the students do not earn the scores on the AP exams or other standardized tests that they would like to receive to enhance their chances of getting accepted to the most competitive colleges. Administrators and faculty would like to explore issues regarding how meaningful assessments can evaluate authentic student learning, if assessments can capture diverse learning growth, and how the school could address the great disparity and variance among students' outcomes.

There are broad educational research insights and controversies on effective assessments in K-12 education in the United States. Private schools as well as states and their public-school districts are spending more and more on assessment systems for evaluating student learning (Chingos, 2012; Olson, 2019). National organizations like the National Parent Teacher Association, NPTA (2019b) supports assessment systems that contribute to measure and set high curriculum standards while improving instruction. The movement for school accountability through assessment effectiveness is viewed as both necessary and useful for improving education. Assessment systems are a key element of the school reform movement, but accountability through high stakes standardized tests might have produced mixed results in certain cases according to scholarly case-studies, correlational studies and meta-analysis published within education research. Yet, assessment systems contribute to measure and set high curriculum standards and help at evaluating student learning (Brookhart & Nitko, 2011; Brookhart, 2013; Brookhart et al. 2016; Harlen, 2005; Kennedy, Chan, Fok, & Yu, 2008; Townsley, 2018).

From the direct and explicit instruction insights and the practical experiences of teaching practitioners there are two main forms of assessments: formative and summative and each serve different but related purposes, and each has different but related characteristics. The purpose of summative assessment is to measure understanding and relative mastery of the materials and skills of the specific applications, concepts or units within a given domain knowledge or discipline. Typically, summative assessment evaluates the student learning throughout the unit, term or course through graded and relatively high-stakes formalized tasks, such as exams, quizzes, tests and projects or labs within academic disciplines or artifacts and productions in the arts. The purpose of summative assessment is providing a summarized evaluation of the relative mastery of the knowledge and skills acquired by the student. Summative assessment can also be used with the purpose to inform changes in instruction to improve teaching and student learning in the future since it typically occurs at the end of a unit, term or course. However, partial graded sections or unit assessments also can provide on-going adaptive feedback for improvement in teaching and student learning. Different components and functions of assessment are both adaptive and developmental tools for student evaluation and learning (Chen & Boomer, 2017; Dawson, Xie & Wilson, 2003; Hamil, 2015, Kebles, 2016; Liu, 2008; Walvoord & Banta, 2010).

In centralized systems and public schools, there are some mandated forms of year-end summative assessments (mainly contracted at state or district levels) as well as required textbooks and ancillary materials. The components of these mandated summative assessments shape to a great extent, the design of on-going quizzes, unit or multi-unit assessments in the classroom. They also impact the types of homework assignments implemented within different courses, levels and grades. In decentralized and less formalized systems, like independent schools, there is a greater impact from the school's overall culture as well as its pedagogical and philosophical approach. The school's approach and culture interact with departmental and disciplinary approaches and expectations which in turn, reflect the professional organizations and specific course standards and practices. Yet, at the very core of what type of assessment assignments are selected and implemented will largely depend on the individual teachers' backgrounds, expertise and preferences and the time and energy constraints all teachers have in their daily schedules for using existing or creating new assessment assignments and tasks.

Formative assessment evaluates the evidence of student achievement and learning through low-stakes and/or non-graded on-going classroom activities, assignments and tasks. Formative assessment can be simply oral, visual or writing checks-ins for understanding and adapting specific activities, explanations, examples and/or lesson planning (Liu, 2018; William, 2011). Thus, the purpose of formative assessment is to assist, check, expand, reinforce and scaffold the application, progress and understanding of the knowledge and skills learned within a given unit or course in a safe and non-threatening or low-stakes context. This enhances students initial learning by trial and error and other forms of experimentation. By the same token, formative assessment can provide critical feedback for teachers to adapt and change their instruction and plans to improve and maximize student learning. In fact, some education researchers have re-framed formative assessment as AFL: assessment for learning (Stobart & Hopfenbeck, 2014). Without getting into the debate on whether formative assessment and AFL are the same (summative assessment is also a tool for learning), it is reasonable to argue with confidence that the flexibility and typical low-stake premises of formative assessment is ideal for incorporating evidence-based instructional learning strategies.

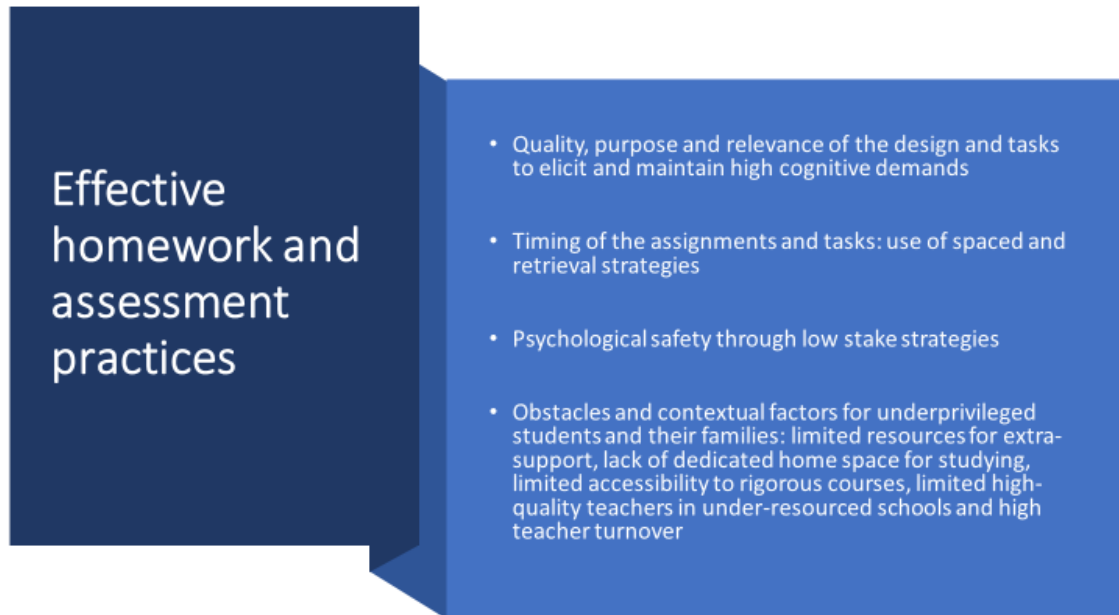
Education quasi-experimental research as well as cognitive psychology experimental research demonstrate the positive impact of both formative and summative assessments on improving student learning outcomes while providing additional insights on how these could become more effective instructional tools. A metacognitive review of a broad array of experimental research on the “testing effect” associated with assessment has demonstrated that testing is not only key for evaluating students but is as critical for learning (Hartwig & Dunlosky, 2012; Rowland, 2014). One of the most insightful and practical experimental studies on assessment is by Raupach et al. (2013). In their article, the authors explore the causal relationship of summative assessments and student learning among medical students. Their study was conducted through experimental research design using randomization among professional and college level medicine students. The results of this study demonstrate effectiveness of summative assessments versus resource intensive teaching formats when contents, design, skills and timing, are consistent with evidence-based practices.

The findings from Raupach et al. are consistent with broader findings from cognitive psychology and researcher-practitioner studies through experimental and quasi-experimental research demonstrating the effectiveness of both formative and summative assessments for student learning. This positive impact of assessment on learning is known by cognitive psychologists as the “testing effect.” The testing effect has been demonstrated by an overwhelming number of experimental and real-life studies over the last several decades (Yan, Luo, Vadillo, Shanks, 2021). Testing is effective for retrieval and thus retention of acquired knowledge. The testing effect is also critical to develop the application of the acquired knowledge and skills from the initial context to comparable or different situations (Cordray et al. 2013; Pellegrino, 2014; Peterson & Wissman, 2018; Roediger, Agarwal, McDaniel & McDermott, 2011; Schuwirth & Van der Vleuten, 2011; Wissman, Zamary, & Rawson, 2018). The learning impact of the testing effect is another way of stating that testing is a key element for mastery of any discipline domain and the related needed skills. Assessments in general, including summative standardized assessments, use open questions as well as multiple choice questions. Both types of questions have demonstrated positive effects on student learning and their educational outcomes. Thus, using both strategies, elaborative short or complex long questions or problems and answers as well as using multiple choice or even true or false sentences support learning and remembering content knowledge and application of skills.

The crucial point is that assessments, including standardized tests, are a set of multiple and varied evaluative instruments and tools to measure student learning and their mastery and capacity to apply their learning knowledge and skills. Assessments also have the added benefit, whether summative or formative, of enhancing and reinforcing student learning through the testing effect. Still, there is a need to adapt the findings from learning science to the conditions of authentic educational situations, but the overall positive impact of formative and summative assessment on learning has been demonstrated (Woolridge, Bugg, McDaniel & Liu, 2014). This is consistent with subsequent research exploring the effectiveness using both formative and summative assessments for student learning and as an instructional tool within medical teaching and learning, where scientific and evidence-based strategies are consistently applied to their educational programs (Kibble, 2017; Kulasagaram & Rangachari, 2018). The underlying

processes for effective assessment are at the root of evidence-based learning strategies as I outline in the instructional practices section.

Image I.5



Source: own elaboration from research review

What is also missing in this insightful body of research on homework, assessment and learning effectiveness is the limits and obstacles related to contextual factors. For instance, underfunded and under-resourced communities, families and schools are impacted by general limited accessibility to highly rigorous courses and learning opportunities, lack of funding for good quality professional development for teachers and in general, lower quality of teaching and higher teacher turnover in those schools. This negatively affects teaching quality and student learning (Adnot, Dee, Katz & Wyckoff, 2017; Boyd, 2008; Domina, Penner & Penner, 2017; Godhaber, Lavary & Theobald, 2015; Kalogrides & Loeb, 2013).

Moreover, the lack of resources of the families of students coming from underprivileged backgrounds contribute further to the negative impact on student learning even if these students are lucky enough to be accepted to a well-resourced private school. This is due to their overall disadvantage growing up in the context of a family with low levels of education and the financial impossibility of providing extra-support, tutoring, home space and a quiet environment for their children to study. Lack of financial resources also limit transportation means and the related mobility to join after school academic and curricular support or enrichment through co-curricular activities. In fact, family background or family environment is one of the primary predictors of student relative success or unsuccess in school (Carnevale, Fasules, Quinn, Campbell, 2019; Egalite, 2016; Lareau, 2011; Pal, 2020; Stoll, 2009). These cumulative disadvantages also impact student performance on school assessments, which is the other problem of practice NYC school wishes to explore through this capstone project.

Image I.6



Source: own elaboration from research review

There are additional obstacles, including a couple that has been overwhelmingly demonstrated through experimental research: stereotype and social identity threats. Steele, Spencer and Aronson (2002) analyze how the constructs of stereotype and social identity threat can have a negative impact on certain individuals and groups as demonstrated by underperforming when they feel they are in unsafe situations. *Individual stereotype threat* refers to specific situations that make individuals feel they might be judged negatively because of widely held stereotypes about the groups which they are identified with. Closely related to individual stereotype threat is the concept of *social identity threat* which creates anxiety or concern for social groups that are generally underrepresented, devalued or stereotyped in a negative way. Both threats result in underperformance of affected individuals and groups with a stereotyped characterization.

Most of the findings and additional analysis of experimental research informing this argument was subsequently summarized and expanded in Steele's (2010) book, *Whistling Vivaldi: How stereotypes affect us and what we can do*. The findings from the research within this area of social psychology are applicable to education and school design, policies and programs. In fact, many of the studies carried out within this field, focus on underperformance of female students in STEM fields; underperformance of African-American and other minority students in STEM fields and on verbal standardized tests; and in general, underperformance of minority and stigmatized groups on job evaluations (Beasley & Fisher, 2012). One of the critical insights from stereotype threat research has not been formally linked to an emergent theoretical strand around the concept of psychological safety although both are intuitively linked: one can only reduce stereotype threats in a context or situation of feeling psychologically safe.

The goals of improving homework and assessment practices at NYC school for enhancing student curricular and co-curricular educational outcomes, restoring more balance in their lives and increasing students' chances of getting accepted into the most competitive colleges cannot be done in isolation. The NYC school leaders understand that improving homework and assessment practices is linked to maximizing teaching and learning. By the same token maximizing teaching and learning involves making the school professional development more impactful on actual instructional practices in an overall learning and trusting school climate. This brings us to the subsequent problems of practice addressed in this capstone project.

I.3.2. Problem of practice #2: Instructional practices

NYC school senior leaders would like to understand how its faculty's current teaching and learning practices can maximize instructional effectiveness and student outcomes for the school to support their growth and development. The school's leadership correctly perceives that maximizing evidence-based teaching and learning is critical to achieve the related goals of improving assessment and homework practices. This is also connected to the school's overall mission and broad goals of students achieving mastery and application of knowledge and tasks through critical thinking skills, problem-solving and creativity. In that sense, it is crucial to articulate what we know from research about the processes and evidence-based strategies for teaching and learning.

Teaching and learning are probably one of the most widely researched areas within education scholarship but also from related disciplines with specialized foci on student learning, such a cognitive psychology or learning science. Teachers' education programs make teaching, learning and curriculum their main foci. The insights from educational practice and research are summarized in teachers' training textbooks. There are several critical evaluations and research on the uneven effectiveness and limitations of teachers' preparation programs (Cochran-Smith & Villegas, 2015; Greenberg, Walsh & McKee, 2014; U.S. DOE Office of Postsecondary Education, 2016). Some cognitive scientists have pointed out that many of those textbooks used in teachers' preparation programs do not typically include effective evidence-based strategies for student learning or when they do, only do so in very limited ways (Pomerance, Greenberg, & Walsh, 2016; Weinstein, Madan, & Sumeracki, 2018).

In many cases, these teachers' training textbooks emphasize teaching strategies based on either unproven instructional approaches or distorted understanding of the implications from research, such as advocating for differentiated teaching and adapting to students' learning styles (Pashler, McDaniel, Rohrer & Bjork, R., 2008; Willingham, Hughes & Dogolyi, 2015; Willingham, 2018). Too often, the teaching programs, textbooks and even PD training, include as true principles about effective learning, some false neuro-myths. This has resulted in many school leaders, teachers and PD trainers assuming as truths some learning and instructional practices that are not evidence-based. For example, many schools in the US state in their missions and educational philosophies that their approach is adapting instruction to students' individualized learning styles (a neuromyth). School leaders typically offer teachers' training PD programs perpetuating these false neuro-myths among teachers, parents and students. That is in part why these neuro-myths have become quite prevalent among the general population and also among

teachers and education trained professionals (Boser, 2017b; Christodoulou, 2014; Dekker; Lee, Howard-Jones & Jolles, 2012; Ferrero, Garaizar & Vadillo, 2016; McDonald, Germine, Anderson, Christodoulou & McGrath, 2017; Newton & Salvi, 2020; Varma, McCandliss & Schwartz, 2016).

Despite the shortcomings in many teacher-training programs and textbooks, most teachers learn relevant instructional practices that are effective and grounded in evidence and experience. Many teachers learn about effective strategies through trial and error of what works and what does not but most teachers coach and mentor each other informally or through formal teachers' induction programs. Through these trial and error or coaching and mentoring experiences, teachers progressively find out some proven and true effective teaching strategies, which include several approaches under the umbrella of what education research refers to as "direct and explicit instruction." This type of trial and error approach to teaching is inspired in the tried and proven strategy of backward design or as was subsequently reframed "understanding by design" (Wiggins & McTighe, 2005).

We can articulate the main principles associated with direct explicit teaching as follows. Instruction should be teacher-led by deciding the curriculum and its flow and structure throughout the academic year. Teachers should also decide the sequence of activities within each lesson. Similarly, the complex artifacts, concepts, materials, procedures, skills and tasks are broken down to small chunks and steps for learning and practicing extensively before engaging in bringing them together for an overall application into a complex product, problem or project. Teachers must explain, clarify and model all new materials and skills before asking students to apply, create, or solve problems using related materials or apply the learned knowledge and skills to similar situations. Once practiced in class, then teachers ask students to apply the acquired knowledge and skills to different contexts and situations while offering scaffolding for the process. All of these should be done with the engagement of all the students participating and practicing the material and skills being studied by making sure every student engages in the relevant tasks. This is better accomplished by assigning all students in a classroom to perform certain tasks and rotating them in the type of tasks in subsequent days, so everyone performs or practice the key components of the curriculum and skills within each unit eventually (Ashman, 2018, Hattie, 2009; Stockard, Wood, Coughlin & Rasplica Khoury, 2018).

A way of summarizing direct and explicit instruction is a set of principles providing clear and succinct explanations of key concepts or materials followed by guided student practice, typically in small chunks or steps. Direct instruction can involve different instructional approaches and principles simultaneously. The most common is the standard sequence of teaching, guided practice and/or discussion, and teaching followed with additional student independent practice. This process of direct instruction continues with an increasingly more complex cycle of student learning and practicing of contents and skills. We can name this the classical teaching approach, sometimes abbreviated as teaching-practice-teaching or TPT, although most teaching practitioners and researchers name it differently.

A variation of the classical direct approach but clearly differentiated from it is the almost reverse teaching sequence: problem-solving approach (sometimes abbreviated as practice-teaching-practice or PTP). In the problem-solving approach learners begin by confronting or inquiring into

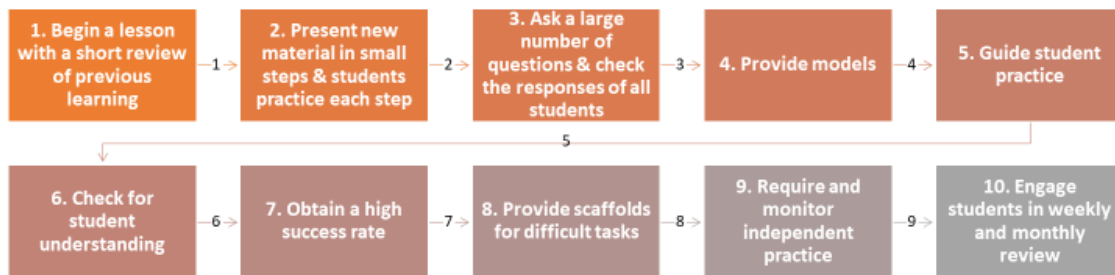
a problem or set of problems, followed by instruction helping students to understand the underlying concept, knowledge and skills they are trying to ascertain. With this subsequent direct and explicit instruction, the teacher guides students to learn the correct content, procedures and skills, followed by more targeted tasks, practice or problem-solving. Research about these two forms of direct and explicit instruction (classical versus problem-solving) show some strengths and weaknesses of one versus the other. However, the evidence about their relative effectiveness versus the other seem to support the more classical approach of teaching-practice-teaching or TPT as more effective (Ashman, Kalyuga, & Sweller, 2020; Sana, Yan, Kim, & Joseph, 2017). The exception as demonstrated through a live experiment is that the problem-solving followed by instruction teaching sequence is more effective than the traditional teaching and practicing sequence only when the lesson design includes abstract cases with an invention prompt (Schalk, Schumacher, Barth, & Stern, 2018).

Most teachers combine both direct instruction approaches: the classical teaching-practice-teaching -TPT- with the problem-solving based, practice-teaching-practice -PTP-. Similarly, teachers supplement direct and explicit instruction with additional “indirect” teaching approaches ranging from collaborative learning and discussion, in-class questioning, elaboration of answers as well as labs, projects and role-playing or skills practicing. In fact, most actual teaching involves a combination of all these direct and indirect approaches. Education researchers and teaching practitioners have connected these direct and indirect teaching approaches under a broad set of effective explicit instructional principles (Hattie, 2009; Stockard, Wood, Coughlin & Rasplika Khoury, 2018).

Image I.7



The 10 principles of direct and explicit instruction



Source: summarizing *Principles of Instruction* by Barak Rosenshine, (2012)

One of the most influential and succinct summaries of the direct and explicit instruction was crafted and synthesized into ten effective teaching principles by Rosenshine (2012). The first one is for teachers to begin a lesson with a short review of previously learned material to strengthen and help with recall of previous knowledge or skills. Second, present new materials in small steps and in short time chunks followed with student practice after each step while assisting them as they practice. Third, asking students several questions and checking the responses to practice the new material while connecting it to prior learning. Fourth, provide models and worked examples for students to learn new material, processes and ways to solve subsequent problems or situations. Fifth, guide and assist student practice. Sixth, teachers need to check for student understanding at every step of the lesson and instruction. Seventh, design the steps and tasks in such a way that help students to achieve a high success rate during classroom instruction. Eighth, provide scaffolds for difficult concepts, materials and tasks to assist student learning. Ninth, require and monitor for student independent practice. Tenth, include weekly and monthly review of learned materials (Rosenshine, 2012).

The principles of explicit instruction are also an attempt to incorporate the insights about self-efficacy (Bandura, 1977, 1993) and enhance student intrinsic and extrinsic motivation (Zepeda, Richey, Ronevich & Nikes-Malach, 2015). I will discuss self-efficacy and motivation in the subsequent section on leadership. The critical point is that the principles for direct and explicit instruction are generally proven but they can be also qualified, supplemented and understood better with the insights from education research and cognitive psychology regarding the role of effort, cognitive demand and learning. Educational practitioners and researchers attempt to address these through the centrality of the concept of learning tasks and the cognitive demand included in the design and application of instructional tasks in the classroom. The rationale behind a cognitive demanding task is that it allows for enhancing and stretching instructional approaches (and the related curriculum, assessment and even teacher PD training) through complex and high-level processes and steps needed to complete it while acquiring the skills and grasping the concept involved. The purpose of designing and implementing sophisticated learning tasks is to trigger and maintain students' effort and cognitive demand within a disciplinary domain as the most effective way of deepening student understanding of the material (Tekkumru-Kisa, Stain & Doyle, 2015, 2020).

High level tasks involving sustained cognitive demand also aims at enhancing students' critical thinking and problem-solving skills as well as applying those concepts and skills to different or novel contexts or problems. These sophisticated tasks are what cognitive psychology and learning science refer to as far transfer of knowledge and skills, long and short term memory (processing, storage and retrieval of information) while connecting the learning tasks to previous background knowledge and the learner reflecting on their own learning (metacognition). I choose the lenses provided by cognitive psychology for this capstone project purposefully, since this case study tries to base its analysis and recommendations on well-established and evidence-based causal understanding of teaching and learning. The insights from cognitive psychology are grounded on explanations of what specific learning processes and strategies result in effective and long-term learning.

The studies and research within cognitive psychology rely on a great array of experimental randomized and real-life learning situations involving general and specific student and adult

groups in school, college or other learning settings. These studies analyze subjects within a wide array of ages, from elementary to middle and high school as well as college and adult subjects. As described by high level cognitive demand tasks, there are four critical processes for learning according to cognitive psychology: background knowledge, short and long-term memory coding, near and far transfer and metacognition. Background knowledge is a proven critical process for learning and is highly effective for subsequent learning when it occurs within the same or similar knowledge domain or situation (Tulving, 1974; Whitman & Kelleher, 2016). Associated with these learning processes are some of the key elements that all educators and administrators pinpoint as crucial for high level learning: critical thinking skills, problem-solving and creativity as application of knowledge and skills to new and unique situations or different domains. The broader and deeper our knowledge and skills within a specific domain the more effective the subsequent learning will be and the capacity to assimilate and understand new knowledge and skills within that specific domain. Evidence-based teaching occurs when merging the insights from learning science with the real experience of actual classroom teaching.

Memory, especially long-term memory coding and retrieval are processes closely linked to background knowledge and skills. The more we use simultaneous dual mechanisms (more effective than a single mechanism) the higher the capacity for coding and eventually retrieval of knowledge and skills. To remember (retrieve) knowledge and skills is critical for mastery of a specific domain and mastery is a necessary condition before developing critical thinking skills and creativity. The learner must master the knowledge and skills within a specific domain to be able to use high thinking skills and apply them to different situations or domains (critical thinking), resolve a problem (problem-solving) or to create a new angle, approach or product (creativity and innovation).

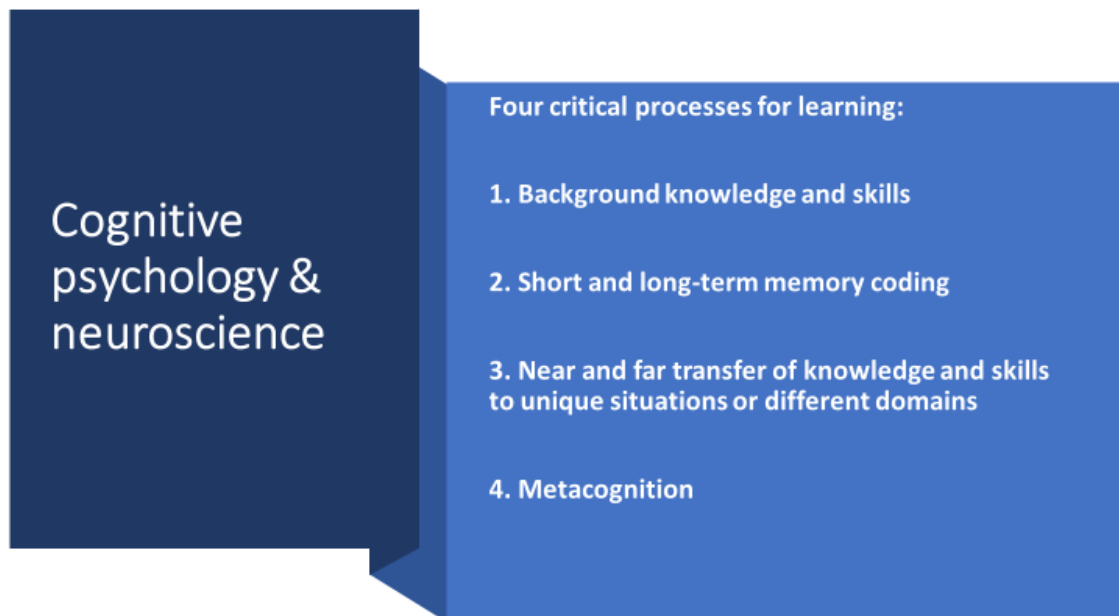
The complicated process of applying and transferring knowledge or skills from a specific domain to very different ones are what cognitive psychologists refer to as far transfer and typically requires clues, scaffolding and support for the learner to successfully master the process. Far transfer is one of the most cognitively demanding processes of learning and high-level thinking, requiring a solid mastery of the initial discipline domain bounded knowledge and skills. For students to successfully perform a task involving far transfer, teachers need to provide well organized and thought-out clues as well as careful procedural planning and scaffolding to guide students at achieving the cognitive demand of high-level thinking tasks. Near transfer is when a learner transfers previous knowledge and skills to similar situations. Near transfer is a necessary condition for initial learning but requires less support to accomplish, although teachers must check and monitor for understanding to make sure students have mastered it.

Educational researchers and educators advocate for the need to include high level cognitive demands in instructional tasks and enhance critical thinking, problem solving and creativity but teachers understand from their experience of trial and error and from what we know from cognitive psychology that there are a lot of difficulties, nuances and subtleties. The process of far transfer of knowledge and skills to novel situations or different domains requires detailed planning and support sustained over the long-term through the student learning process, course or career. There are no shortcuts to develop the critical thinking and problem-solving skills or creativity associated with successfully accomplishing far transfer processes of knowledge and skills. First, learners need acquire the basics and fundamentals, grow and develop a minimum

level of mastery within a given domain. Subsequently, for learners to be able to proceed with a successful far-transfer of knowledge and skills from a domain to a different one, or even within the same discipline but at a higher level, they need to develop increased mastery of knowledge, skills, learned sophistication and understanding of the underlying concepts or skills (De Bruyckere, Kirschner, & Hulshof, 2020; Willingham, 2020).

There is an additional critical process to develop and enhance learning beyond a specific subject matter. Metacognition is a broad process to improve learning by reflecting and thinking about how we learn and think about our strengths and weaknesses with specific content or skills within a given knowledge domain. The metacognitive processes involve self-awareness through purposeful planning, follow-up monitoring and assessing learning. This self-awareness is developed through meta-strategies focusing on assessing the strengths and weaknesses of our abilities, knowledge and readiness for certain assignments or tasks. This process involves identifying and correcting errors and preparing for the needed steps or breaking down tasks to continue improving our knowledge and skills. Metacognition is critical for transferring and adapting knowledge and skills to new contexts and thus for growing and improving learning (Bransford, Brown & Cocking, 2000; Pintrich, 2002; Wiley et al. 2016; Zohar & David, 2009).

Image I.8



Source: summarizing research review from cognitive psychology and learning science

Metacognition must be developed within specific learning contexts and learned as explicit concepts, language and relevant processes for the learners to adapt their strategies to new situations. There are many forms of metacognition including: pre-assessments and tasks for identifying areas of confusion or misunderstanding of concepts. Another metacognitive strategy is using retrospective post-assessments and reflection on what worked or did not in different types of assessments. An additional effective strategy is incorporating guided questions learners

should ask themselves or encouraging learners to ask their own questions in class activities, assignments, tasks and tests. Finally, one can exemplify difficult acquisition of knowledge and skills by modeling the specific metacognitive steps and practices within the discipline or domain of the course. Like any process for learning, metacognition involves effort, practice over time, self-testing in the efficacy of those approaches and assessing and reflecting on what behaviors and strategies achieved best results or more learning (Lovett, 2013; Salvatori &, Donahue, 2004; Tanner, 2012). Another way of thinking about metacognition is through its absence or the lack of self-awareness of our own learning strengths and weaknesses. The lack of metacognitive skills is linked to unawareness of errors, incompetence and lack of insight into our own deficiencies, whether intellectual or social (Dunning, Johnson, Ehrlinger & Kruger, 2003).

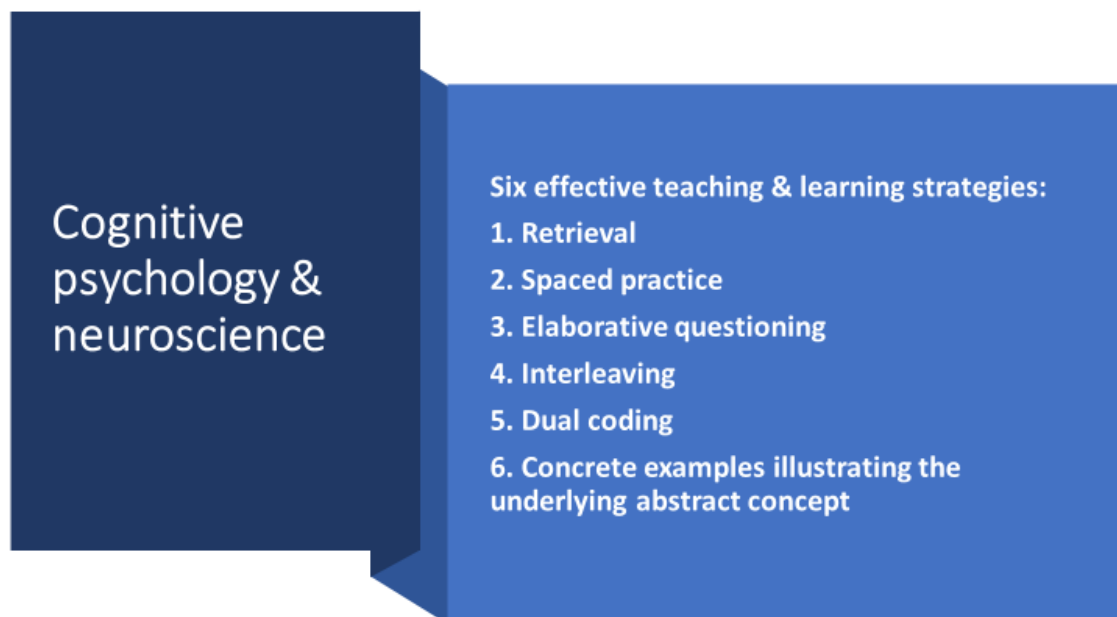
Weinstein and Sumeracki (2018) summarize the findings from cognitive psychology and neuroscience on causal explanations of what specific learning strategies result in effective and long-term learning. They review a broad body of experimental and quasi-experimental real-classroom situations demonstrating that there are six effective learning strategies as uncovered by learning science research. These learning strategies are different ways of reinforcing the learning processes of background knowledge, memory coding, transfer and metacognition. These six strategies are retrieval, spaced practice, elaboration, interleaving, dual coding and using differentiated concrete examples illustrating the underlying relevant abstract concept. These six effective strategies have also been outlined and summarized by an increasing number of learning scientists through influential articles and books (Boser, 2017a; Brown, Roediger, & McDaniel, 2014; Dunlosky, Rawson, Marsh, Nathan, & Willingham, 2013a,b; Pashler, Bain, Bottge, Graesser, Koedinger, McDaniel & Metcalfe, 2007; Sumeracki, Weinstein-Jones, Nebel & Schmidt, 2019; Whitman, & Kelleher, 2016; Willingham, 2010). Each of these six proven learning strategies provides insights and clues on how teachers could adapt their craft for students to increase their understanding, long-term knowledge and skills and expand their metacognitive skills of improving self-awareness of their learning strengths and weaknesses while also enhancing their grit, growth mindset and drive (Duckworth, 2018; Dweck, 2006; Pink, 2009).

I am going to use Weinstein & Sumeracki (2018) synthesis of cognitive psychology research and insights on the six evidence-based learning strategies. The two most effective and proven practices to enhance teachers' effective instructional strategies and students' retention and understanding of new concepts and materials are retrieval and spaced practice (Agarwal & Bain, 2019). To consolidate and recall learning it is critical to use retrieval practice, which can and must include, several techniques. For instance, writing down and drawing all that has been learned from the instructional explanation on a blank piece of paper or responding to questions while providing answers without consulting notes, materials or textbooks. Low stake quizzes and practice exams with either multiple choice, short questions and answers or different problems are also great retrieval practice techniques. Retrieval practice is effective even without providing feedback but doing so increases the impact and effectiveness of teaching and learning and can be reinforced further through distributed or spaced practice (Agarwal, Roediger, McDaniel & McDemont, 2018; Smith et al., 2016; Wissman, Zmary, & Rawson, 2018). Spaced practice requires to practice, study and teach the material through shorter segments of time but doing so more frequently and spaced across several units, weeks or months. Using a spiral curriculum or simply reviewing previous concepts and materials in the context of new or subsequent units is an

effective spacing strategy for teaching (Johnston, 2012; Wong, Lam, Sun & Chan, 2009). Spiral curriculum impact can be enhanced through well designed sequences of courses within a broader strand as part of an overall curricular program (Neumann, Neumann & Lewis, 2017).

Teachers can further deepen the learners' understanding of the material when the teaching and subsequent practice involves connecting what students are learning to previous knowledge and information through two additional strategies. One is asking probing relevant open questions (interrogative elaboration or elaborative questioning) that requires clarifying and linking various aspects of the concepts and information, such as why, how, what if, etc., either led by the teacher, peers or asked to oneself. This strategy is most effective when carried out after the initial learning and with the teachers' expertise guiding the process (Pashler, Bain, Bottge, Graesser, Koedinger, McDaniel, & Metcalfe, 2007; Nestojko et al. 2014; Tajika et al., 2007; Weinstein & Sumeracki, 2018). The second strategy is interleaving or switching the order of the concepts, problems and topics being studied within a course or unit and doing so in different order. This strategy is most effective within the same course or knowledge domain.

Image I.9



Source: summarizing review of cognitive psychology research from Weinstein and Sumeracki (2018)

The other two effective learning strategies, dual coding and the use of concrete examples, allow teachers to help learners integrate new information and review or retrieve previous concepts. When teachers present information or knowledge and skills that include pairing images or graphics with verbal expressions (written words or speech), the learners process the new information through two differentiated mechanisms for further understanding and future retrieval reinforced by the connection between both modes of learning. This strategy requires careful design and certain conditions to be effective: too much information, unrelated images to the text or too appealing images can result either in overloading or distraction (Mayer & Moreno, 2003).

Similarly, when teachers illustrate through several and apparently different concrete examples the shared characteristics or ideas of an underlying abstract concept, learners can assimilate and understand the abstract concept more deeply and effectively. The caveat for this strategy to be effective is to make sure that the examples must be different but relevant for the underlying abstract concept characteristics (Carbonneau, Marley, & Selig, 2013). Additionally, this strategy typically requires for teachers to provide clues and scaffolding to help students ascertain the underlying characteristics and connections of very different concrete examples to the abstract concept (Weinstein & Sumeracki, 2018).

I.3.3. Problem of practice #3: Professional development and school structures

The NYC school senior leaders did not directly address the need to build up and improve professional development (PD) effectiveness and opportunities for teaching faculty since they felt that the school already has a strong PD program in place. This indicates that the school's leadership correctly perceives that professional development is a critical aspect for improving teaching and learning as well as a mechanism to enhance a positive learning environment and school climate. The school leaders stated that NYC school's professional development is extensive and robust. However, after talking with the department chairs during the semi-structured interviews, it became clear that the school's professional development practices are uneven in their effectiveness, focus and impact according to department chairs. Since effective professional development is critical for improving teaching and learning, I incorporated PD as an additional problem of practice and as a section in the SOTAH survey for teachers.

Similarly, as I was finishing the round of interviews with department chairs in March 2020 and I was preparing for a campus visit, the COVID-19 pandemic hit New York especially hard. This resulted in a cancellation of schools, along with my planned campus visit, and online teaching began. The pandemic situation also brought up the issue of student support as well as of teacher professional development regarding distance teaching and learning. Thus, I decided to also include a couple of questions regarding online instruction. Department chairs also brought up during the semi-structured interviews the issue of the disparity of students' background knowledge and skill level. This issue touches two major problems that any school faces every day. One is the broader societal inequality of opportunities and resources and their impact on the student achievement gap. Educators and schools have a rather limited impact on those broader contextual issues. However, school can and often try to contribute to reduce the achievement gap by providing opportunities and support structures within the school to their own students. Although this is not the focus of this capstone project, I included a couple of questions regarding student engagement and support in the SOTAH survey.

The research literature on the disparity of students' background knowledge and skills and how these relate to greater societal inequities is at the root of the debates regarding ability grouping in schools (or earlier framed as "tracking"). The debate and research on ability grouping has also brought up issues regarding its positive or negative impact on student learning as well as how to support students: reinforcement for those that need the extra-help and acceleration opportunities for those with stronger abilities (the specialized school gifted programs and services: see Olszewski-Kubilius, 2015). There are many case studies and correlational research on the

effectiveness of ability groups but very few cognitive psychology or education randomized experimental research on this issue. A comprehensive meta-analysis of over one hundred years of studies on ability grouping and acceleration concluded that these practices are effective at improving students' learning and outcomes (Steenbergen-Hu, Makel, and Olszewski-Kubilius, 2016). Yet, the impact of ability grouping on lower tracks seems to be negative and has brought up issues about discrimination and inequality of opportunities (Oakes, 2008; Domina, Penner & Penner, 2017). The scholars arguing against ability grouping see it as perpetuating the achievement gap and the underpinning of this debate has become very ideological, polarized and even racially charged within the United States.

Several meta-analyses within international and comparative education research in developed countries seems to support both arguments. In these international studies emerge a couple of additional variables influencing student learning, achievement and outcomes: the socio-economic background and the migrant status of the student population (Schofield, 2010; Woessmann, 2009). These findings support similar arguments to those that have emerged and evolved within the United States but without the politically divisive and racial overtones of the American debate on tracking. To assess the plausibility of competing theoretical approaches and to falsify hypotheses through causality analysis would require Randomized Controlled Trials, RCT. Fortunately, there are a couple of meta-analyses within international education research that include several RCT studies regarding the effectiveness of ability grouping and acceleration strategies in developing countries (Evans and Popova, 2015; McEwan, 2015). One of the most relevant RCT studies on the effects of ability grouping on student outcomes has been carried out in Kenya by Duflo, Dupas and Kremer (2009). The fact that this study was undertaken in an African nation dispels any notion of intended or unintended bias against people of African origin, which is one of the main objections against ability grouping in the US given the historical context of discrimination and the subverted racial use of tracking in certain districts and schools. One of the authors of this study, Duflo, also was awarded a Nobel Prize on Economics for this and subsequent related research last year, so it is clearly a high quality and insightful study.

The Duflo, Dupas and Kremer (2009) Kenya's RCT study findings are consistent with a broad set of case and correlational studies in the US and developed countries in several aspects. However, regarding the issue of the negative impact of the lower tracks on student performance the Kenya's RCT shows that under the correct conditions, ability grouping also improves performance of students in lower tracks. This is a bright spot that begs further exploration and seems to point out to the need for more effective teaching strategies for lower performing students. There is anecdotal and comparative evidence of what those bright spots may look like when we consider the insights from cognitive psychology research on effective teaching and learning and examine some of the bright spots of the top performing public charter and magnet schools and some of the top leading private schools in the United States.

All the top US private and public charter and magnet schools have strong and yet balanced requirements for graduation, including the expectation that students need to complete at least 6 or more AP, IB or other advanced courses. In fact, their graduates typically go well beyond the minimum requirements. These schools also offer placement by curricular knowledge and skills (instead of only placement by age) and more importantly, they provide either accelerated paths or multiple flexible paths for advancements into higher level courses. This approach is

supplemented by strong support programs, either through well- established public programs like AVID or specific school developed support programs within most of the top private schools (Fernández-Castro, 2018; 2019). These strategies, structures and policies result in better student learning when compared to the rest of the US educational system.

We can conjecture that professional development for teachers focusing on effective teaching and learning strategies uncovered by cognitive psychology and the bright spots within teaching practices would result in improved student learning and outcomes. This approach will need to be enhanced through support programs helping disadvantaged students to acquire the needed content knowledge and skills while practicing effective learning strategies. Given the scope of this capstone project, I will only briefly address the issue of student support, ability grouping and impact of online distance learning. I will instead focus the bulk of my analysis on the effectiveness of NYC school PD program and the impact of professional development on teachers' instructional strategies.

The research literature on professional development is broad and extensive. Previous research has highlighted several factors that contribute to effective professional development. These include flexibility and guidance from school leadership regarding teachers' growth, including a high degree of agency and autonomy at designing teachers' professional development programs, collaboration, meaningful feedback and support (King 2014; Kwakman, 2003). These elements are critical for teachers to focus on the areas of content and teaching methods that can improve their craft, but research has pointed out other areas affecting teachers' professional development effectiveness. School overall goals and programs and how teachers understand the school system's decision-making processes also impact teachers' professional development (Kaseorg & Uibu, 2017; Santiago, Levitas, Rado & Shewbridge, 2016). Similarly, teachers' buy-in and identification with the school leadership, mission and goals is positively related with improved performance, professionalism and increased effort (Geijsel, Slegers, Stoel & Kruger, 2009; Yoon et al, 2007). Professional development effectiveness is also related to how teachers perceive their own cognitive and emotional commitment and involvement individually, as part of a department or as professionals (Avalos, 2011).

Comparative and international surveys, like the Teaching and Learning International Survey (TALIS), have shown a great variability in the extent, effectiveness and opportunities of professional development across countries (OECD, 2009, 2016). One of the most interesting findings across countries and among different education systems from the OECD's TALIS surveys is that professional development that is extended over time for longer periods is the most effective according to teachers self-reported answers. Focused coursework or certificates within a specific domain or subject content or methods lasting from a quarter or semester to a whole academic year, seems to be one of the most effective approaches. Another important component of effective professional development of teachers across countries is their involvement in collaborative research regarding teaching and learning, the establishment of teachers' learning communities and networks as well as the accessibility to teachers' coaching and mentoring programs (CCSEA, 2016; Ingersoll & Strong, 2011; Kraft, Blazar & Hogan, 2018; Schleicher, 2016; Sherer, Norman, Bryk, Peurach, Vasudeva & McMahon, 2020).

The crucial question is to what extent are professional development practices effective at improving actual teaching and student outcomes. In the United States one of the most influential studies on effective professional development highlights seven critical variables and characteristics (Darling-Hammond, Hyler, Garner & Espinoza, 2017). First, effective PD engages teachers in learning opportunities that are content focused. Second, it is supportive of actual teaching practices. Third, effective PD is job-embedded in instructional planning and tasks. Fourth, it is actively collaborative. Fifth, effective PD provides coaching and mentoring. Sixth, it models effective practices. Seventh, and finally, effective PD is ongoing through a sustained reasonably long period of time, according to research. Focused professional development can positively impact the design and implementation of instructional tasks provided by teachers to students in their classroom (Penuel, Gallagher & Moorthy, 2011; Reiser, 2013). Thus, when targeted, PD can indeed be effective and have a direct impact on enhancing teaching and learning and indirectly, improving student outcomes.

Image I.10



Source: summarizing research finding by Darling-Hammond, Hyler, Garner & Espinoza (2017)

There is a broader set of questions related to teachers' PD effectiveness when applied to the specific school's structures and environment where teaching takes place. These questions range from class size, ability grouping, socio-economic, ethnic or linguistic backgrounds of the student population, resources and structures for student support as well as school learning environment and leadership approaches. Since this capstone project focuses on teaching and its related professional development, I will not address these school characteristics and structures except for overall school climate and leadership due to its ubiquitous impact on any school. This brings us to the fourth and last problem of practice addressed in this capstone project.

I.3.4. Problem of practice #4: School climate, leadership and trust

NYC school senior leaders expressed interest in issues of the school climate of trust although this issue was not an explicit concern. This problem of practice was rather expressed implicitly. The school leaders' suggestion was that this capstone project should begin its research sequence with department chair interviews to build up trust and rapport before proceeding with surveying faculty. The school's leadership correctly perceives that trust and school climate are critical for maximizing teaching and learning and professional development practices to achieve the related goals of improved and meaningful assessment and homework practices. This suggestion from the school senior leaders about the need to build up trust plus the subsequent interviews with department chairs brought me to the decision of including a set of questions in the survey to better understand the current level of trust of faculty as well as their overall perception of the school's leadership and climate.

Instructional leadership is the concept that captures leadership impact on student outcomes and the most appropriate to address this problem of practice. The relative impact of quality of instructional leadership is considered the second most significant factor on student learning outcomes after teachers' competence, knowledge and passion about their subject matter and the teachers' pedagogical skills. The impact of school leadership on student outcomes is more significant in more centralized and hierarchical systems and more modest within more decentralized and horizontal systems such as in the case of the United States' public versus independent schools (Karadag, 2020). Yet, a broad body of research has outlined the significant impact of school leadership on school climate, teachers' selection, professional development, program quality and indirectly on students' educational outcomes (Day, Gu, & Sammons, 2016; Geisel, Sleeper, Leithwood, Jantzi, 2003; Goldring, Porter, Murphy, Elliot & Cravens, 2007; OECD, 2009, 2016).

Building on the concept of instructional leadership and synthesizing it with the organizational theory and research concept of distributed leadership (Spillane, 2006), several researchers have investigated and made explicit the empirical connection between instructional distributed leadership and school learning environment and trust. Distributed leadership stretch actual leading over multiple individuals within an organization, either appointed or as factual leaders due to their influence over others. Distributed leadership shapes more around the function, goal, task or team involved according to a flexible division of labor and informal channels of influence and practice instead of relying on a rigid hierarchical structure. The mix methods comparative global study on leadership in International Baccalaureate (IB) schools (Hallinger & Lee, 2012) demonstrates that distributed leadership contributed to smoother student transitions within the IB programs and created cross-program coherence. These insights have been supported in other school contexts and with different research methods. For instance, there is a correlational study comparing the impact of distributed leadership on teachers' affective commitment to their schools between a private and a public-school system in the US (Trammell, 2016). This study demonstrates a moderate significant positive correlation between distributed leadership and teachers' affective commitment, which is another indicator of trust.

Even more relevant is the experimental methods study on the impact of distributed leadership on collaborative team decision-making (Supovitz & Tognata, 2013). This experimental research

findings establish on solid empirical ground that distributed leadership, indeed causes collaborative decision making in schools. This impact includes several critical aspects of school climate and trust, such as individual's perceived influence on the school decision making process, an increased and more wide use of data, and a higher level of trust within teams in the school. It is not an accident that distributed leadership's impact on school climate and teachers' affective commitment and trust extend to other critical dimensions of teaching effectiveness, such as a teacher's sense of autonomy, motivation and self-efficacy. In fact, there is not autonomy without a sense of self-efficacy and motivation. Conversely, there is no self-efficacy and motivation without a degree of autonomy. Distributed leadership is at the core of this interactive dynamic between autonomy, motivation and self-efficacy.

The concept of self-efficacy was developed and framed in an impactful way in the classic work within cognitive psychology by Bandura (1977, 1993). The fundamental principle is that learners are more likely to persist and put the effort for learning if they expect to succeed, accomplishing a task or attaining goals, typically associated with their perception of their own capacity, competency and skills. Likewise, this motivational principle has been applied to teachers' sense of autonomy and motivation. Teachers can have a positive impact on student learning by designing and implementing activities, plans, and tasks helping students to acquire the needed domain knowledge and skills to master the course materials and curriculum. When teachers believe in their own ability to manage these professional challenges and instructional steps and that they have the autonomy to plan and execute them, their perception of well-being and a positive working environment will likely translate into more effective instruction and student learning (Barni, Danioni & Benevene, 2019; Loughland & Alonzo, 2018; Mok, & Moore, 2019; Patall, Sylvester & Han, 2014; Putwain & von der Embse, 2019).

Self-efficacy is related to another critical concept for effective distributed leadership: motivation. The literature and research on motivation is extensive and complex. Cognitive and social psychology have contributed with insightful approaches to what motivates and how the motivation mechanism shape the drive of human beings to accomplish goals but one of the most useful is the categorization of intrinsic and extrinsic motivation (Pink, 2009; Zepeda, Richey, Ronevich & Nikes-Malach, 2015). Intrinsic motivation has the locus in the individual self and is associated with autonomy and self-efficacy leading human-beings to be more likely to pursue tasks at one's own initiative and being more engaged cognitively. This dimension of motivation also involves a willingness to take-on more challenging areas and aspects of any situation or task, striving for genuine understanding and persistence in the face of failure to achieve a goal or outcome. By contrast, extrinsic motivation is associated with the context and incentives outside the self or the task at hand. The external incentives of rewards or avoidance of punishment become the motivating locus for action or behaviors.

Effective school leaders build on and design cultural tools such as a mission, vision, values and goals of the school in a climate of collaboration and trust that can be accomplished through distributed leadership and providing teachers with autonomy and thus, motivation and self-efficacy. A positive climate affects and interacts synergistically with impactful professional development and well-organized and relevant curricular programs. Yet there is an additional critical element in that interaction between school leadership, school climate, professional development and curricular effectiveness: the teacher evaluation system.

An effective and fair teacher evaluation system contributes to a positive school climate of trust. By the same token a fair teacher evaluation system is linked to impactful professional development on curricular and instructional practices and student learning. The most recent insights from the literature research on teacher evaluation systems can be summarized as the tendency towards hybrid systems that are both effective and fair, typically linked to targeted professional development. A hybrid teacher evaluation system combining elements from the more traditional subjective observations and informal interaction with more objective tools related to student learning outcomes seems able to capture the strengths of each system while ameliorating their respective weakness (Kane & Cantrell, 2013; Pham, Nguyen and Springer, 2020; Putnam, Ross & Wash, 2018). Hybrid systems provide predictability and stability through broader evaluation that contribute to improve teaching and learning excellence, reward effort and talent accurately and broadly. A fair teacher evaluation system linked to targeted and effective professional development is critical for creating a positive school climate of trust that encourages teachers' agency, motivation, self-efficacy and professionalism devising effective instructional strategies. A positive school climate of trust constitutes the foundation of psychological safety.

The standard definition of *psychological safety* is an environment where people's perceptions of the possible consequences of taking interpersonal risks lead them to feel confident to voice their ideas, willingly seek and provide honest feedback, collaborate and experiment with different options and processes. An *environment of psychological safety* contributes to organizational growth, improvement, learning and helps to achieve successful outcomes for individuals, teams and organizations (Edmonson & Lei 2014). Amy Edmonson expanded further on her research and theoretical elaboration on psychological safety in her book entitled *The Fearless Organization* (2019) in which she analyzed a broad set of studies exploring the organizational impact of psychological safety and synthesizes the findings.

The findings from Edmonson's (2019) broader analysis on the research on psychological safety can be summarized in six leadership strategies establishing and enhancing innovation and learning for teams and organizations. First, the importance of leaders modeling the acceptance of fallibility by sharing their own struggles and failures. Second, asking for feedback and input while improving two-way communication and conversations. Third, addressing conflict not as an adversary but rather as a collaborator focusing on the root causes of the conflict and objectively attempting resolution. Fourth, replacing blame with curiosity by focusing on ideas to improve and error-proof processes instead of the mistakes that individuals make. Fifth, speaking with empathy as human beings regardless of the hierarchical position of each individual on the team or in the organization. Sixth and finally, measuring psychological safety periodically and envisioning strategies to improve it as a team or organization.

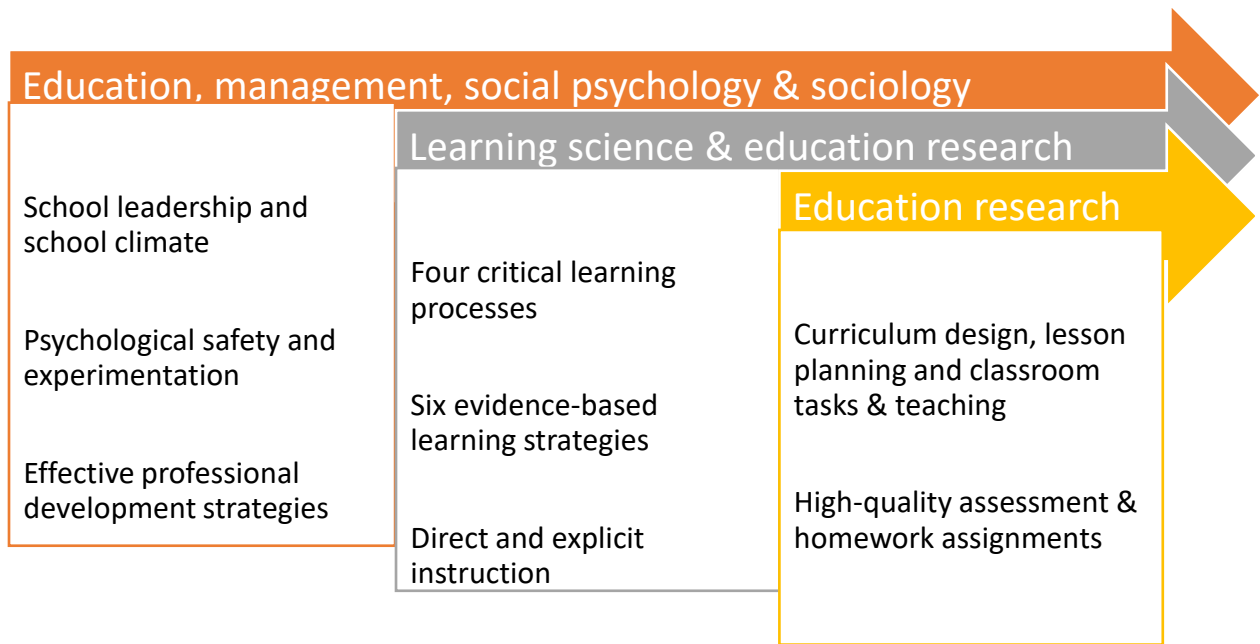
This expansion of the application of psychological safety can also be linked to an insightful empirical and practitioner-oriented research by Google (2014) and other practitioner-oriented and scholarly research on effective teams, organizational culture and how to implement positive change (Coyle, 2018; Garvin, Edmondson & Gino, 2008;). Psychological safety is linked to distributed leadership: the existence of an autonomous and self-efficacy culture among teachers require delegation of authority from the top leadership. A culture of psychological safety must also start when the top leadership leads by example. These are the basis for creating a positive school climate and impacting effective professional development and instructional practices.

I.4. A conceptual framework for NYC school’s problems of practice: Synthesis of Bronfenbrenner’s ecological model and social science three levels of analysis

To develop a conceptual framework and explore the related research questions to the problems of practice outlined by NYC school, I am going to examine key concepts and insights from the literature review and related theoretical debates previously discussed, within the context of a broader conceptual model. It is crucial to articulate what we know from experimental and quasi-experimental research about evidence-based concepts, processes and strategies about leadership and school climate, professional development, teaching and learning and assessment and homework to analyze and evaluate current practices at NYC school. Any recommendation for maximizing these areas of the school needs to be based on the findings from evidence-based research to have a meaningful and positive impact.

For this capstone project, the focus will be on the insights of several key concepts from education, social psychology, sociology, management and organization research to address issues of effective leadership, trust and psychological safety as part of the school climate. A related intervening issue from education and organizational research is professional development effectiveness as a mediating factor from the impact of school leadership and climate into the actual teaching and student learning outcomes.

Graphic I.11



Source: own elaboration from research and literature review

The broad body of literature from cognitive psychology and neuroscience on learning processes and proven evidence-based learning strategies complemented with education research bright spots, such as direct and explicit instruction, provides insights into the micro-level of actual effective instructional strategies. Key processes for learning such as background knowledge and

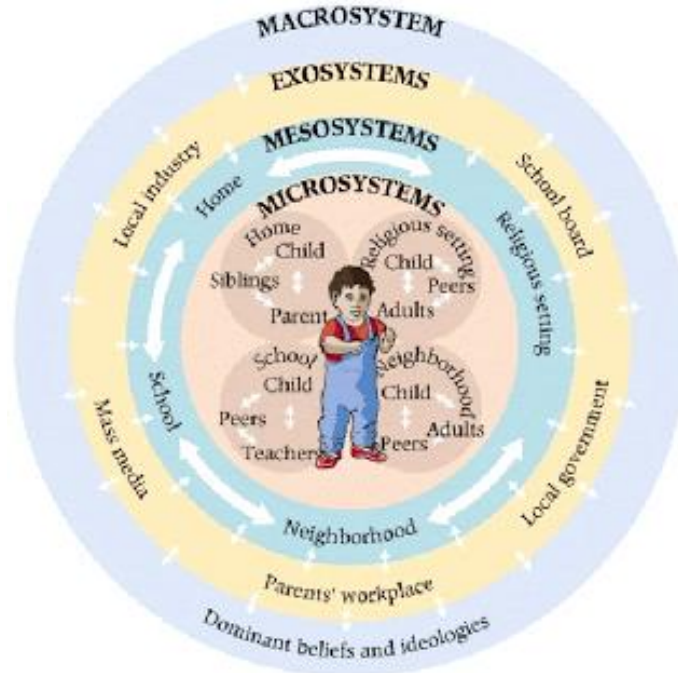
skills, connecting current and previous knowledge, critical thinking, transfer and metacognition are linked and embedded within the six most effective and evidence-based teaching and learning strategies. These six proven strategies are: retrieval and spaced practices, elaborative questioning and interleaving as well as dual coding and using concrete examples to illustrate abstract concepts. Finally, education research provides insights into the bright spots of teaching planning, high-quality homework and assessment practices. This constitutes an additional strand of analysis and understanding regarding how schools and teachers can design and devise more effective assessments and homework practices at the granular level.

These sets of key insights and concepts from research related to the NYC school's problems of practice also raise the critical question on how to frame them within a broader and more encompassing conceptual model to address the various levels of analysis involved in this case study. I will use a four-dimensional learning environment model adapted and inspired from the many iterations of Bronfenbrenner's ecological model (Bronfenbrenner, 1979) and the social science three levels of analysis, as the lenses and heuristic conceptual framework to explore, gather evidence and analyze the specific aspects of the NYC school's problems of practice. Bronfenbrenner's ecological model describes various impacts of behavior ranging from the individual and their immediate environment, the interaction with the behaviors and norms of the institutions and organizations in which those individuals are immersed and the broader societal culture and dynamics.

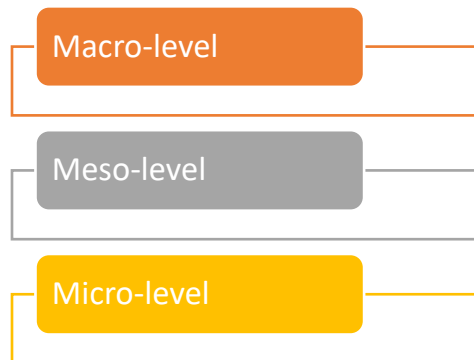
Another way of understanding Bronfenbrenner's ecological model is as an adaptation of the use of macro, meso and micro levels of analysis within sociology, political science, organizational and administrative studies. This multi-level analysis approach can be seen in some of the works of the classics from these disciplines (Webber, 1922; Dahl, 1947) up to the present (Prinsloo, Slade, & Khalil, 2018; Serpa & Ferreira, 2019). The multi-dimensional framework with different levels of analysis was re-defined within psychology and social psychology with an emphasis on the individual complex interactions with their proximal (closer) and more distal (distant) environments. The classical outline of this conceptual framework is known as the ecological model of human development (Bronfenbrenner, 1979). This model has gone through subsequent iterations and more detailed modifications (Bravo et al., 2017; Christensen, 2017; Harkonen, 2007; Penn, 2005).

Bronfenbrenner's ecological model is typically represented in 4 or 5 concentric circles around an individual or small group of individuals. Each circle moves towards the outer edge from the most proximal (micro and meso) to most distal (exo and macro) level of interaction and influence around the individual(s) at its center. The original proponent of this ecological model, Bronfenbrenner, adapted and incorporated into it some key elements of the social interaction approach to cognition by Vygotsky's social development theory (Vygotsky, 1978). The central idea of learning is that it takes place within the proximal and distal environment of the learner, interacting within the broader organization, community and society (Rogoff, 1993; Wertsch, 1985). Bronfenbrenner's ecological model has also been adapted and applied to different situations within education as illustrated by the graphic representation by Penn (2005). Other education researchers have used different adaptations and applications of the ecological model to address various student learning issues and educational approaches, such as early education and interaction with student families (Rosa & Tudge, 2013; Swick & Williams, 2006).

Graphic I.12



Source: Bronfenbrenner's bioecological model, <https://educ3040fall13.weebly.com/>



Source: summarizing the three levels of analysis from classical social science

I am going to synthesize a modified version of Bronfenbrenner's ecological model as a conceptual framework with the classical social science multi-level analysis approach adapted to teachers' perceptions of decision-making processes within educational systems (Kaseorg & Uibu, 2017). These adaptations and modifications of the heuristic framework of the ecological model and the classical social science multi-level of analysis are also useful to organize the theoretical debates and insights from the literature and research as well as to operationalize the dimensions affecting the problems of practice addressed in this capstone project.

Kaseorg and Uibu (2017), conducted a qualitative study of the Estonian education system through semi-structured interviews of 48 teachers from 28 elementary schools using the macro, meso, micro levels of analysis. The authors of this study found that most teachers did not feel included in the processes of education at the macro-level (government decisions). Teachers felt more familiar with the processes at the meso-level, involving mainly professional development programs. The micro-level of the school and classroom was the area where teachers had more agency. Yet, teachers still felt that their craft and contributions were not recognized to the degree they would have appreciated and that their expertise should be considered and incorporated more consistently in the decision-making processes at this level, including school management. This iteration of the social science classical multi-level of analysis together with the insights from Bronfenbrenner's ecological model can be synthesized and adapted to a single school and I will call it the four-dimensional school learning model.

CHAPTER II

The four-dimensional model, research questions, design and methods

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Chapter II. The four-dimensional model, research questions, design and methods

The research questions underpinning this capstone project are drawn from NYC school's problems of practice and the insights from the research literature on these issues. These questions and related research literature involve a broad array of concepts, theoretical strands and evidence-based findings that can be grouped around four major school dimensions or levels of analysis: macro, meso, micro and granular levels. These four overarching dimensions are a synthesis and reformulation of the ecological model of human development and the classical social science multi-level analysis as discussed in the previous section. The four-dimensional school learning conceptual framework is a fruitful and insightful way of framing the NYC school's problems of practice at different levels of analysis. These in turn shape the design and methods of this study. Subsequently, I will operationalize the four-dimensional learning environment conceptual framework through the substantive focus of each of the four research questions addressed in this capstone project.

II.1. A four-dimensional school learning conceptual framework

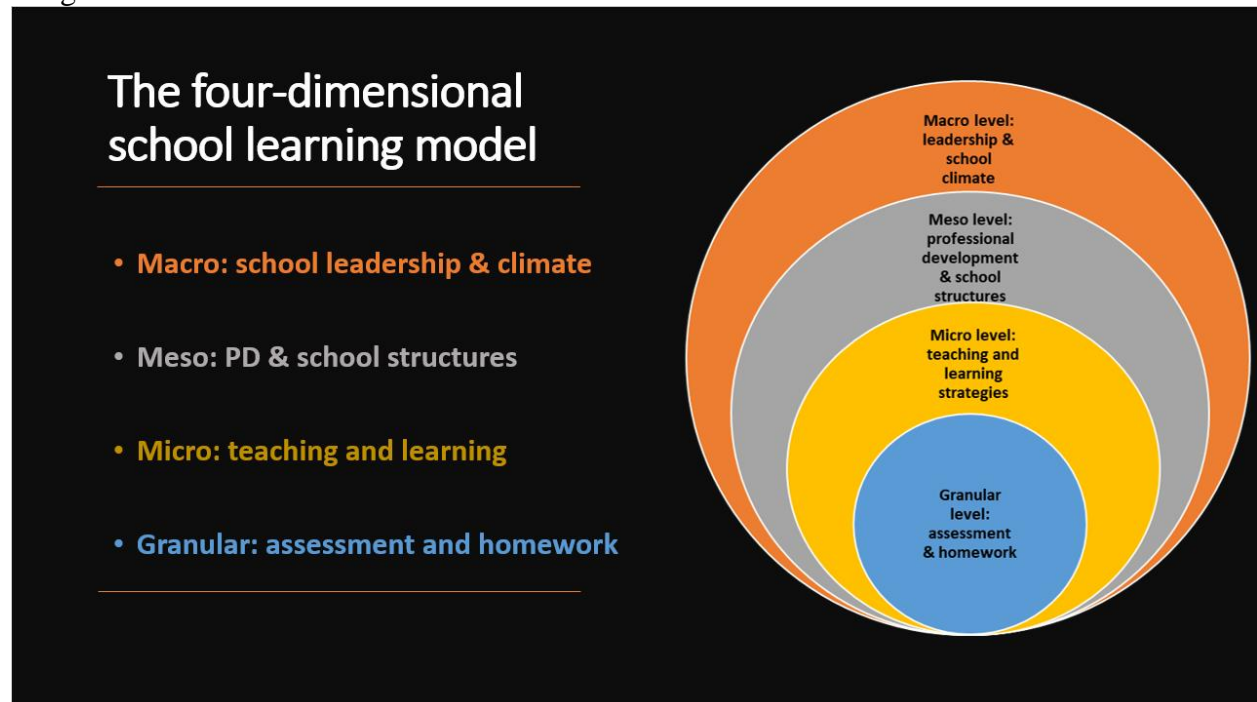
A pragmatical approach to explore the problems of practice addressed within a single educational organization, like the case study of NYC school in this capstone project, is to adapt and synthesize the ecological model and the classical social science multi-level analysis into a four-dimensional model with macro, meso, micro and granular levels. Using this conceptual framework allows us to incorporate the theoretical strands and key concepts from the insights of several disciplines and fields. I am going to call this the four-dimensional school learning model.

An insightful social science multi-level analysis within education has been developed by Kaseorg & Uibu (2017) in their study on teachers' perception of decision-making processes within a national education system. According to these authors the macro level is defined by educational policies and regulations shaping the learning parameters, practices and structures within an education system (Santiago, Levitas, Rado & Shewbridge, 2016). Decisions, programs and structures shaping professional development supporting teachers and student learning constitute the meso-level which in turn affect overall curriculum sequencing, teaching methods and the repertoire of pedagogical tools and strategies (King, 2014; Kwakman, 2003). The micro-level is the basic unit of interaction and engagement between teachers, students and curriculum. The specific teaching and learning practices and strategies, curriculum and lesson planning, classroom activities and tasks for engaging the materials and develop students' knowledge and skills for learning takes place at this level. Factors affecting this level include the quality of professional development, teaching efficacy, personal autonomy and perceived control together with the classroom behavior and tasks and the effectiveness of the contents and teaching methods. These are critical elements of teaching affecting student learning and outcomes in this model (King, 2014; Rivkin, Hanushek & Kain, 2005).

What Kaseorg and Uibu's three-dimensional-levels framework (2017) did not include, at the micro-level, are the insights from cognitive psychology experimental and evidence-based contributions about effective teaching and learning strategies or the more granular level of specific classroom tasks. Since Kaseorg and Uibu's study is methodologically a multi-school or

education system country-wide study, I will adapt and modify it into a four-dimensional model encompassing the problems of practice and their corresponding levels of analysis for this specific case study of NYC school. The macro-level is useful to explore the problem of practice around leadership, learning environment and school climate. The meso-level is the appropriate level to analyze the problem of practice around professional development and school structures. The micro-level of classroom interaction is best to examine the problem of practice around teaching and learning and the granular level is related to the most specific problem of practice of assessment and homework assignments design and quality.

Image II.1



Source: own elaboration by adapting the ecological model to the NYC school project

I represent this synthesis of the ecological model of human development with the social science three levels of analysis adapted to a school, as a set of concentric circles indicating, as the original ecological model, the proximal and distal environment and area of influence from classroom teaching and learning proximal level to the meso (professional development) and macro (leadership and climate) distal levels of the school. This heuristic framework allows for the incorporation of more granular and evidence-based insights from the literature which informs the survey questions and design of this capstone project.

The overall distal environment is defined by school leadership and climate. School leadership has a significant impact on the learning environment of an educational institution not only through its mission and vision but more importantly in its psychological safety and trust climate. These overall macro-aspects also have an indirect impact on the relative quality and support of the faculty's professional development opportunities as well as educational accessibility and support structures for student learning. Faculty professional development together with student accessibility and school support structures constitute the meso-level intervening factors

mediating the relative impact of the macro-level overall school leadership on the micro-level of school classrooms' teaching and learning practices. The micro-level of actual teaching and learning through the daily classroom instructional activities and tasks is the key for engaging students with curriculum and teachers during class time. The daily teaching and learning practices also shape the granular level of assessments and homework through asynchronous assignments or tasks engaging students and materials beyond class time. This model allows us to incorporate the theoretical strands and key concepts from a multitude of related disciplines and fields exploring education and learning.

To operationalize the four-dimensional learning conceptual framework through the substantive focus of each of the four research questions, I will begin from the most general or macro-level (leadership and school climate), to the meso-level (professional development and school structures) to the most specific micro-level (teaching and learning practices) and granular level (assessment and homework). It is the complex set of processes occurring in the interaction between macro, meso, micro and granular levels that shape the dynamics between instructional leadership and school climate, professional development and teaching and learning practices as well as assessment and homework practices and their relative impact on student learning outcomes.

II.2. Research questions, design and methods

Research questions

The first macro-level dimension can be characterized as the leadership impact on the school climate and the role that leadership plays creating a learning environment underpinning the related school educational policies. Effective school leaders build on and design cultural tools such as a mission, vision, values and goals of the school in a climate of collaboration and trust. This dimension includes clear communication of the school leadership about the institution's mission, vision and strategic plans while articulating those into specific strategies and policies reinforcing psychological safety, trust and support for faculty and students. These are the fundamental pillars for creating an effective learning environment within any educational organization:

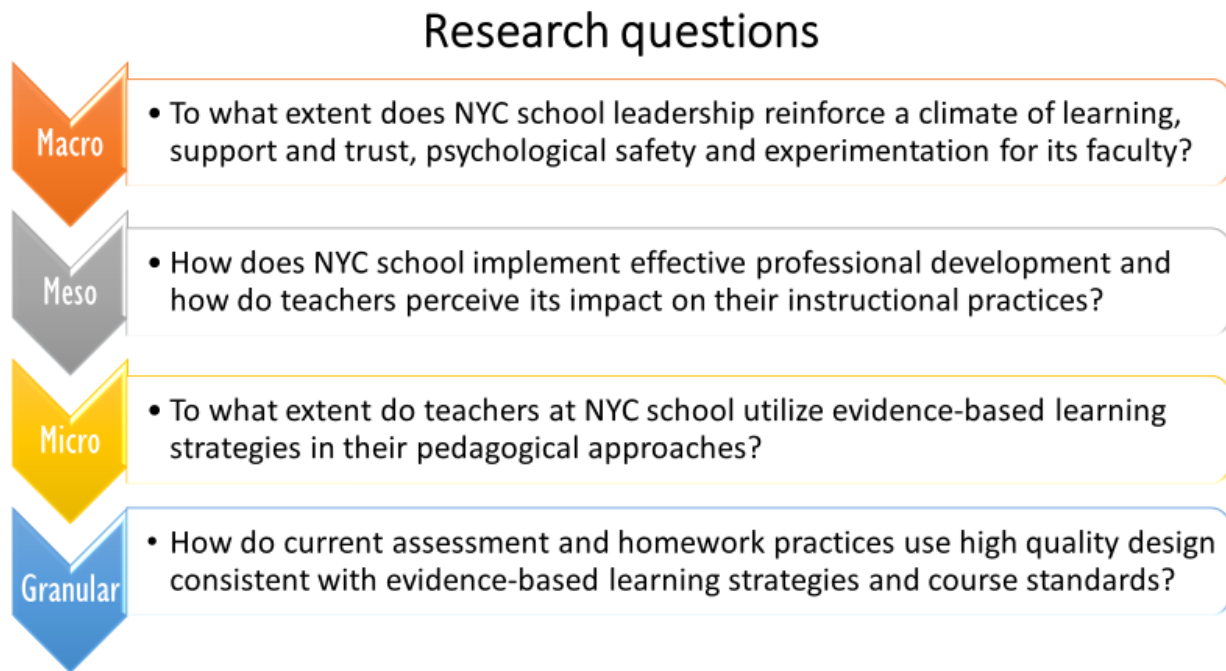
- First, to what extent NYC school's leadership reinforces a climate of learning, faculty support, psychological safety and trust?

The second dimension, the meso-level, mediates the articulation and implementation of the decisions at the macro-level into specific teaching and learning practices at the micro-level through professional development practices and school structures facilitating accessibility and support for teacher, student engagement and learning. School leadership and climate impact the meso-level dimension's intervening variables of professional development and school structures. A positive climate affects and interacts synergistically with well-designed and effective professional development, teacher evaluation and curricular organization as well as with student accessibility and support policies and programs. This capstone project will focus on the relative effectiveness of professional development as the key element to maximize evidence-based

instruction and teaching faculty perceptions and practices of the school’s PD program. Teachers’ perceptions of the relative effectiveness of their professional development experiences can be an insightful way of exploring the extent to which these practices are positively impactful on their instructional approaches. However, it is important to acknowledge that there are other aspects at this meso-level dimension, such as specific policies and structures that facilitate accessibility for all students to a rigorous curriculum and related student support. For the purpose of this capstone project, the focus will be limited to the faculty perception of their professional development effectiveness regarding their teaching craft:

- Second, how does NYC school implement specific professional development programs and how do teachers perceive their relative effectiveness and relevance for improving their teaching craft?

Image II.2



Source: own elaboration from research review and capstone conceptual framework

The third dimension is the micro-level of actual instructional practices and processes for incorporating teaching and learning strategies in course curriculum, lesson plans and classroom tasks. The micro-level is where the interaction between teachers, curriculum and students at the school classroom level takes place. It is at this micro-level of actual teaching where faculty instructional approaches and methods shape the contents and sequencing of the curriculum. A well-designed and effective professional development, teacher evaluation and curricular organization creates a positive learning climate affording teachers’ agency and professionalism. This allows teachers and teaching teams devising effective curricular development and lesson plans, contents, classroom tasks and enhancing evidence-based teaching and learning instructional strategies. This is where one can explore the impact and degree of effectiveness of

instructional teaching on student learning and acquisition of domain bounded knowledge and skills:

- Third, to what extent do teachers at NYC school utilize evidence-based learning strategies in their pedagogical approaches?

The fourth dimension is the granular level of classroom processes and instructional strategies of faculty individual practices designing and implementing the specific task and tools for evaluating and measuring student learning and reinforcing such learning with practice assignments. The granular level is where teachers or teaching teams design and implement the specific course level formative and summative assessment and asynchronous homework assignments and tasks as the key elements in this complex triadic engagement and interaction between curriculum, students and teachers to evaluate and reinforce student learning. The relative effectiveness of instructional strategies is likely to affect the relative effectiveness and quality of assessment and homework assignments and practices. This informs the last research question:

- Fourth, how do current assessment and homework practices at NYC school utilize high-quality design and strategies consistent with evidence-based learning and departmental or discipline standards?

Research design: a case study

This capstone project is a research case study and improvement proposal using sequential mixed methods. A case study is a research design strategy to generate or test hypotheses (or both) when there are contradictory or limited theoretical approaches on the research problems associated with the object of study. Focused individual or a single case study, and when possible simultaneous multiple comparable case studies, can shed new light on ambiguous but critical theoretical and practical educational questions. Case studies inquiry is even more critical when we also have little information on the object of study and the research problem requires detailed description of the dynamics underlying it (Goodrick, 2014; Hamilton, & Tsakalou, 2018; Murakami, 2013; Yazan, 2015). Within the context of education practitioners' research and program evaluation, detailed analysis of case studies is the predominant approach, since the focus of practical oriented research and program evaluation is to make recommendations for intervention and improvement adapted and targeted to the ideographic characteristics of the object of study.

Indeed, I have very limited information about NYC school and its problems of practice besides the information I gathered in my initial discussions with the school administration. Similarly, there is ambiguous and even contradictory evidence and theoretical approaches on assessment, homework and instruction effectiveness. There is critical experimental research on learning but there is very little research done on applying evidence-based learning strategies among teachers in real life situations. The only study addressing specifically evidence-based learning strategies among teachers that I have found in my literature review is a limited national survey conducted by Boser (2019). In fact, this study will become one critical point of reference when analyzing and interpreting the quantitative data results in this capstone project.

Research methods: sequential mixed methods


Mixed methods, using both qualitative and quantitative approaches within different phases of a research process is an effective way of understanding a research problem within a specific case study. A mixed methods research design includes several dimensions and phases, ranging from the purpose and theoretical drive to the timing (simultaneous versus sequence dependency) and integration of results, adding to the possible interactive and complex characteristics of this methodological approach (Ponce & Pagán-Maldonado, 2015). Leading education researchers and scholars agree that qualitative data within a mixed methods approach provides critical and valuable insights to the quantitative data and how to interpret it with greater validity (Alfeld & Larson, 2015). More specifically, for the case study of NYC school where we have little initial information, it is advisable using an exploratory sequential mixed methods design.

Sequential mixed methods are even more critical when the initial qualitative data collection will shape the operationalization of the variables used in the quantitative data collection instrument (Creswell & Plano, 2018) as indeed is the case in this capstone project. Education and program evaluation practitioners frequently use mixed methods to provide the basis for making evidence-based recommendations for their case studies. Mixed methods can assist at triangulating the interpretation and insights of the data collected from several sources as to provide a minimum threshold of validity. The mixed methods approach ameliorates the non-generalizable and ideographic insights associated with a cases study by allowing to check for some internal validity and put it in the context of the meaning and sense-making to the human beings involved in the decision-making process.

Image II.3

Research design & methods

- A case study (improvement project)
- Sequential mixed methods:
 1. Qualitative semi-structured interviews
 2. Quantitative survey instrument

Source: own elaboration from capstone design, methods and data collection

The first method is qualitative confidential semi-structured interviews with school leaders and department chairs. The second method is an anonymous and voluntary faculty survey inquiring about school climate, professional development practices and teachers' daily classroom tasks, assessment and homework. I created this survey, which I named **Survey on Teaching, Assessment and Homework practices (SOTAH)**, based on insights from the research literature on these topics, the input I gathered about the specific practices at NYC school through the semi-structured interviews with department chairs and my own experience as a classroom teacher. I initially planned an additional third method of ethnographic school observation by visiting, collecting and analyzing relevant artifacts or course documents, but the pandemic situation during 2020 prevented a school observation and visit. Therefore, the methodological approach and data collection instruments used in this capstone project focuses on the initial semi-structured interviews and subsequent teaching faculty SOTAH survey. Instead of a third method of ethnographic observation and visit, I carried out two follow-up interviews with senior leaders and collected NYC school publicly available documents through their website or internet search. After summarizing and analyzing the data and findings for each dimension as a separate chapter, this project presents a set of recommendations for the school at the end of each chapter. These recommendations are based on the evidence found and the insights from broader research on the areas and topics discussed and researched in this case-study.

II.3. Qualitative data: Semi-structured interviews

II.3.1. Semi-structured interviews of Department Chairs

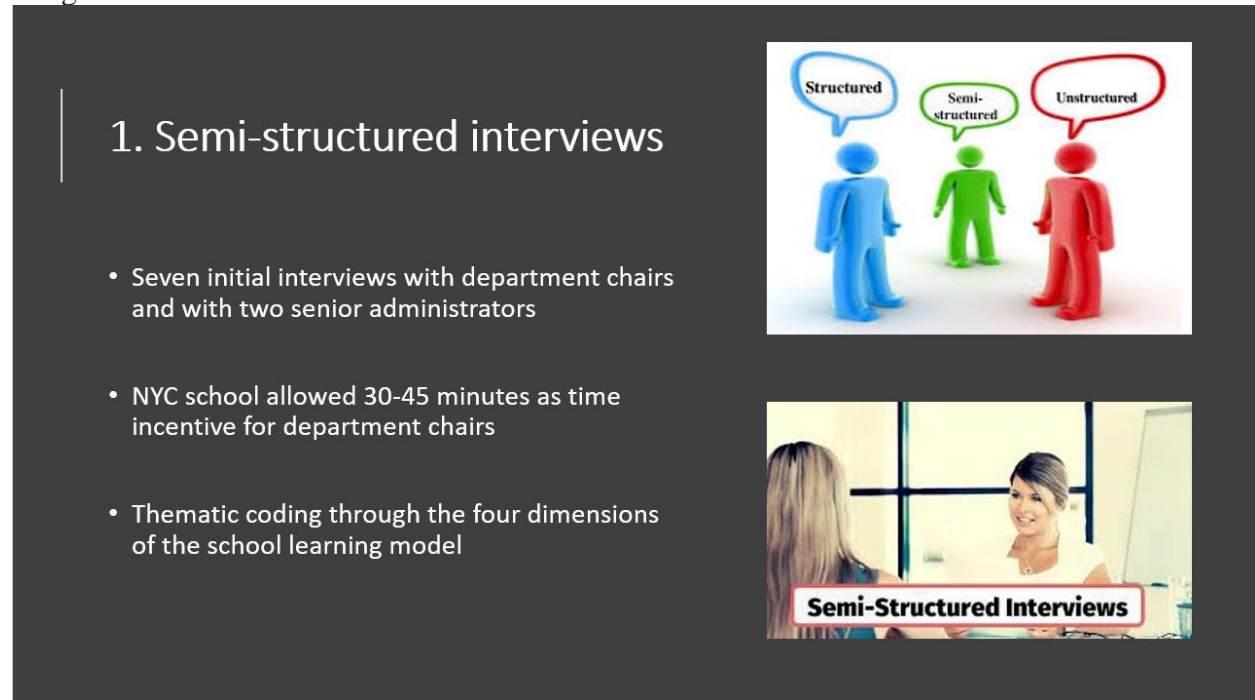
The first method was qualitative through an initial round of nine confidential zoom individual semi-structured interviews with department chairs and administrators at NYC school. This was requested by the school senior administrators since they thought this process would assist at creating and enhancing trust and willingness of teaching faculty to participate in the subsequent survey and engage department chairs regarding the practices among their faculty members. I, as the principal researcher, agreed to this suggestion since it was consistent with a sequential research approach of the research design of this project. The initial semi-structured interviews informed and provided input for the design of the quantitative survey instrument. These interviews with department chairs lasted between 30 to 45 minutes.

The purpose of these initial interviews was to understand the overall dynamics within the school. These interviews explored the various aspects of the research questions within each department and division regarding assessments and homework assignments in the context of daily classroom tasks and school practices and professional development support. See appendix A for the questions asked in the semi-structured interviews. These interviews were carried out during the Spring of 2020 and involved seven department chairs and two senior school administrators. The Associate Head of School gave permission and school time to the department chairs who wished to do the interviews in lieu of their monthly meetings. The only department chair not interviewed was from the science department since, as I found out later, there was not a department chair at that time. The interviews were confidential and participation voluntary as to guarantee the integrity of the feedback and protection of the participants' privacy according to Vanderbilt University Institutional Research Board's practices.

I asked the participants for permission to record the conversation. If the participant declined to be recorded, I took detailed notes of the conversation. Three of the nine interviewees requested me to take notes, the other six accepted being recorded. After completing this first round of interviews, the audio-scripts and notes were categorized and evaluated to understand the department chairs' points of view and practices and to inform the elaboration of the survey questions. The identity of the participants is avoided or masked in any of the written reports of this capstone project summarizing the findings. The records are kept under locked cabinet or password protected digital files within Vanderbilt University's electronic file system. After May 2021, all records and possible identification of the participants will be destroyed.

The goal of these semi-structured interviews was both to earn the trust of the department chairs and learn from their insights about assessment, homework, instructional and professional practices to shape the questions and possible answers for the SOTAH questionnaire I was creating and designing for the subsequent quantitative survey method. The contents of the semi-structured interviews were coded and analyzed through a thematic approach to inform the questions and possible answers in SOTAH. See appendix B for the thematic summary of semi-structured interviews content analysis. The analysis was structured consistently with the four-dimensional model conceptual framework and the related research questions.

Image II.4



1. Semi-structured interviews

- Seven initial interviews with department chairs and with two senior administrators
- NYC school allowed 30-45 minutes as time incentive for department chairs
- Thematic coding through the four dimensions of the school learning model

Semi-Structured Interviews

Source: own elaboration from capstone design, methods and data collection

When I contacted the NYC school senior leaders for this project to decide on its focus, they did not directly pose the issue of perception of leadership and school climate as an initial problem of practice. However, senior leaders asked me to begin the research through the interviews with department chairs to build up rapport and trust as to earn teachers' cooperation for this study.

This is an indicator that the school leadership is aware and mindful about the need to have a positive climate of trust. This was an implicit acknowledgement that there is a potential problem of practice regarding trust, school climate and leadership perception. I did not address the issue of trust directly during the semi-structured interviews with department chairs but rather through generally indirect and neutral questions about the strengths and weaknesses of the department.

At this initial stage of the research process I was trying to grasp the overall situation of the departments within the school but focused on the main explicit agreed upon problems of practice: assessment and homework in the context of teaching and learning. Yet during the semi-structured interviews some issues related to leadership and school climate emerged indirectly and I decided to include a set of questions in SOTAH. I coded the semi-structured interview discourses around 3 themes: School leadership style and perceived trust; departmental and faculty autonomy; school and department climate and faculty psychological safety regarding the macro-level dimension (see table II.5 at the end of this section).

The school senior leaders during the initial stages of this capstone project stated that the school professional development was robust and solid. However, I decided to include a question (with follow-up questions) during the semi-structured interviews to ascertain the department chairs' perception and points of view about this critical dimension for shaping instruction. I coded the semi-structured interview discourses around 3 themes: School support for PD; effectiveness of PD at improving instruction; and faculty autonomy at selecting PD programs (self-directed PD).

The department chairs detailed explanations about the instructional, assessment and homework practices within their respective department brought up insights, concepts and possible choices that I incorporated into SOTAH questions. Regarding assessment, I coded their explanations around 3 themes: use of different combinations of instructional approaches, sources for curriculum planning and teaching teams and, finally, use of evidence-based learning strategies in classroom tasks. Similarly, I coded department chairs' explanations about their respective departments' assessment and homework practices around 3 themes: Use of graded & non-graded assessment & homework assignments, sources and types of departments & teachers' assessment & homework assignments and design and use of evidence-based strategies in assessment & homework assignments. I included those insights into the broader context of what we know from the research literature on these areas of teaching and learning and from my own experience as a classroom teacher to craft the specific questions for each section of the SOTAH survey. This resulted in a total of 80 questions spread over five different sections.

II.3.2. Follow-up interviews with senior administrators and publicly available documents

The third method would have been an ethnographic approach of observations and campus visit while gathering authentic artifacts and documents from NYC school regarding teaching and learning and classroom practices. The COVID-19 pandemic situation did not allow for this third method of a campus visit and live observations to take place as planned. Instead, I did follow-up interviews with a couple of senior leaders and for documentation, I relied on open source or publicly available documents about the NYC school and its academic programs. This third method provided an additional source for insights into some of the prominent themes and issues

that emerged with the first qualitative method of semi-structured interviews with department chairs and the second quantitative method through the SOTAH responses. These findings, analysis and related recommendations are organized and explored through each dimension outlined by the four-dimensional conceptual framework developed in the previous section.

Table II.5

Four-dimensional school learning model	Semi-structured questions	Thematic coding & analysis
Macro-level: school leadership & climate	One general question about the strengths and weaknesses of the department with follow-up questions.	<ol style="list-style-type: none"> 1.School leadership style and perceived trust 2.Departmental and faculty autonomy 3.School and department climate and faculty psychological safety
Meso-level: professional development practices	One general question about the professional development practices within the school and department with follow-up questions.	<ol style="list-style-type: none"> 1.School support for PD 2.Effectiveness of PD at improving instruction 3.Faculty autonomy in selecting PD programs (self-directed PD)
Micro-level: instructional practices	One general question about the instructional practices within the department with follow-up questions.	<ol style="list-style-type: none"> 1.Departments & teachers use of different combinations of instructional approaches 2.Sources for curriculum planning and teaching teams 3.Using evidence-based learning strategies in classroom tasks
Micro-level: assessment and homework practices	Two general questions about assessment and homework practices within the department respectively with follow-up questions.	<ol style="list-style-type: none"> 1. Use of graded & non-graded assessment & homework assignments 2. Sources and types of departments & teachers' assessment & homework assignments 3. Effectiveness & use of evidence-based strategies in assessment & homework assignments

Source: research questions and responses to semi-structured interviews with department chairs



II.4. Quantitative data: Survey on Teaching, Assessment & Homework (SOTAH)

The quantitative method used in this capstone project is a questionnaire for the teaching faculty designed by the principal researcher, regarding teachers' views and practices at NYC school. I termed this instrument SOTAH from the initials for Survey on Teaching, Assessment and Homework practices. See appendix C for the detailed and complete questionnaire. The SOTAH survey was administered online because of the pandemic situation through an email hyperlink to Qualtrics software during a NYC school zoom faculty meeting on November 17 of 2020. The survey was anonymous and participation voluntary as to guarantee the integrity of the feedback and protection of the participants' privacy according to Vanderbilt University Institutional Research Board's practices. I analyzed and summarized the results from the answers to SOTAH questions and their responses could not and were not linked to any specific participant. All answers are presented only in aggregated data form. The records will be kept under locked cabinet or password protected digital files within Vanderbilt University's electronic file system. After May 2021, all records and possible identification of the participants will be destroyed.

Image II.6

2. Survey on teaching, assessment and homework (SOTAH) for NYC school faculty

- Newly created survey using both original and adapted questions from existent surveys
- 80 questions spread over 5 sections
- Administered online anonymously
- 63% return rate for survey completion
- NYC school provided a 30-minute time incentive



Source: own elaboration from capstone design, methods and data collection

The purpose of the SOTAH questionnaire is to evaluate to what extent the practices on teaching, assessment and homework in the context of daily classroom practices are evidence-based. This survey also tries to elucidate faculty's understanding of evidence-based teaching and learning as well as how faculty perceive the school's climate and the effectiveness of the professional development provided by the school. About 60% of the 80 SOTAH questions were created afresh with the insights from the semi-structured interviews, my own experience as a classroom teacher and insights from research. The other 40% of the questions were adapted from the insights of other scholars' findings and previous related surveys on each of the topics addressed.

The survey was created grouping the questions in 6 blocks: an initial information and consent block followed by 5 sequential content-oriented blocks with the respective questions. I have enclosed below a summary of the teachers’ SOTAH survey flow.

Table II.7

SOTAH survey flow by sequential blocks	Items and questions within each block and approximate time to complete
Block 1: Consent	1 item: 1 descriptor and 1 consent question 1 minute to complete
Block 2: Instructional practices	19 items: 1 descriptor and 18 questions 7 minutes to complete
Block 3: Assessment practices	20 items: 1 descriptor and 19 questions 7 minutes to complete
Block 4: Homework practices	20 items: 1 descriptor and 19 questions 7 minutes to complete
Block 5: PD and school climate	20 items: 1 descriptor and 19 questions 7 minutes to complete
Block 6: Demographic information	7 items: 1 descriptor and 6 questions 2 minutes to complete

Source: own elaboration adapting from Qualtrics report on SOTAH survey flow

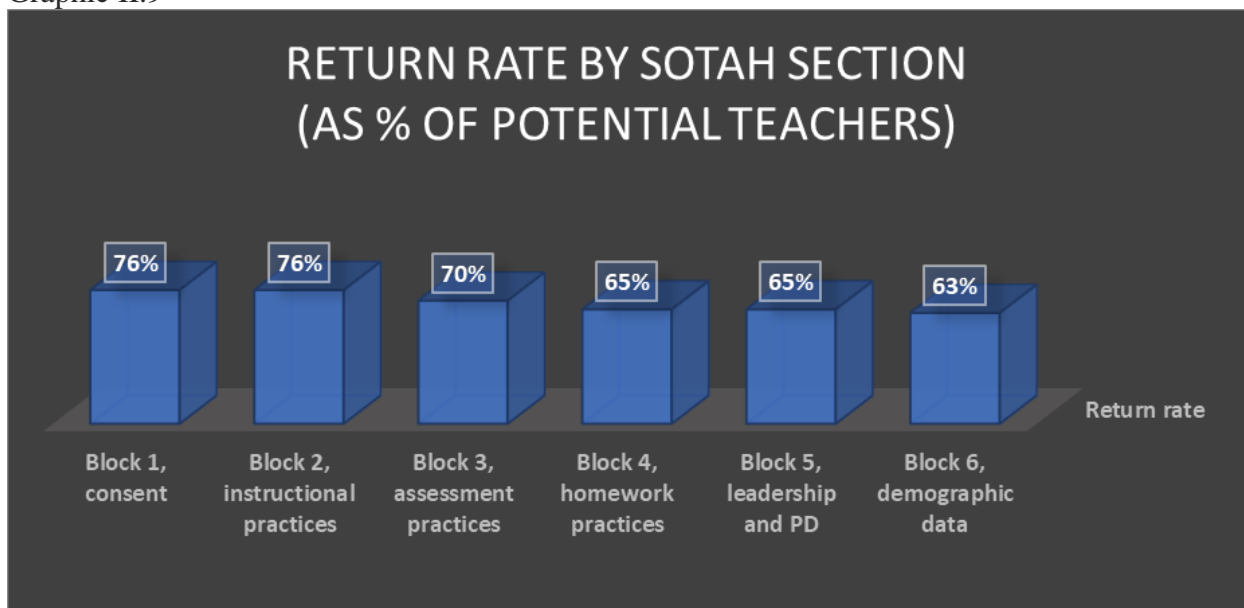
The first question (Block 1) was a simple descriptor of the survey contents ending with a consent question before proceeding with the questionnaire. The second group of 18 questions (Block 2) focused on instructional and curriculum planning practices in the context of their daily teaching routines, including questions to ascertain the extent of evidence-based teaching practices in their classroom. This section took about 7 minutes to complete. The third group of 19 questions (Block 3) focused on formative and summative assessment, including specific questions to ascertain the extent of evidence-based assessment practices. This section took about 7 minutes to complete. The fourth group of 19 questions (Block 4) addressed the issue of homework assignments and to what extent faculty understood evidence-based homework practices. This section took about 7 minutes to complete. The fifth group of 19 questions (Block 5) addressed the faculty’s perception of school’s leadership and psychological safety climate as well as teachers’ views on the effectiveness of professional development they have engaged in. This section took about 7 minutes to complete. The final group of 6 questions (Block 6) inquired about the respondents’ demographic characteristics. This took about 2 minutes to complete. I structured the flow of SOTAH into these 6 consecutive blocks. I describe each section and the main sources for creating the questions within each section in the table below.

Table II.8. Survey flow by block descriptors and sources of questions		#Items, # questions & # responses
<p>Block 1: Consent</p> <p>Adapted from Qualtrics standard wording on consent.</p>		1 consent question, Completed by 78 teachers out of 86 at the faculty meeting.
<p>Block 2: Instructional practices</p> <p>I created questions & statements Q2.1to Q2.9 & Q2.16 to Q2-19 based on personal experience as a classroom teacher and from the insights of NYC school department chairs semi-structured interviews. Questions and statements Q2.10 to Q2.15 were inspired on insights from Pomerance, Greenberg and Walsh (2016) grouping effective learning strategies versus common misunderstandings. The wording was also inspired by direct questions developed by the Learning Agency (Boser, 2019) and the Learning Scientists (2019) questionnaire.</p>		19 items: 1 descriptor and 18 questions. Completed by 78 teachers of the 86 at the faculty meeting of 103 total teachers.
<p>Block 3: Assessment practices</p> <p>I created questions & statements based on personal experience as a classroom teacher and insights from NYC school department chair semi-structured interviews. Questions and statements Q3.8 to Q3.13 were inspired by a summary of the research findings on transfer of knowledge by De Bruyckere, Kirschner & Hulshof (2020); and critical thinking by Willingham (2020).</p>		20 items: 1 descriptor and 19 questions. Completed by 72 teachers of the 86 at the faculty meeting of 103 total teachers.
<p>Block 4: Homework practices</p> <p>I created questions & statements based on personal experience as a classroom teacher and insights from NYC school department chair semi-structured interviews. Scenarios and questions on effective strategies Q4.14 to Q4.20 adapted from Boser (2019) using Morehead et al (2016) & McCabe (2018) learning situations.</p>		20 items: 1 descriptor and 19 questions. Completed by 67 teachers of 86 at the faculty meeting of 103 total teachers.
<p>Block 5: Professional development, leadership and school climate</p> <p>Questions & statements Q5.4 to Q5.15 on professional development adapted and modified from the Teaching and Learning International Survey: TALIS 2018 (OECD, 2019). Questions and statements on psychological safety Q5.3, Q5.19 & Q5.20 adapted and modified from Higgins, Ishimaru, Holcombe and Fowler (2012). Questions on PD sources and timing Q5.16 to Q5.18 adapted from Boser (2019).</p>		20 items: 1 descriptor and 19 questions. Completed by 67 teachers of 86 at the faculty meeting of 103 total teachers.
<p>Block 6: Demographic information</p> <p>I created questions & statements based on personal experience as a classroom teacher, insights from NYC school department chairs' semi-structured interviews and typical demographic questions in quoted surveys above.</p>		7 items: 1 descriptor and 6 questions. Completed by 65 teachers of the 86 at the faculty meeting of 103 total teachers.

Source: own elaboration from designing and administering SOTAH survey

The NYC school was cooperative in the administration of SOTAH and graciously provided the best incentive for survey completion: allotted 30 minutes of teachers’ time during a faculty meeting via zoom to complete it from their own computers at home, assuring further anonymity. The school invited me as the principal researcher to attend the faculty meeting on November 17 of 2020 to answer any questions teachers might have. There were 86 teachers present during the Faculty meeting out of a total of 103 teaching faculty employed in the upper and middle divisions of NYC school. Of the 86 teachers attending the meeting, 78 consented voluntarily to do the anonymous SOTAH survey. Of those 78 teachers that started the survey, a total of 65 teaching faculty completed the entire survey. This is a 63% return rate of completed surveys versus the 103 potential teachers employed by the school (or a 76% return rate from the 86 teachers present during the faculty meeting that day).

Graphic II.9



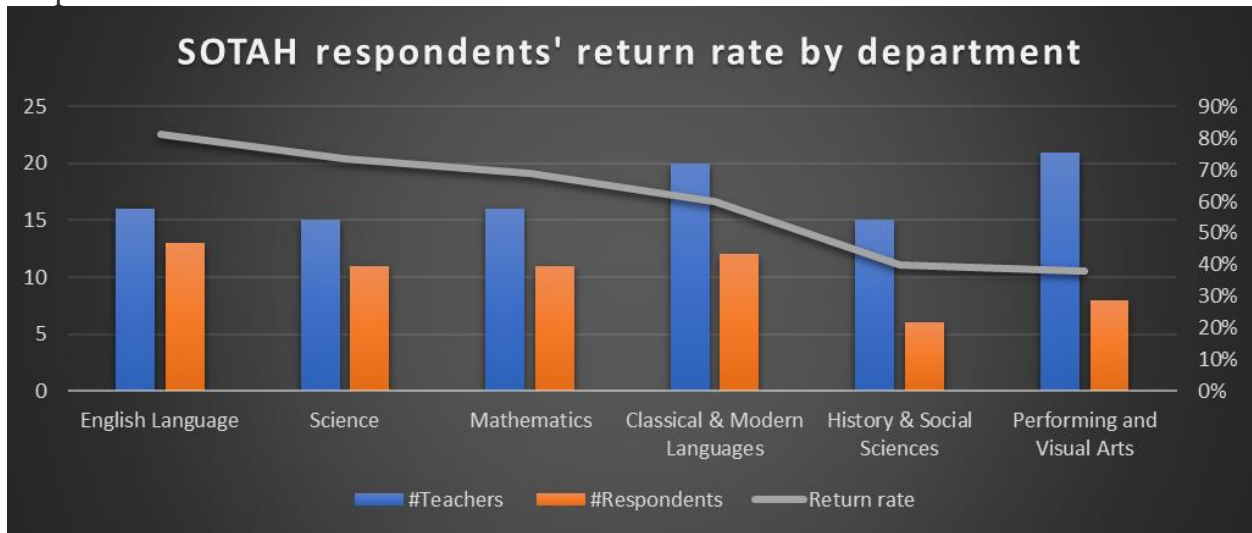
Source: own elaboration adapting from Qualtrics report on SOTAH survey responses

In addition to the 65 teachers that completed the entire survey, there were 13 additional teachers that completed one or more of the 5 SOTAH sections. There were 78 teachers that completed the section on instructional practices: a 76% return rate for that section from a total of 103 potential teachers. Similarly, 72 teachers completed the section on assessment: a 70% return rate for that section. Moreover, 67 teachers that completed the section on homework as well as the section on school climate and professional development practices: a 65% return rate for those two sections. Finally, 65 teachers completed the entire survey, which included the additional demographic section at the end. Thus, the total SOTAH return rate is 63% completing the entire survey of all potential teachers at the corresponding divisions at NYC school (or 76% return rate of the actual teachers present during the faculty meeting when the survey was administered).

I will include the responses of those that completed only some sections of the survey in the data description since that will increase the accuracy of the analysis of those aggregated responses for those specific sections. However, the respondents completing only some sections of SOTAH did not complete the demographic section of the survey and cannot be included when analyzing

some items through demographic variables. The response rates of teachers from the various departments of potential teachers ranged from the lowest rate of 38% from the performing and visual arts departments (grouped as a unit) and 40% from the history department to an 83% response rate from the english department faculty. Thus, when analyzing the results, the application of the analysis or recommendations to the performing and visual arts departments as well as to the history department should be taken more cautiously.

Graphic and table 2.10



SOTAH respondents' return rate by department	#Teachers	#Respondents	Return rate
English Language	16	13	81%
Science	15	11	73%
Mathematics	16	11	69%
Classical & Modern Languages*	20	12	60%
History & Social Sciences	15	6	40%
Performing and Visual Arts**	21	8	38%
Administration/not-identified***		4	
Total	103	65	63%

* Includes teachers from classical languages department & modern languages department

**Includes teachers from performing arts department & visual arts department

***Four respondents selected school administration although by open responses these seem to be learning specialists since most administrators also teach at least one course

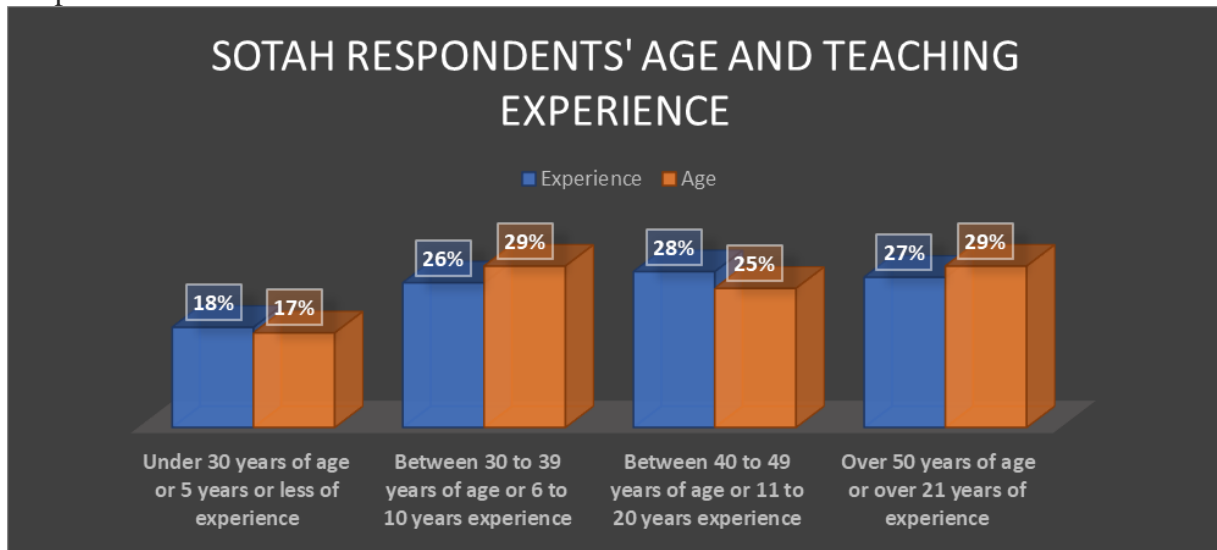
Source: elaboration from SOTAH Q6.7 and NYC school publicly available data

The rest of the school departments' return rates ranged more closely to the overall 63% average response rate: from 60% response rate of the classical and modern languages departments to the 81% return rate from the English department. I am guessing that many of the faculty in the performing and visual arts department are artists and most in that department do not assign assessments and homework. Thus, they might have been the bulk of the respondents among the 13 teachers that began the survey but did not complete those sections in SOTAH. Similarly, I am guessing that some other segment of teachers that completed the initial section on instruction but did not complete the PD, school climate and demographic SOTAH sections were from the

history department. This is a guess based on the lower return rates of these departments compared to the average rate of return among the rest of the departments.

The demographic characteristics of NYC school teaching faculty that agreed to do the SOTAH survey can be summarized as follows: Around 54% of the teachers are female, 41% male, and about 5% identified themselves as non-binary, non-confirming or other gender identity.

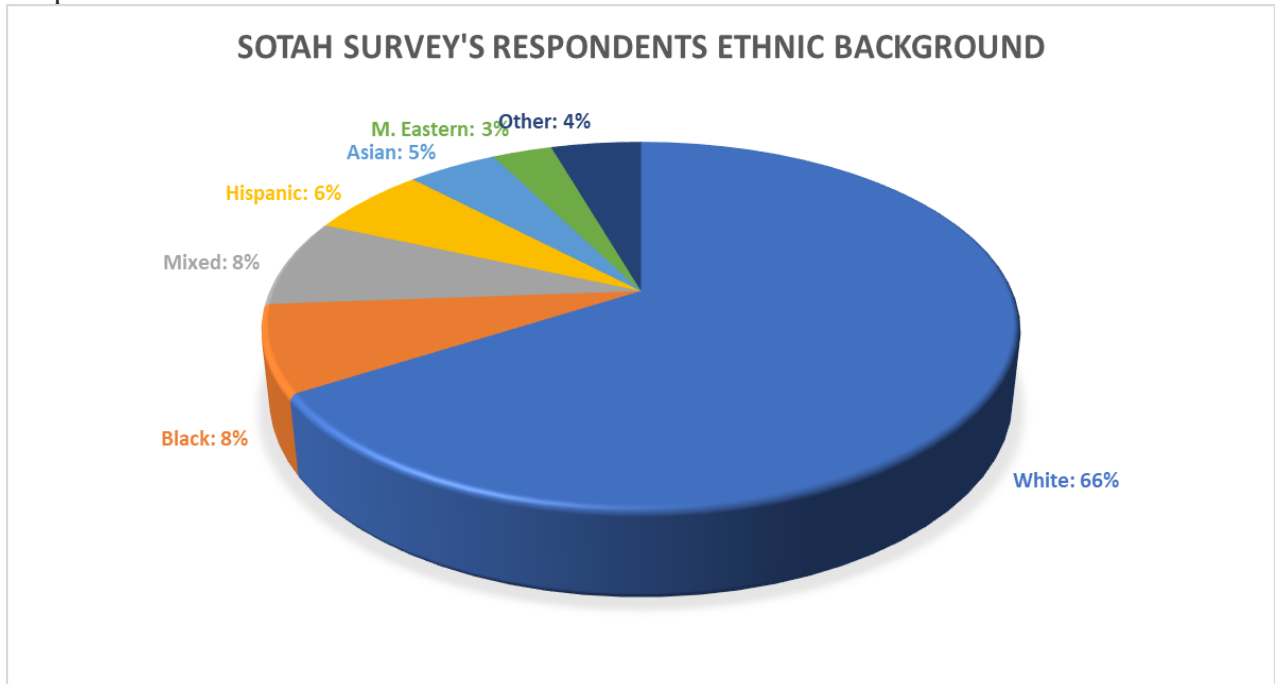
Graphic II.11



Source: SOTAH responses Q6.3 (age group) and Q6.4 (experience)

Teachers at NYC school are in general, very experienced professionals. Only about 17% of the respondents to SOTAH have 5 years or less of teaching experience, which includes mainly teachers within the group under 30 years of age. By contrast, about 83% of the respondents have more than 6 years of teaching experience. By groups, 29% have between 6 to 10 years of experience (mainly the group between 30 to 39 years of age). About 25% of the respondents have between 11 to 20 years (mainly from the group between 40 to 49 years of age). Finally, about 29% of the respondents have more than 21 years of teaching experience (mainly from the group of 50 years or more of age).

Graphic II.12



Source: SOTAH responses Q6.5

Regarding ethnic and racial backgrounds, about 66% of teachers self-identified as White and the other 35% self-identified as follows: 8% as Black or African American, 8% Mixed races, 6% Hispanic or Latino, 5% Asian, 3% Middle Eastern and 4% as Other. These percentages are similar with the ethnic and racial background of NYC school's student body regarding White versus non-White, but I do not know the corresponding break-down by sub-categories since I don't have the detailed demographics of the student body ethnic and racial composition.

CHAPTER III

The macro level: Leadership, school climate and learning environment

Chapter contents

- III.1. Operationalizing school leadership, climate and learning environment
- III.2. Data results on leadership, climate and learning environment
 - III.2.1. Evidence from semi-structured interviews on school climate and leadership
 - III.2.2. Evidence from SOTAH responses on school climate and leadership
- III.3. Findings and analysis of school climate and leadership practices
- III.4. Recommendation #1: Focus distributed leadership on strategic instructional planning

Chapter III. The macro level: leadership, school climate and learning environment

The complex set of processes occurring in the interaction between school leadership and learning underlies in most of the findings within the research literature establishing a significant impact of instructional leadership on student outcomes. The corresponding research question for this dimension is: to what extent does NYC school’s leadership reinforce a climate of learning, faculty support, psychological safety and trust? After operationalizing the macro-level dimension, I present the evidence and findings collected at NYC school through the qualitative semi-structured interviews with department chairs and senior administrators. I included some of the prominent themes and issues that emerged into a set of questions for the relevant section in the subsequent SOTAH questionnaire. The quantitative findings through the SOTAH responses by teaching faculty provides the evidence of teachers’ perceptions on these issues. These two methods of collecting evidence provided the triangulation for analysis and interpretation of the findings regarding leadership and school climate as well as the related recommendations.

III.1. Operationalizing leadership, school climate and learning environment

Effective school leaders build on and design cultural tools such as a mission, vision, values and goals of the school in a climate of collaboration and trust. A positive climate affects and interacts synergistically with well-designed and effective professional development, teacher evaluation and curricular organization as well as with student accessibility and support policies and programs. This in turn creates a positive learning climate affording teachers’ agency and professionalism at devising effective curricular development and lesson plans, contents, classroom tasks and instructional strategies. These effective instructional strategies in turn affect the quality of homework and assessment practices and student outcomes. School leadership can be analyzed through a broad set of variables pointed out from previous literature but I am going to focus on those directly related to school climate, professional development and teaching and learning (Geisel, Sleeper, Stoel & Kruger, 2009; Hou, Cui &, 2019; OECD 2019). I explore the variables and indicators related to leadership and school climate at NYC school through a specific section on school climate in the survey of teaching, assessment and homework (SOTAH) that I created for this capstone project.

Table III.1. Positive leadership and school climate
1. Clear and effective communication of the school’s mission and vision
2. Strategic plan with an instructional focus and incorporating all stakeholders
3. Trust-based, respectful and fair interactions and relationships
4. Support for professional development and growth for teaching faculty
5. Leaders know each teachers’ strengths and provide fair and useful feedback
6. Improvements are based on evidence-based analysis of educational outcomes

Source: own elaboration from research review

I adapted and synthesized the insights from the OECD (2019) TALIS survey section on school governance into six critical indicators exploring school leadership. First, school leadership articulates and communicates a clear mission and vision of the school. This has a positive correlation with instructional practices and student learning outcomes when those goals are consistent with effective instruction, professional growth and faculty feeling identified with the

stated school’s mission and vision. Second, it is critical that the school design an instructional strategic plan incorporating evidence-based teaching and learning strategies and principles. To be positively impactful, this must include the input and support of its stakeholders, especially of the school’s teaching faculty. Third, for educators to provide meaningful input, they need to feel they are treated fairly and with respect by the school leadership and administration and that there is a trust-based relationship between all school stakeholders. Fourth, teachers must feel supported in their professional development and growth for school leaders to create a learning environment in the school in a similar way that students need to have access to a rigorous curriculum and feel supported in the school structures and policies to achieve a high performance learning environment. Fifth, at an individual level it is critical that teachers also feel that school leaders and supervisors know their strengths and provide fair and useful feedback for instructional improvement. Sixth and last, there is also a critical element of evidence-based analysis of practices and a fair teaching evaluation system to design and implement further improvements for the school’s learning environment. These variables and indicators are explored in SOTAH question Q5.2.

How teachers relate to school leadership is shaped by their perception of the school climate for learning, how safe teachers feel in their autonomy and self-efficacy regarding their craft, which in turn, also affect the overall school culture discouraging or encouraging experimentation with the many aspects of teaching. In fact, these three variables are the key factors underlying the broader concept of psychological safety (Edmonson & Lei 2014). Empirical and scholarly research on school climate regarding psychological safety within education has focused on these three main variables as suggested by previous literature, while specifying a set of specific indicators for each variable, as articulated by Higgins, Ishimaru, Holcombe, & Fowler (2012).

Graphic III.2. Variables and indicators of psychological safety



Source: summarizing psychological safety variables according to Higgins, Ishimaru, Holcombe & Fowler (2012)

The first variable of psychological safety is leadership that reinforces learning. This variable encompasses six indicators such as leaders inviting input from others in discussions, acknowledging their own limitations regarding knowledge, information or expertise, asking probing questions, listening attentively, encouraging multiple points of view and accepting different views than those held by the school leadership. The second variable is the perception of psychological safety by teachers. This variable includes indicators related to how comfortable people feel to speak their minds, talk about problems or disagreements and how eager people are to share information about what does and does not work. The third variable is related to the level of experimentation teachers feel comfortable doing to improve their teaching craft. This variable includes indicators such as experiments with new ways of working and planning processes for conducting and evaluating new ideas (Higgins, Ishimaru, Holcombe, & Fowler, 2012). For this project, I added experimentation regarding instruction, assessment and homework as indicators of this variable in the context of this case-study. The school leadership and climate dimension and its variables and indicators are explored in SOTAH questions Q5.3, Q5.19 and Q5.20 as I will discuss in the data results section.

III.2. Data results on leadership, climate and learning environment

Senior leaders asked me to begin the research through the interviews with department chairs to build up rapport and trust as to earn teachers' cooperation for this study. In retrospect, there seemed to be two reasons informing this suggestion. First, NYC school seems to have a collegial and distributed leadership approach and provides a great deal of authority and autonomy regarding instructional leadership to their department chairs. The department chair within any specific area oversee both the upper and middle divisions' curriculum and faculty teaching the respective courses and levels. This multi-division departmental structure encourages a more cohesive instructional leadership at the specific discipline domain levels, and thus, to explore the problems of practice addressed in this capstone project, department chairs were the logical first step. The second reason seems to be an implicit acknowledgement that there was a potential problem of practice regarding trust, school climate and leadership perception. There was a major leadership change in 2016 with a new Head of School after some trust and school climate issues emerged from the previous administration. I did not address the issue of trust directly during the semi-structured interviews with department chairs but rather through general indirect and neutral questions about the strengths and weaknesses of the department.

III.2.1. Evidence from the semi-structured interviews on leadership and school climate

I began the semi-structured interviews asking the respective chair about the strengths and weaknesses within their department. All department chairs were proud of the professionalism, diversity of backgrounds and teaching vocation of their departments' faculty. Department chairs emphasized that their faculty members were both knowledgeable and skillful about their subjects' content and all were keen at maximizing their teaching craft. As one department chair said, "there is a great wealth of teaching experience, skills and professional backgrounds among my teachers." Similarly, department chairs pointed out the challenges that all teachers face at

improving student learning given that NYC school has a very diverse and uneven student body regarding their backgrounds, knowledge mastery and skills. As another department mentioned, “good teaching is good teaching no matter the background of the students, but it is more challenging when you have a wide range of ability and academic backgrounds in the same class.”

I found it interesting that no department chair referred to any schoolwide instructional strategic plan or how their department contributed or was part of NYC school’s mission or vision. The emphasis was only on what they were doing as a department, which suggest a great deal of autonomy and self-efficacy of departments at devising their own academic and educational programs. As another department chair put it, “we set the direction of the department together and teachers develop their own approaches.” This is consistent with a collegial and distributed leadership approach but also indicates the need for a schoolwide instructional strategic plan incorporating the various departments’ instructional insights as subsequently SOTAH responses suggested.

There were only two explicit indicators signaling that there might be some issues with school climate and trust. The first indicator was that the science department chair did not volunteer to be interviewed. Later, through the follow-up interviews with the school senior leadership, I learned that “the situation in the science department is very fluid and there is not a department chair but rather three different senior teachers sharing the science department leadership responsibilities.” This situation seems to indicate some leadership issues at least at that departmental level.

The other indicator of some issues regarding school climate and trust was that two department chairs that I did interviews with, brought up the issue of high turnover of teachers within their departments. As a department chair said, “it is hard to train teachers to expectations when they leave after a year and you have a new teacher the following year.” High teacher turnover is not only highly disruptive to accomplish any school’s mission and educational goals, but it is a solid indicator that there are likely school climate or trust issues either within the specific department or the overall school and those issues need attention and improvement.

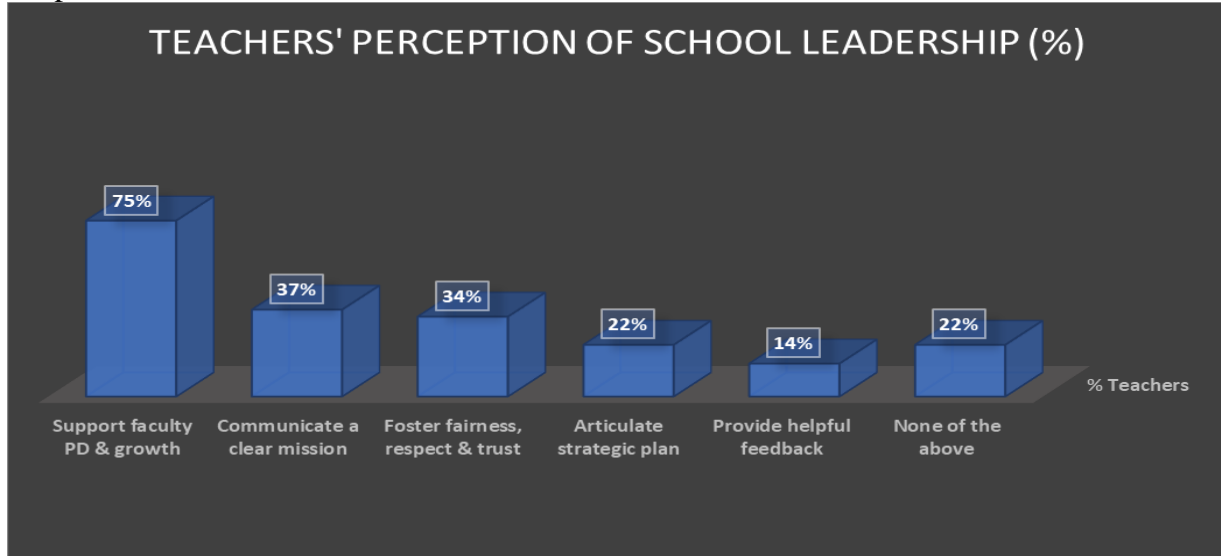
These insights from the semi-structured interviews brought me to include questions on school leadership, climate and psychological safety in the SOTAH survey to get a better grasp of NYC teachers’ perceptions. Those are key indicators of the macro-level of school leadership creating a learning environment, psychological safety and an experimentation climate. The leadership and school climate can have a significant instructional impact as we know from research and thus, I decided to include a set of questions in SOTAH to evaluate the possible impact on the NYC school learning environment.

III.2.2. Evidence from SOTAH responses on leadership and school climate

The teacher responses to SOTAH question Q5.2 on school leadership’s six indicators were mixed, ranging from very high in their level of agreement in one indicator to moderate or low in the other indicators. The respondents could choose to check one, several, all the 5 indicators of this leadership variable or alternatively could choose the exclusionary “none of the above.” A total of 14 teachers (22%) selected none of the five indicators associated with positive and

effective instructional leaders. The remaining 78% of the teachers chose at least 2 of these positive indicators to characterize NYC school leadership.

Graphic III.3

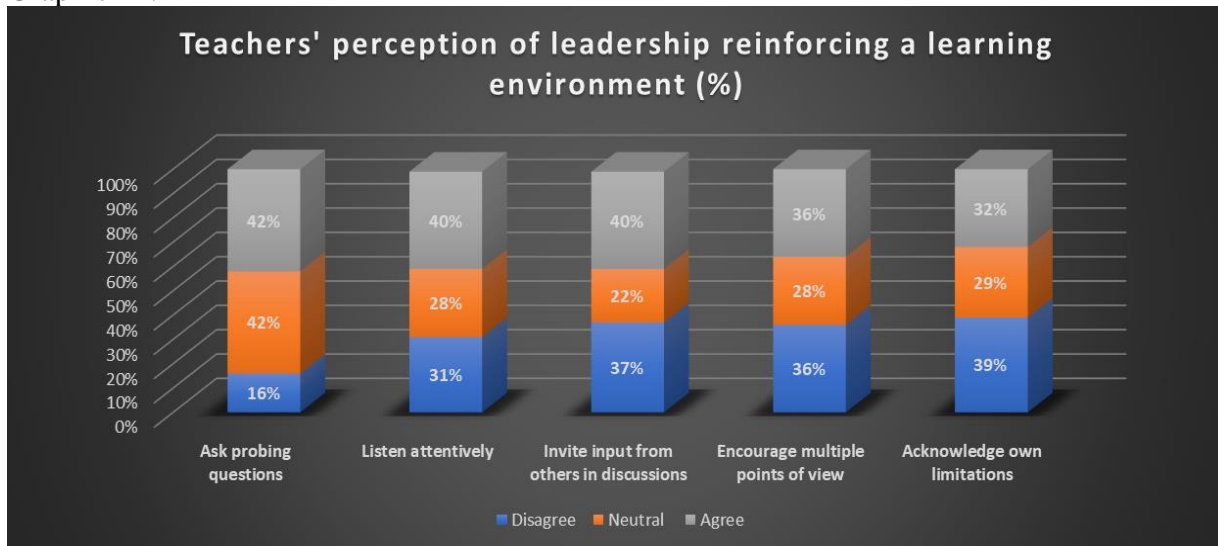


Source: SOTAH responses Q5.2

The stronger positive indicator is the perception that NYC school and its leadership support faculty professional development and growth. A total of 49 teachers (75%) selected this indicator. The teaching faculty at NYC school selected two additional positive indicators of effective school leadership at a moderate level. About 24 teachers (37%) selected that school leaders communicate a clear mission and vision for the school. Similarly, 22 teachers (34%) selected the positive indicator that school leaders foster a school climate of fairness, respect and trust. The other two positive indicators of an effective school leadership were selected at lower levels. A total of 14 teachers (22%) selected the statement that school leaders articulate a well thought out strategic plan for maximizing instruction, assessment and homework. The lowest rated indicator was the statement that school leaders know teachers' strengths and provide fair and helpful feedback for instructional improvement. Only 9 teachers (14%) selected this indicator of positive instructional leadership, which is the weakest area of NYC school leadership.

The teaching faculty of NYC school have a moderate to high positive perception of the overall school climate regarding its three variables of school leaders reinforcing learning, creating a psychological safety climate or encouraging an environment of experimentation. The most moderate responses were regarding the first variable of school leadership reinforcing a learning environment, as articulated through 5 indicators in question SOTAH Q5.3. The teachers at NYC school could chose to agree, disagree or be neutral with each of these statements. Most teachers rated these indicators of school leadership reinforcing a learning environment at moderate levels, ranging from 42% to 32% of the teachers agreeing with these positive indicators.

Graphic III.4



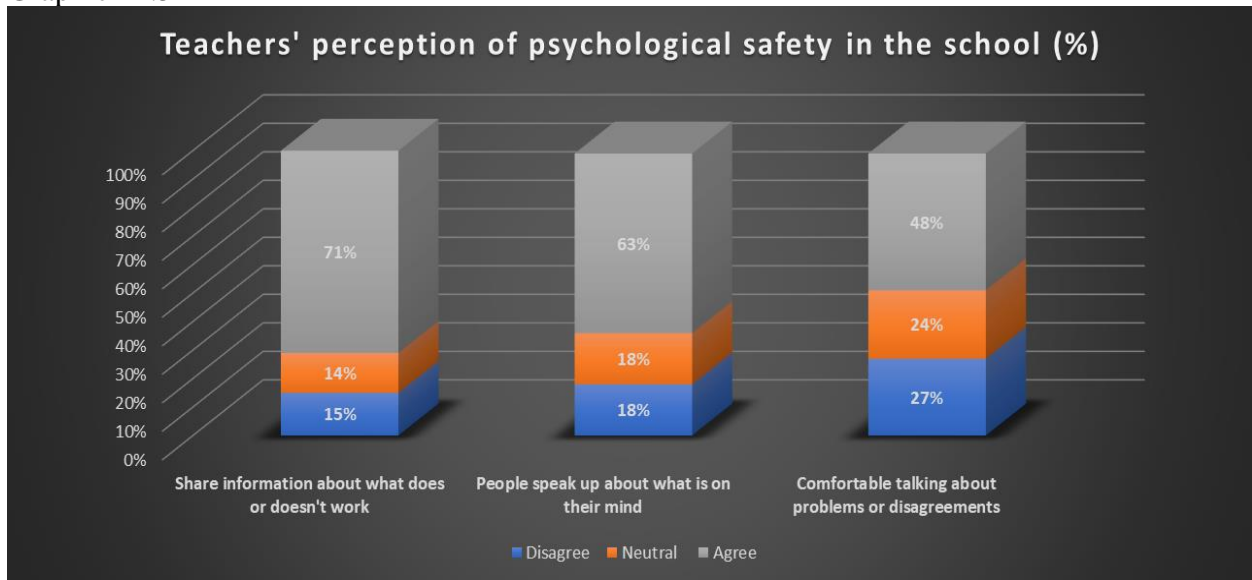
Source: SOTAH responses Q5.3

The highest level was 42% of the teachers agree (16% disagree, 42% neutral) that school leaders ask probing questions. This is the statement with the highest level of agreement but also with the lowest level of disagreement. About 40% of the teachers agree (31% disagree, 28% neutral) that school leaders listen attentively and another 40% of the teachers agree (37% disagree, 22% neutral) that leaders invite input from others in discussions. The remaining two statements scored at the lower level of the range of agreement within this variable. About 36% of the teachers agree (36% disagree, 29% neutral) that school leaders encourage multiple points of view and 32% of the teachers agree (39% disagree, 29% neutral) that school leaders acknowledge their own limitations regarding knowledge, information or expertise.

The second variable of school climate is psychological safety: how teachers feel about possible consequences of taking interpersonal risks to voice their ideas. NYC school teaching faculty scored high in their perception of psychological safety as indicated in their responses to SOTAH Q5.19. These responses ranged from very high to high proportions of teachers agreeing with the indicators of psychological safety (with corresponding very low levels of disagreement with those indicators).

The highest positive indicator within the variable of psychological safety was that 71% of the teachers agree (15% disagree, 14% neutral) that in NYC school, people are eager to share information about what does and doesn't work. Slightly below the highest indicator, was the fact that 65% of the teachers agree (18% disagree, 18% neutral) that faculty and other employees at this school speak up what is on their minds. The third indicator of psychological safety was more moderate compared to the high levels of the two previous indicators. About 48% of the teachers agree (27% disagree, 24% neutral) that people at the school are comfortable talking about problems or disagreements.

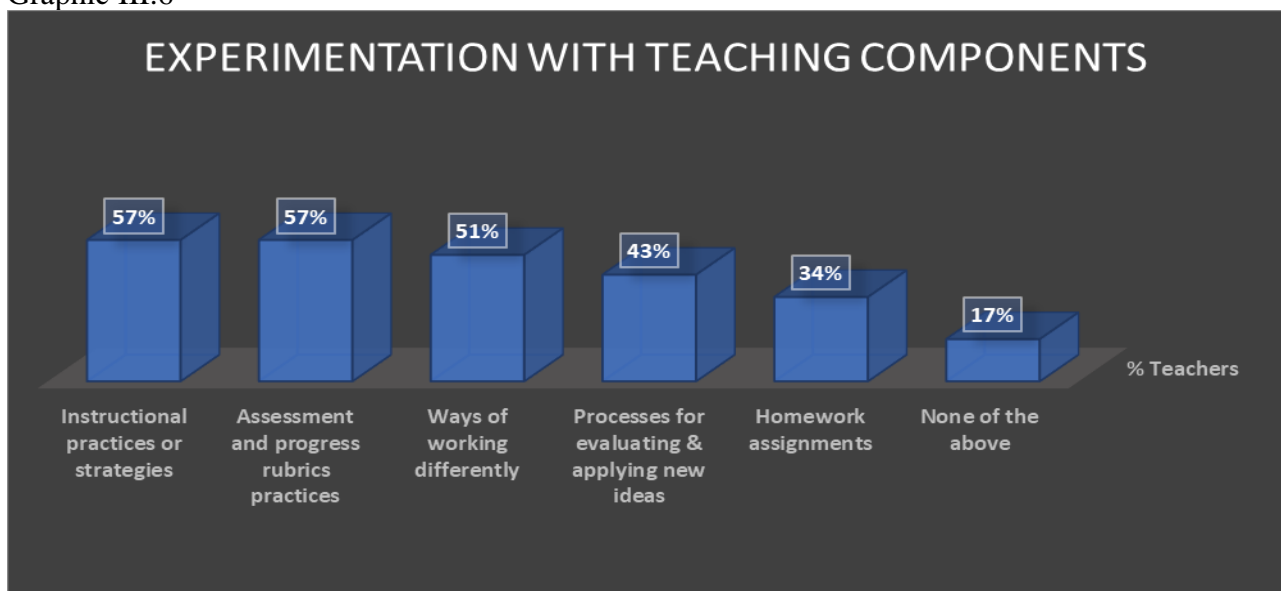
Graphic III.5



Source: SOTAH responses Q5.19

The third variable of a school positive learning climate is related to levels of experimentation teachers feel comfortable doing regarding the various components of their teaching craft. NYC school teaching faculty scored within high (above 50%) to moderate (between 43% to 34%) in their levels of experimenting with different aspects of their teaching craft as indicated in responses to SOTAH question Q5.20 and its indicators or statements. The NYC school teaching faculty selected one, several or all the 5 positive indicators of areas of experimentation or alternatively could choose the exclusionary “none of the above.”

Graphic III.6



Source: SOTAH responses Q5.20

The two higher scored indicators were experimenting with instructional practices and strategies, which was selected by 37 teachers (57% of the respondents). Experimenting with assessment and progress rubrics was also selected by 37 teachers (57%). These two highest levels of experimentation were followed by 33 teachers (51%) selecting the option that they experiment with ways of working differently. The two subsequent areas of experimentation were selected at moderate levels. About 28 teachers (43%) stated experimenting with processes for evaluating and applying new ideas. This was followed by 22 teachers (34%) stated that they experiment with homework assignments. Only 11 teachers (17%) indicated not experimenting with any of the above areas.

III.3. Findings and analysis of school leadership practices

The semi-structured interviews with department chairs provided some initial insights into the strengths and weaknesses of NYC school's macro-level of instructional leadership and school climate. One explicit stated strength is the faculty professionalism, content knowledge and skills and commitment to help students. The implicit strength was the apparent autonomy that departments have within their domain coupled with what seems to be a collegial and distributed style of leadership of the senior administrative team at the school.

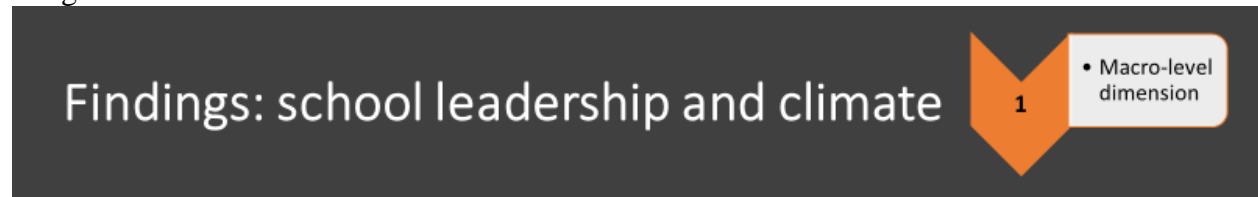
The weaknesses were implicitly pointed out at the initial phases of this project, when the school senior leaders suggested that I should start by creating rapport and trust with department chairs. This pointed out implicitly the need for addressing teachers' perception of school climate and trust as a potential weakness. This was further supported implicitly by the fluid situation in the science department and the explicit issue that two department chairs brought up during the semi-structured interviews about high teacher turnover within their departments. The evidence from the survey brought to light explicitly these strengths and weaknesses of NYC school leadership and climate.

The SOTAH responses to indicators of a positive instructional leadership environment vary widely. These responses are consistent with most of the implicit and explicit arguments of department chairs regarding school leadership and climate while uncovering new areas of strengths and weaknesses. The highest score, with 75% of the teacher agree with the statement that NYC school leaders support their faculty professional development and growth. This is consistent with the views of senior leaders although as discussed later, there are some issues around the effectiveness and practicality of the PD program. Here, the key point is that teachers clearly appreciate and value the PD support they receive from the school leadership. This strength of the school is reinforced by the high scores in some indicators of psychological safety and experimentation and to a lesser extent by the moderate scores regarding leadership supporting a learning environment.

Teachers' perception of their own psychological safety is high to very high in two of the three indicators of psychological safety. In fact, 71% of the teachers agree that in NYC school, people are eager to share information about what does and doesn't work. Slightly below that indicator, was the fact that 65% of the teachers agree with the statement that people at this school speak up

what is on their minds. The third indicator of psychological safety was in the high moderate range: 48% of the teachers agree that people at the school are comfortable talking about problems or disagreements. The lower score of this indicator is probably related to the “culture of nice” that predominates within most of the United States’ private schools but in NYC school about half of the teachers still feel free to express disagreement and discuss problems openly. Yet, this moderate score is still relatively high compared to how teachers in other independent or even public schools rate this indicator of psychological safety (Higgins, Ishimaru, Holcombe, & Fowler; 2012).

Image III.7



RQ #1. To what extent does NYC school’s leadership reinforce a climate of learning, support and trust, psychological safety and experimentation for its faculty?

Strengths

- Positive school climate: distributed leadership
- Departments & teachers’ autonomy and self-efficacy
- Very high faculty professional development support
- High psychological safety & experimentation climate



Source: Semi-structured interviews and SOTAH responses

The high scores regarding self-perceived psychological safety of teachers were also reflected at moderate to high levels in the indicators of the variable of experimentation. The scores ranged from a high of 57% of the respondents agreeing with the statement that they experiment with instructional practices as well as another 57% of the teachers selecting that they experiment with assessment and progress rubrics. These two indicators were followed by 51% of the teachers agreeing that they experiment with ways of working differently. The other two subsequent areas of experimentation were selected at moderate levels: 43% of the teachers stated experimenting with processes for evaluating and applying new ideas and 34% of the teachers experiment with homework assignments. I will explore and connect this lower percentage of agreement with homework experimentation with subsequent analysis of results regarding homework practices at the end of the capstone project. Only 17% of the teachers indicated not experimenting with any of the above areas.

The areas of weakness, consistent with the implicit and explicit perceptions of department chairs, were related to trust as well as instructional leadership or school leaders reinforcing a learning environment. The SOTAH responses of the teachers at NYC school to the five indicators about their perception of leadership reinforcing a learning environment ranged from moderately high to moderately low. About 42% of the teachers agree with the statement that school leaders ask probing questions, closely followed by 40% of the teachers agree that school leaders listen attentively and another 40% agree that they invite input from others in discussions. The lower levels of agreement were 36% of the teachers agreeing with the statement that school leaders encourage multiple points of view while even a lower 32% of the teachers agreed that school leaders acknowledge their own limitations regarding knowledge, information or expertise. These two last indicators of the variable of school leaders supporting a learning environment are the ones that need some improvement for NYC school leaders to enhance trust and faculty engagement.

Image III.8

Findings: school leadership and climate

1

• Macro-level dimension

RQ #1. To what extent does NYC school's leadership reinforce a climate of learning, support and trust, psychological safety and experimentation for its faculty?

Weaknesses

- Moderate identification with the mission of the school
- Moderate climate of respect and trust
- Low instructional guidance from school leaders
- Leaders are unaware of teachers' strengths and do not provide helpful feedback
- High teacher turnover in a couple of departments



Source: semi-structured interviews and SOTAH responses

Teachers also expressed moderate to low levels of agreement with the indicators of instructional leadership reflecting identification with the school mission, its instructional strategic plans, the level of trust and the issue of teachers' evaluation (feedback). Indeed, 37% of respondents agreed that school leaders communicate a clear mission and vision for the school and 34% of the teachers agreed with the statement that school leaders foster a school climate of fairness, respect and trust. The percentages of respondents agreeing with the statements regarding instructional direction and a fair evaluation system of their teaching craft are even lower. About 22% of the teachers agreed with the statement that school leaders articulate a well thought out strategic plan for maximizing instructions, assessment and homework. The lowest rated indicator was the statement that school leaders know teachers' strengths and provide fair and helpful feedback for

instructional improvement with 14% of teachers selecting that statement about the school leadership. Moreover, 22% of the teachers that selected “none of the above,” which indicates an important segment of teaching faculty that does not feel connected and in sync with the school and its leadership at all. This in part reflects the historical remaining attitudes from the school’s previous climate of distrust before the new administration began to restore trust after 2016.

The low level of teachers selecting the indicator that school leaders know their strengths and provide fair and helpful feedback for instructional improvement can be explained in part due to the more collegial and distributed approach to leadership in NYC school and the active delegation of instructional leadership to department chairs. Indeed, NYC school department chairs assume the leadership of their curricular domain areas and respective teaching and learning. Department chairs are supervised by division heads and the Associate Head of School. This interpretation is reinforced by the also relative low proportion of teachers agreeing with the statement that the school articulate a well thought out strategic plan for instruction, assessment and homework. In other words, the school leaders with clear knowledge of teachers’ strengths or providing feedback are not the senior leaders of the school but rather teachers’ immediate supervisors: their respective department chairs. Yet, it seems to be a disconnection between instructional leadership at the senior level and at the department level as reflected by these responses, which seem to indicate a limited teacher evaluation and feedback system as well as the lack of an encompassing strategic instructional plan for the school.

When these moderate to low indicators are put in the context of the highest scores of leaders supporting teachers’ professional development, psychological safety and high levels of experimentation, the overall picture of school leadership at the macro-level is both paradoxical and unusual. This seems to indicate that NYC school leadership have adopted a collegial distributed approach trying to provide great autonomy and self-efficacy to each department and faculty member while supporting professional development, which is consistent with the implicit and explicit views expressed by department chairs. There are also moderate levels of listening and adopting the teaching faculty input and perspectives. Moreover, and unlike many other independent schools with multiple divisions, NYC school made a clear organizational choice regarding its departmental structure: department chairs oversee both the upper and middle divisions curricular programs under the management of the respective division heads and the Associate Head of School. Simultaneously, the school leadership has not pushed for a clearly articulated mission and strategic plan for instructional practices although it has emphasized professional development support and its collegial and distributed leadership approach. The actual positive findings of the NYC school leadership reinforcing a positive learning environment through a strong PD program and high levels of psychological safety and experimentation, provide an insight for how the school could enhance its overall school climate of trust and a more focused instructional approach.

III.4. Recommendation #1: Focus distributed leadership on strategic instructional planning

The analysis of the evidence of the macro-level dimension shows that the leadership at NYC school reinforces a positive professional school climate with distributed leadership, autonomy and self-efficacy for teachers. There is a strong faculty professional development and teacher growth support program. Similarly, there is among its teaching faculty an environment of psychological safety and learning experimentation. There are also some areas for improvement. The school climate of trust, respect and identification with the mission is slowly being established. The school leadership is perceived by teaching faculty as having limited impact on instructional guidance, having limited knowledge about the strengths of individual teachers or providing helpful feedback for instructional improvement. There is high teacher turnover in a few departments.

The school distributed approach seems to have limited success at increasing trust and outlining a clear mission and vision for the school. This raises the question if it is possible to design a strategy for NYC school's collegial and distributed leadership approach to improve trust and its instructional impact? If so, is it possible to do it while simultaneously maintaining or enhancing the school's robust PD support and its climate of psychological safety and experimentation? The insights from scholarly research and the evidence collected in this project suggest that indeed it is possible. A well thought out plan can enhance a positive school climate of trust and instructional leadership if the school develops a more focused mission and vision as well as a strategic instructional plan addressing the weak areas of school programming using its current strengths.

First, NYC school leadership should explore the feasibility of crafting a new mission and vision or redefining and reframing the current one in the context of a school strategic plan addressing areas of improvement through an inclusive process incorporating the input from all stakeholders. This will increase the identification with the school's mission and vision of all constituencies, and especially the teaching faculty. Constituents and employees identification with the school is critical for improvement of educational outcomes, teachers motivation and professionalism as demonstrated by the literature (Day, Gu, & Sammons, 2016; Geijsel, Slegers, Stoel & Kruger, 2009; Goldring, Porter, Murphy, Elliot & Cravens, 2007; Kaseorg & Uibu, 2017; OECD, 2009, 2016; Santiago, Levitas, Rado & Shewbridge, 2016).

Second, within school programs, those more directly related to instructional practices and enhancing a learning and trust environment are the most critical for its overall improvement. NYC school must develop an instructional strategic plan focusing on using evidence-based learning strategies. Maximizing teaching and learning requires the training and implementation of evidence-based strategies at various stages of the instructional process: from designing and planning curriculum and lessons to the specific tasks to accomplish in class or the assessment and homework assigned. As I illustrated in the literature review, the evidence and insights into this approach is broad and I make specific recommendations in the following chapters dealing with professional development, instruction, assessment and homework.

Third, as part of a strategic instructional plan, it is critical that NYC school develops a balanced and fair teacher evaluation system, which should also be linked to professional growth. The

effectiveness and fairness of teacher evaluation is related to the convergence of traditional subjective and observation criteria and more objective performance systems into a broad and hybrid set of criteria and tools for teaching evaluation. There are some clues about this tendency in recent investigations of teaching evaluation systems in innovative private and public-school systems (Kane & Cantrell, 2013; Pham, Nguyen and Springer, 2020; Putnam, Ross & Wash, 2018). A fair and hybrid evaluation system will enhance and improve both instructional impact, communication with teachers and feedback fairness, which in turn, will increase psychological safety and trust at NYC school.

Fourth, I also recommend to NYC school to create and develop a teaching fellows program to recruit and retain new teachers while providing a source for professional development for mentors and master teachers at the school. The effectiveness of teacher induction and onboarding programs has been established in the literature (CCSEA, 2016; Ingersoll & Strong, 2011; Kraft, Blazar & Hogan, 2018; Schleicher, 2016; Sherer, Norman, Bryk, Peurach, Vasudeva & McMahon, 2020). Independent schools have adapted this type of system through what most private schools call teaching fellows programs. These programs are basically a new teacher induction program with a double purpose of recruiting and retaining teachers from different backgrounds and training them for the profession and/or onboarding these new teachers or experienced teachers new to the school to its culture and expectations.

Fifth, engage all stakeholders in the processes for crafting and redefining the mission, vision and strategic plan. The value proposition of NYC school of already having a collegial and distributed leadership approach and its senior leaders being aware and willing to increase trust and maximize instructional practices and student learning can be enhanced by truly incorporating all voices in defining the problems, shaping the processes and articulating action plans. The positive impact of distributed instructional leadership (Spillane, 2006) has been demonstrated by a broad set of international comparative studies (Hallinger & Lee, 2012; Supovitz & Tognata, 2013; Trammell, 2016). The input and incorporation of the voices from all stakeholders in the crafting process needs to be balanced with the expertise from learning scientists in the wording, defining the school's instructional direction and plans. These recommendations are consistent with the findings in this capstone project. They are also consistent with the synthesis of the major research findings on the impact of school leaders and principals on teachers effectiveness and student learning in a recent study by Grissom, Egalite and Lindsay (2021) commissioned by The Wallace Foundation and supported by Vanderbilt University Peabody College of Education and other research foundations and higher education institutions.

CHAPTER IV

The meso level: Professional development and school structures

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 IV.2.2. Evidence from SOTAH responses on professional development

IV.3. Findings and analysis of school professional development practices

IV.4. Recommendation #2: Enhance effective professional development options

Chapter IV. The meso level: Professional development and school structures

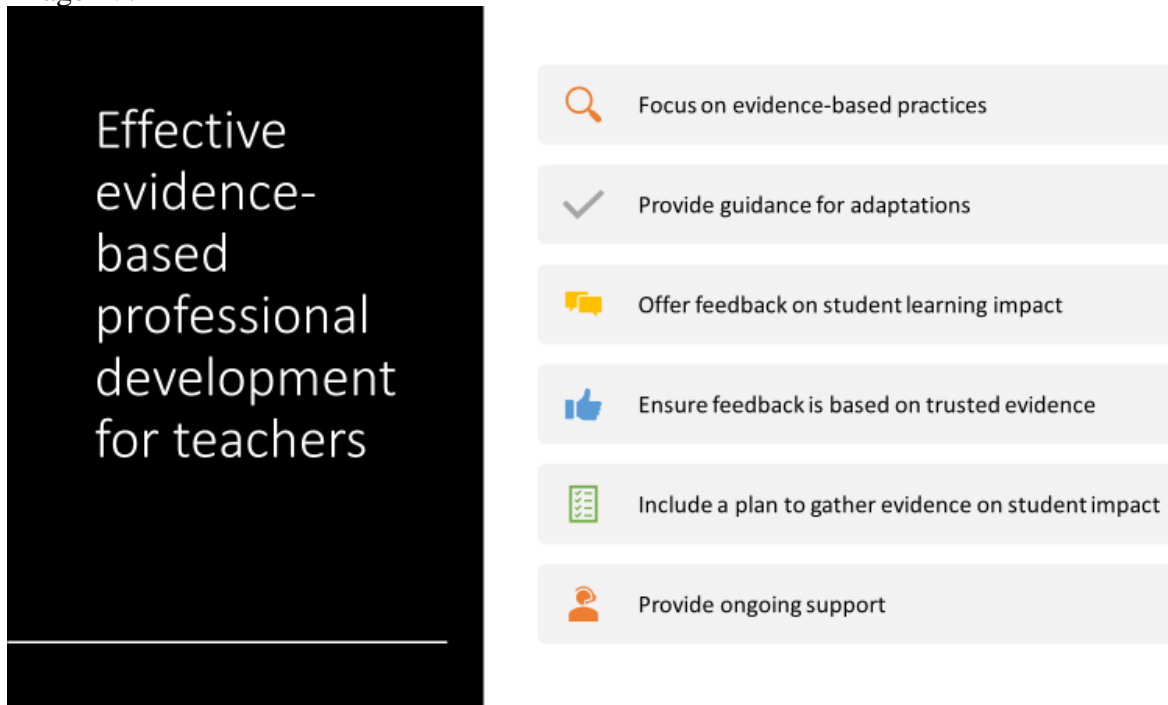
The dimension of school leadership and climate as articulated through the variables of psychological safety can impact the meso-level dimension's intervening variables of professional development and school structures. Since student accessibility to curriculum, student perceptions and student support are not included for the purpose of this capstone project, I am going to set aside those other variables at the meso-level of analysis. Instead, this project will focus on teachers' professional development and their impact on their teaching craft and indirectly on student learning. Teachers' perceptions of the relative effectiveness of their professional development experiences can be an insightful way of exploring the extent to which these practices can have an impact on their instructional approaches. The crucial question is: how does NYC school implement effective professional development and how do teachers perceive its relative effectiveness and relevance for improving their teaching craft?

IV.1. Operationalizing professional development practices

Professional development programs, training and workshops are as ubiquitous in education as they seem to be limited in their actual impact at improving instruction. The limited impact of teacher PD is related to its lack of focus on evidence-based learning. This has been succinctly summarized by one of the leading professional development researchers: "The ineffectiveness of so many current professional learning experiences stems from the lack of clarity about the desired outcomes and the tendency of leaders to gravitate more toward what's popular than what trustworthy evidence supports." (Guskey, 2021, p.59). This author offers a guide to make PD more impactful through evidence-based learning practices. Guskey's recent approach advocates for six steps for PD to make a difference. First, it should focus on evidence-based practices. Second, PD programs must provide guidance for balanced adaptations. Third, PD must offer feedback regarding its impact on students' learning. Fourth, it ensures that the feedback provided is evidence-based and trusted by teachers. Fifth, an effective PD program needs to include a plan to gather evidence on student learning impact quickly. Sixth and finally, effective PD must provide ongoing support (Guskey, 2021). The question is what is the evidence about effective teachers' professional development?

According to the research literature, the most effective professional development is targeted and focused on data based decision-making processes enhancing teachers' knowledge, skills, and self-efficacy related to their specific curriculum and expertise domain with the support of specialized researchers (Gesel, Lejeune, Chow, Sinclair & Lemons, 2020). For the purpose of this capstone project, I am going to focus on two of the most insightful studies articulating the variables and indicators for effective professional development that have been pointed out by previous research. Professional development, when targeted, can indeed be effective and have a direct impact on improving teaching and learning, and indirectly, student outcomes as summarized by the findings and insights of Darling-Hammond, Hyler, Garner & Espinoza (2017). This approach has been articulated by the Tennessee Educator Survey (2019) and used to assess professional development in the context of a private school in the US (Holthaus, 2020).

Image IV.1



Source: summarizing the six steps to effective evidence-based PD by Guskey (2021)

For this capstone project, I will use a slightly different approach on effective professional development research although it shares many of the aspects and insights outlined by Darling-Hammond et al. as well as Guskey's insights and research. I will use an adapted and modified version of the OECD's comparative studies using its Teaching and Learning International Survey, TALIS (OECD, 2019). The TALIS survey segment on professional development captures more broadly and deeply the variables and indicators for the purpose of this capstone project. The adapted questions from TALIS are also an initial and indirect inquiry into whether there is some evidence-based focus on the specific professional development components and practices examined in this school case study. I will explore the TALIS variables and indicators related to professional development at NYC school through a specific section on PD in the Survey of Teaching, Assessment and Homework (SOTAH).

The first variable of different types of professional development is peer coaching and mentoring required within the school. The second variable is collaboration time and professional development workshops within the school or specific department or division. The third variable is participation in outside collaboration or professional development. The fourth variable is participation in education conferences or seminars led by education researchers or teachers. The fifth variable is participation in certificate or degree programs beyond the initial teaching degree and credential. The sixth variable is participation through classroom observations of or by colleagues within or outside the current school.

The indicators for each variable in SOTAH are actual participation (Yes/No) and if Yes, there was a filtered question with a battery of statements regarding whether or not these professional experiences were: 1. Professional, specific and helpful; 2. Closely aligned with instructional and

curricular materials and practices; 3. Have a large impact on maximizing teaching effectiveness; 4. The frequency and spacing of each of these experiences to be effective and 5. Teachers’ agency and autonomy selecting those PD experiences. There was a 6 “none of the above” exclusionary choice. These variables and their indicators are explored in SOTAH questions Q5.4 to Q5.17. The seventh and eighth variables for this dimension are participation in specific professional development focused on assessment and homework, which are explored in question Q3.2 &3 (assessment section) and Q4.2 &3 (homework section) respectively with the same typology of indicators mentioned above.

Table IV.2 SOTAH questions on PD participation and filtered follow-up effectiveness question

Teachers’ participation by type of PD activity (8 questions)	Follow-up question on PD effectiveness if respondent answered YES
1. Coaching or mentoring required within the school	<p>*If teachers participated in any of the various types of professional development, how effective was it?</p> <ul style="list-style-type: none"> • PD experience is professional, specific and helpful. • PD experience is closely aligned with instructional and curricular materials and practices. • PD experience has a large impact at maximizing teaching effectiveness. • The experiences have enough frequency and spacing to have an impact. • Teachers have agency and autonomy selecting those PD experiences. • None of the above
2. Collaboration & PD workshops within the school	
3. Collaboration & PD workshops outside the school	
4. Education conferences or seminars	
5. Certificate or degree programs beyond teaching certificate/degree	
6. Classroom observations within or outside school	
7. Assessment focused PD	
8. Homework focused PD	

Source: adapting OECD’s TALIS (2019) and elaborating from interviews with NYC school department chairs

Additionally, it is critical to explore what type of school professional and informational sources teachers select more frequently to ask and receive instructional support. It is also relevant to find out when teachers are more likely to use what they learn in PD programs and apply it to the overall planning of their courses. SOTAH explores these three variables about sources of professional support, sources of information and timing for applying learning to their planning in questions Q5.16, Q5.17, and Q5.18 adapted from PD questions created by Boser (2019).

IV.2. Data results on professional development practices

In this section I explore professional development practices at NYC school. The senior leaders stated initially that the school professional development program was robust and solid. This perception was also subsequently supported by the statements of department chairs during the semi-structured interviews. After administering the SOTAH survey to the teachers at NYC school, 75% of the teachers agreed with the indicator stating that the school supports faculty professional development and growth when this issue was explored as part of the school leadership approach. Yet, the reason SOTAH included a battery of questions regarding professional development was due to additional insights from department chairs during the semi-structured interviews that PD effectiveness was rather limited despite the school's robust PD program. This highlighted a new problem of practice within the meso-level dimension: how effective is this robust PD program at NYC school at helping teachers maximizing their instructional impact?

IV.2.1. Evidence from the semi-structured interviews on professional development

During the semi-structured interviews with NYC school department chairs, they all stated that the school supports its faculty professional development and growth, offering a robust PD program with a wide variety of opportunities and workshops. Several department chairs mentioned that a part of mandated school-wide PD is related to legally required training. The more focused teacher PD program and activities can be within the school or outside the school and some of the many PD activities can be self-directed and self-selected by the teachers. As a department chair said, "we have required PD by the school, but teachers can choose outside PD programs focused on their own disciplines and interests." Yet, the most common view shared by most departmental leaders and stated by one of the department chairs was, "the broad schoolwide PD workshops are more informational than practical."

At least two department chairs explicitly mentioned that they purposefully designed department meetings incorporating more practical PD workshops focusing on specific instructional strategies to address PD needs not covered by the overall school workshops. As a department chair said, "I use department meetings to have different teachers showcasing how to best teach a concept or skill." Most other departments leave more practical and focused PD at their teaching faculty's initiative and choice of specific programs. As another department chair said, "my teachers go to 'learning and the brain' conferences or similar institutes every year." A combination of mandated and self-directed PD approach is the predominant pattern among independent schools and NYC school seems to be part of that pattern.

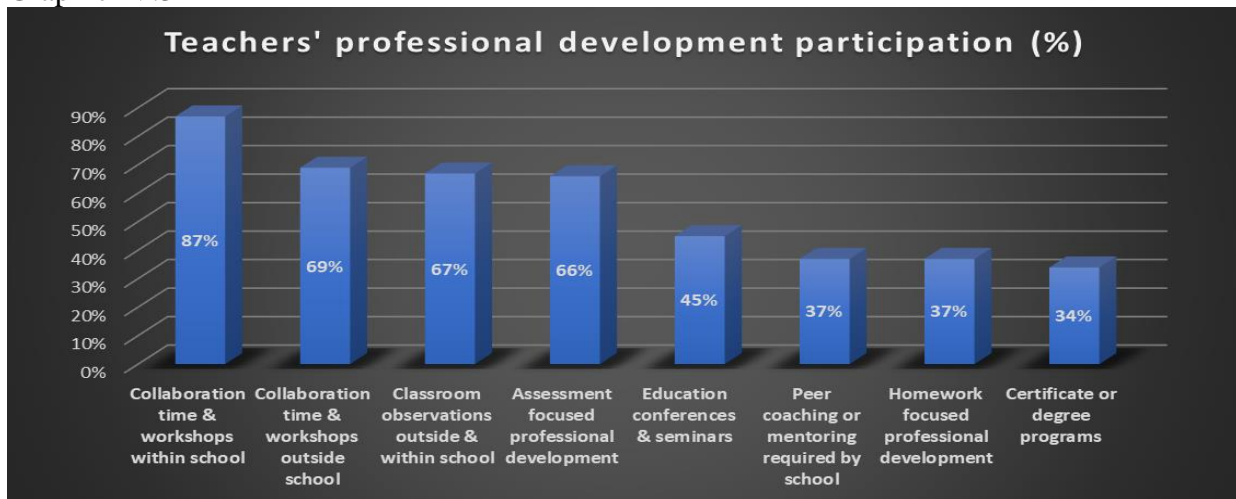
A couple of departments at NYC school mentioned the limitations of the yearly PD workshops within the school and within their departments due to high faculty turnover, and thus, having to re-start PD training almost from scratch the following academic year with newly hired teachers. With these initial thematic problems of practice emerging from the semi-structured interviews and the insights from PD research, I included in SOTAH survey a set of questions adapted from the OECD's TALIS survey that address PD effectiveness. Teachers' responses to SOTAH PD questions were broadly consistent with the characterization by department chairs. The most interesting caveats from these responses were what seem to be a negative assessment of the

impact of either mandated PD or too narrowly defined PD compared to voluntary and more broad professional development activities.

IV.2.2. Evidence from SOTAH responses on professional development

The self-directed nature of PD for most teachers and the view of department chairs about the limited effectiveness or practical application of school-wide or outside PD to instructional practices are supported by NYC school teaching faculty responses to SOTAH questions. The findings from SOTAH responses show that an average of 37 teachers or 55% of the respondents participated in at least 4.3 different types of professional development activities in the last two years. There were several PD activities that were used more frequently by a larger number of teachers than other sets of PD activities.

Graphic IV.3



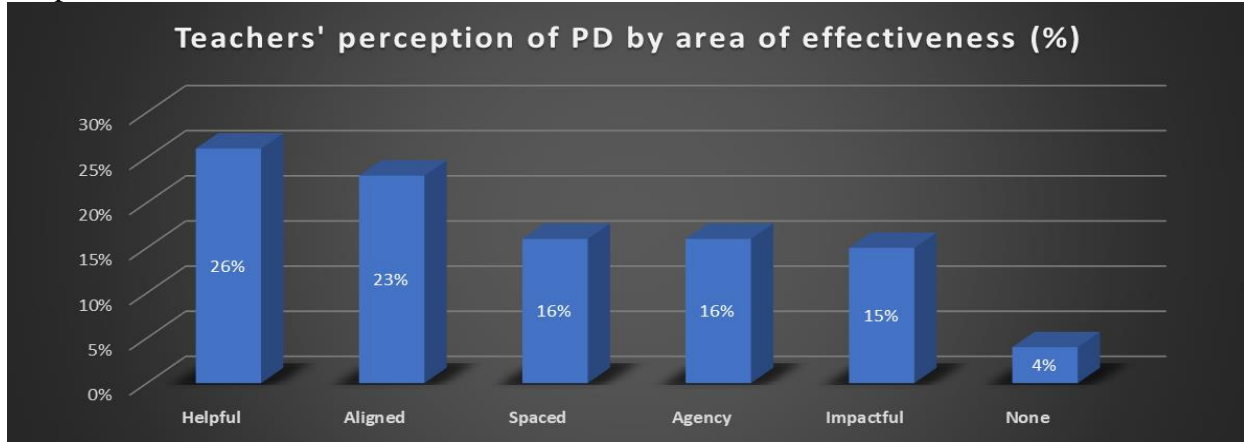
Source: SOTAH responses Q3.2, Q4.2, Q5.4, Q5.6, Q5.8, Q5.10, Q5.12, Q5.14

We can group teachers' participation in two sub-sets of professional development activities according to the proportion or frequency of engagement in those PD activities. There were four types of PD activities with at least a 65% participation rate of the teachers in the last 2 years versus the other four types of PD activities with teachers' participation rates below 45%. The graphic above summarizes the participation rates within each of these eight variables or types of PD activities. The participation rate ranged from the high of 87% of the teachers involved in collaboration time and workshops within the school to a low of 34% of the teachers engaged in certificate or degree programs. I will explore each of the eight PD activities, including the remaining six between the highest and the lowest rates of participation later-on.

For now, let's first examine how the teachers at NYC school perceive these eight PD activities overall by averaging their responses to each indicator of their relative effectiveness. This average provides a reference for describing each of these five effectiveness indicators within each specific PD activity teachers have engaged with in the last 2 years. For the teachers at NYC school that answered YES to participating in any of the eight PD activities, there was a follow-up question with six statements regarding their perception of that specific PD experience

effectiveness. Teachers could choose to check one, several, all five or alternatively could choose the exclusionary “none of the above” of the indicators of each specific PD experience.

Graphic IV.4

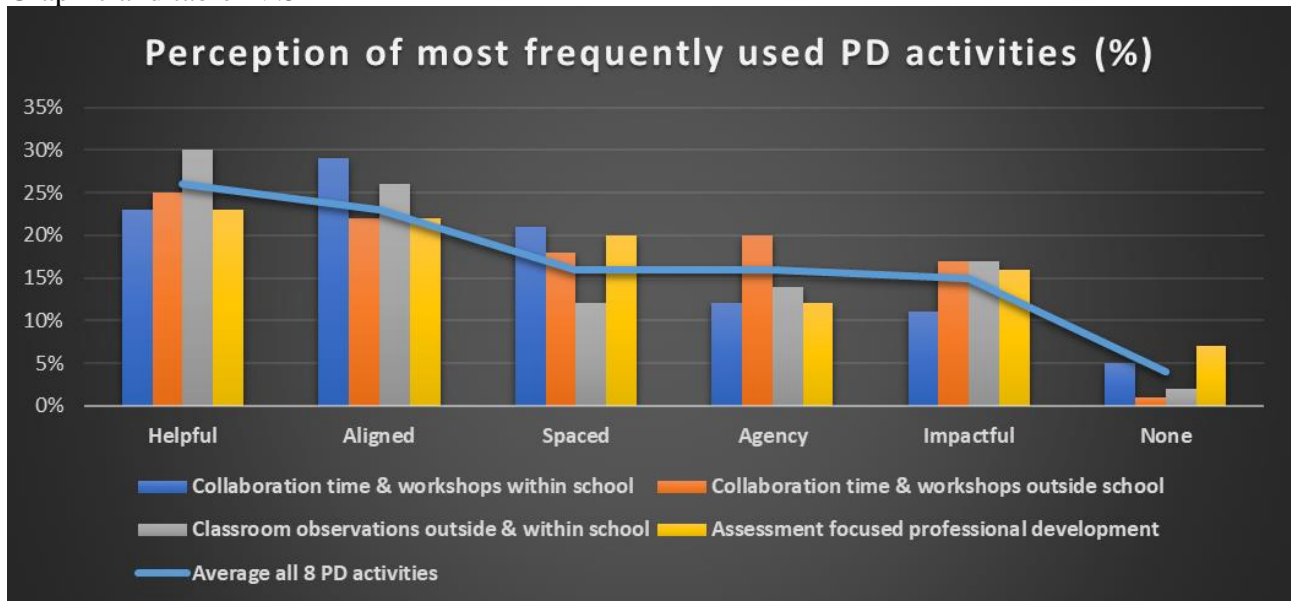


Source: SOTAH responses Q3.3, Q4.3, Q5.5, Q5.7, Q5.9, Q5.11, Q5.13, Q5.15

Teaching faculty responses for choosing a particular PD experience ranged from an average of 26% of the respondents perceiving them as helpful, professional and specific, 23% as aligned with their curricular and instructional materials, 16% as these PD experiences held throughout several days/sections (spaced), 16% as having the initiative in choosing that particular activity, and 15% as having a large impact on their teaching effectiveness. An average of 4% of the respondents chose that none of the above applied to their PD experiences.

To explore the NYC school teaching faculty’s perception of the relative effectiveness and impact of their PD experiences, it is critical to examine their responses to each of the eight types of PD activities. First, I will describe the results from the top 4 PD activities used by teachers most frequently. As mentioned above and captured by SOTAH question Q5.7, the PD activity used by most teachers, at 87% participation rate, was collaboration time and professional development workshops within the school, specific department or division. Teachers participating found this PD activity below average regarding being professional, specific or helpful by 23% of the respondents (vs a 26% average) but higher than average regarding being aligned with curricular and instructional materials by 29% of the respondents (vs a 23% average). This was the activity with the highest score regarding being spaced throughout different days and sessions by 21% of the respondents (vs 16% average). By contrast, this PD activity was rated among the lowest regarding the degree of agency and autonomy at choosing it by faculty’s own volition by 12% of the respondents (vs 16% average) as well as among the lowest regarding its impact at improving teaching effectiveness at 11% (vs 15% average). About 5% of the participants stated that this activity was not effective at all in any of the areas mentioned above (vs a 4% average).

Graphic and table IV.5



Teachers' perception of most often used PD by effectiveness	Helpful	Aligned	Spaced	Agency	Impactful	None
Collaboration time & workshops within school	23%	29%	21%	12%	11%	5%
Collaboration time & workshops outside school	25%	22%	18%	20%	17%	1%
Classroom observations outside & within school	30%	26%	12%	14%	17%	2%
Assessment focused professional development	23%	22%	20%	12%	16%	7%
Average all 8 PD activities	26%	23%	16%	16%	15%	4%

Source: SOTAH responses Q3.3, Q5.7, Q5.9; Q5.15

The second most frequently used PD activity, at a 69% participation rate, was collaboration time and professional development workshops outside the school as shown by the responses to SOTAH question Q5.9. Teachers participating in this PD activity found it professional, specific or helpful at 25% of the respondents (vs a 26% average) and being aligned with curricular and instructional materials by 22% of the respondents (vs a 23% average). This activity was scored higher than average regarding it being structured and spaced throughout several days or sessions by 18% of the respondents (vs 16% average). By contrast, this PD activity was rated among the highest regarding the degree of agency and autonomy at choosing it by faculty’s own volition by 20% of the respondents (vs 16% average) as well as among the highest regarding its impact at improving teaching effectiveness by 17% of the respondents (vs 15% average). About 1% of the participants stated that this activity was not effective at all in any of the areas mentioned above (vs a 4% average).

The third most frequently used PD activity, as illustrated by the responses to SOTAH question Q5.15 was classroom observation of colleagues and other teachers within NYC school or other schools at a 67% participation rate. Teachers participating scored this PD activity at the highest level regarding being professional, specific or helpful by 30% of the respondents (vs a 26% average) and second highest regarding being aligned with curricular and instructional materials by 26% of the respondents (vs a 23% average). This activity was scored below average regarding being spaced throughout days and sessions by 12% of the respondents (vs 16% average) as well as regarding the degree of agency and autonomy at choosing this activity at faculty’s own

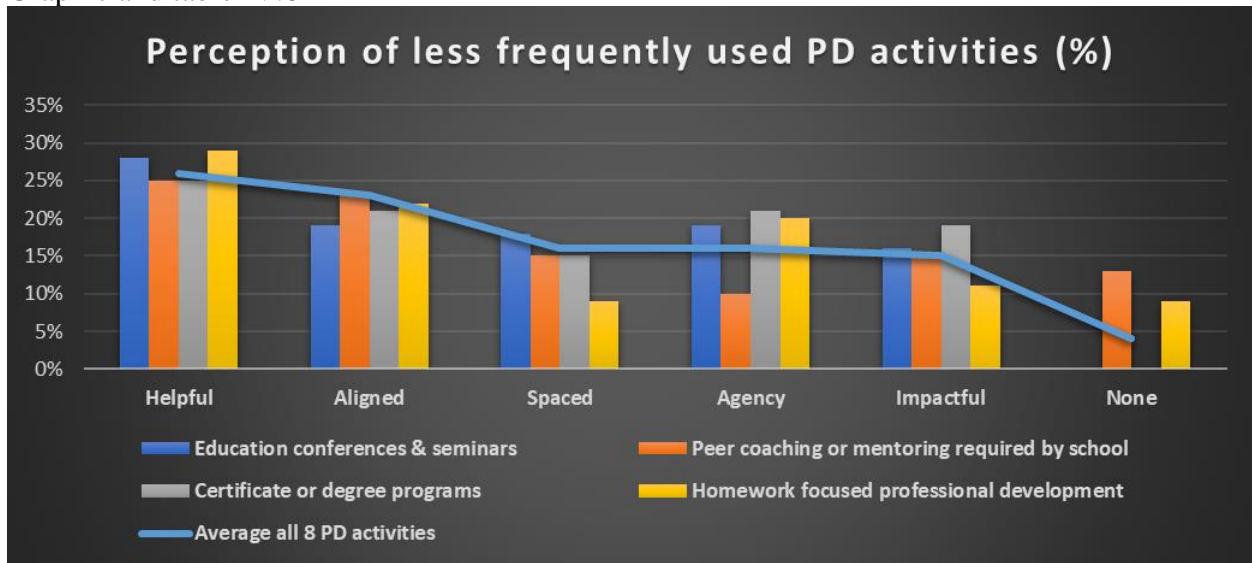
volition by 14% of the respondents (vs 16% average). However, this PD activity was scored above average regarding its impact at improving teaching effectiveness by 17% of the respondents (vs 15% average). About 2% of the participants stated that this activity was not effective at all in any of the areas mentioned above (vs a 4% average).

The fourth most frequently used PD activity, at a 66% participation rate, was assessment focused professional development workshops as shown by the responses to SOTAH question Q3.3. Teachers participating found this PD activity below average regarding being professional, specific or helpful by 23% of the respondents (vs a 26% average) and regarding being aligned with curricular and instructional materials by 22% of the respondents (vs a 23% average). This PD activity was scored higher than average regarding being spaced throughout days and sessions by 20% of the respondents (vs 16% average). By contrast, this PD activity was rated among the lowest regarding the degree of agency and autonomy at choosing it at faculty's own volition by 12% of the respondents (vs 16% average) and at a slightly higher level than average regarding its impact at improving teaching effectiveness by 16% of the respondents (vs 15% average). This PD activity ranked by 7% of the participants as not being effective at all in any areas mentioned (vs a 4% average).

I am going to explore and describe the NYC school teaching faculty's perception of the relative effectiveness and impact of their PD experiences regarding the other 4 PD activities used by teachers less frequently. The fifth PD activity used by teachers at a frequency rate of 45% of participation was education conferences and seminars outside the school, as illustrated by SOTAH question Q5.11. Teachers participating in this PD activity found it above average regarding being professional, specific or helpful by 28% of the respondents (vs a 26% average) but below average regarding being aligned with curricular and instructional materials by 19% of the respondents (vs a 23% average). This activity was scored higher than average regarding being spaced throughout days and sessions by 18% of the respondents (vs 16% average). This PD activity was rated at a higher level than average regarding the degree of agency and autonomy by faculty's own volition by 19% of the respondents (vs 16% average) and at a slightly higher level than average regarding its impact at improving teaching effectiveness by 16% of the respondents (vs 15% average). None or 0% of the respondents dismissed this activity as not being effective at all in any of the areas mentioned above (vs a 4% average).

The sixth PD activity used by teachers, at a 37% participation rate, was peer coaching and mentoring required by the school, division or department, as demonstrated in the answers to SOTAH question Q5.5. Teachers participating in this PD activity found it slightly below average regarding being professional, specific or helpful by 25% of the respondents (vs a 26% average) and at an average level regarding being aligned with curricular and instructional materials by 23% of the respondents (vs a 23% average). This activity was scored slightly below average regarding being spaced throughout days and sessions by 15% of the respondents (vs 16% average). This PD activity was rated the lowest regarding the degree of agency and autonomy by faculty's own volition by 10% of the respondents (vs 16% average) and at the average level regarding its impact at improving teaching effectiveness by 15% of the respondents (vs 15% average). This PD activity ranked at the highest level of 13% of the participants stating as not being effective in any of the areas mentioned above (vs a 4% average).

Graphic and table IV.6



Teachers' perception of effectiveness by less often used PD	Helpful	Aligned	Spaced	Agency	Impactful	None
Education conferences & seminars	28%	19%	18%	10%	16%	0%
Peer coaching or mentoring required by school	25%	23%	15%	10%	15%	13%
Certificate or degree programs	25%	21%	15%	21%	19%	0%
Homework focused professional development	29%	22%	9%	20%	11%	9%
Average all 8 PD activities	26%	23%	16%	16%	15%	4%

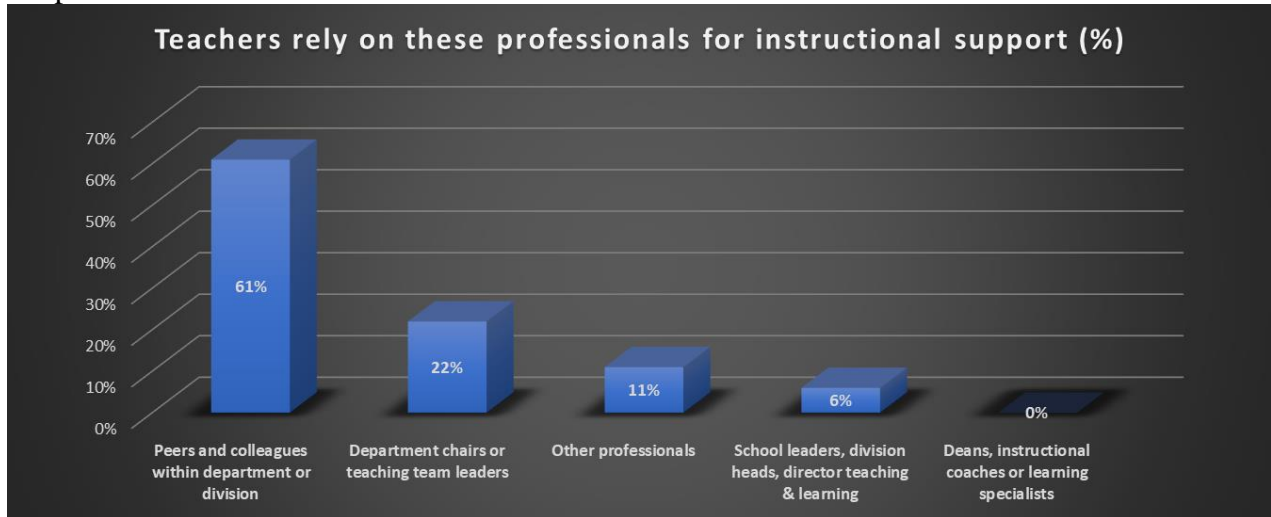
Source: SOTAH responses Q4.3, Q5.5, Q5.7, Q5.11, Q5.13

The seventh PD activity used by teachers, also at 37% participation rate, was homework focused professional development workshops as illustrated by SOTAH question Q4.3. Teachers participating in this PD activity found it above average regarding professional, specific or helpful by 30% of the respondents (vs a 26% average) and at an average level regarding being aligned with curricular and instructional materials by 23% of the respondents (vs a 23% average). This activity was scored the lowest regarding being spaced throughout days and sessions by 9% of the respondents (vs 16% average). By contrast, this PD activity was rated the highest regarding the degree of agency and autonomy at faculty’s own volition by 20% of the respondents (vs 16% average) and at a lower level than average regarding its impact at improving teaching effectiveness by 11% of the respondents (vs 15% average). About 7% of the participants in this PD activity rated it as not being effective at all in any of the areas mentioned above (vs a 4% average).

The eighth PD activity, which is the activity less frequently used by teachers, at a rate of 34% of participation, was certificate or degree programs beyond the initial teachers’ certification and degree as shown by the responses to SOTAH question Q5.13. Teachers participating in this PD activity found it slightly below average regarding professional, specific or helpful by 25% of the respondents (vs a 26% average) and regarding being aligned with curricular and instructional materials by 21% of the respondents (vs a 23% average). This activity was also scored below average regarding being spaced throughout days and sessions by 15% of the respondents (vs 16% average). By contrast, this PD activity was rated the highest regarding the degree of agency and autonomy at faculty’s own volition by 21% of the respondents (vs 16% average) and also at

the highest level regarding its impact at improving teaching effectiveness by 19% of the respondents (vs 15% average). None or 0% of the respondents rated it as not being effective at all in any of the areas mentioned above (vs a 4% average).

Graphic IV.7

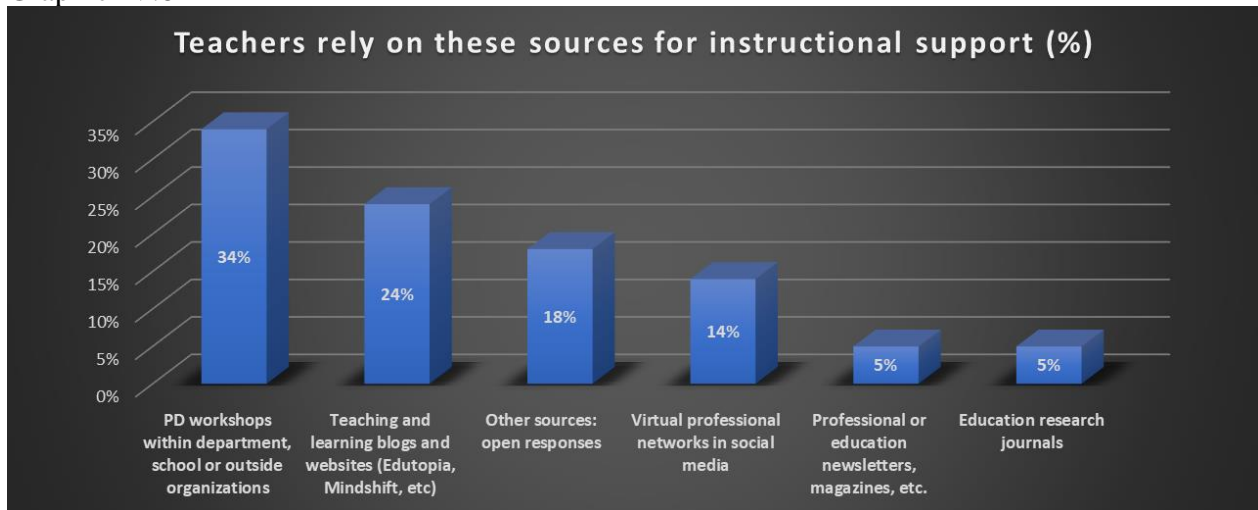


Source: SOTAH responses Q5.16

When teachers answered SOTAH question Q5.16 about whom they rely on for instructional support and having to choose one among 5 types of professionals, their responses were very clear. The top choice by teachers about whom they rely on for instructional support, by 61% of the respondents, was their colleagues and peers within their respective department or division. The second ranked option, well below the first one, with 22% of the respondents selecting as the preferred professional for instructional support was department chairs or teaching team leaders. The respondents selected other professionals at a rate of 11% and school leaders, division heads or senior school administrators at 6%. None or 0% selected deans, instructional coaches or learning specialists. This in part can be explained in that NYC school does not have instructional coaches and the school deans focus on students' support and college advising while its learning specialists focus on special education and student academic support.

SOTAH question Q5.17 was about the main sources (instead of the main professional person) teachers use for instructional support. This question includes six types of sources and the respondents had to choose one of those options. Teachers' answers were distributed across categories in a different way than in the previous question. Instead of a single predominant source, the respondents selected two main sources followed by two intermediate level ones and the last two were at much lower rates.

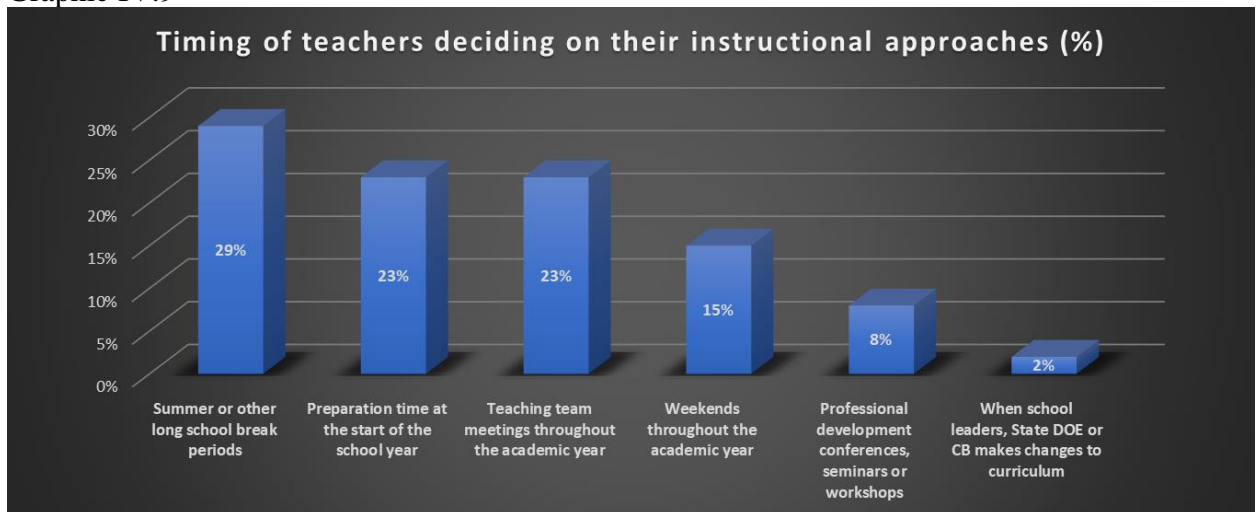
Graphic IV.8



Source: SOTAH responses Q5.17

The top choice by 34% of respondents was PD workshops within or outside the school and the second top choice by 24% of the respondents was teaching and learning blogs and websites. The third and fourth choices were 18% of the respondents selecting “other sources” and 14% of the respondents choosing virtual professional networks in social media. The lowest percentages of respondents were 5% selecting professional or education newsletters and magazines, and another 5% selecting education research journals. Thus, writing articles are not the most impactful means to provide PD information support to teachers. When exploring the 18% respondents (12 teachers) choosing the category of “other sources,” and writing-in their main source of information for instructional support, 6 respondents entered “a colleague” and 6 entered “the internet.” These write-ins are telling, since they seem to indicate that 9% of the teachers prefer to have their colleagues as their main source for instructional support and another 9% prefer to research through the internet about instructional strategies on their own.

Graphic IV.9



Source: SOTAH responses Q5.18

When SOTAH question Q5.18 inquired about the teachers' timing for deciding on their instructional approaches, their responses were divided by 3 relatively high timing periods for these critical tasks. The subsequent three lower timing periods during which teachers do most of their overall instructional approaches progressively declined in frequency. This question presented 6 timing periods for devising their overall instructional approaches and teachers needed to choose one of them. The top choice by 29% of the respondents, was the Summer or other long school breaks. The second and third top choices by 23% of the teachers were during preparation time at the start of the school year or during their teaching team meeting time throughout the academic year. The fourth and fifth choices were weekends throughout the academic year (15%) or during PD conferences, seminars or workshops (8%). The lowest choice at 2% was timing their instructional approaches to changes in the curriculum by school leaders, the State, or the College Board.

IV.3. Findings and analysis on professional development practices

The semi-structured interviews with department chairs brought to light some strengths and weaknesses of NYC school's professional development program. The strengths are that the school leadership supports faculty's professional development and growth at all school-levels. The school has a robust and wide regular PD program of workshops, seminars, specialists and guest speakers. The mandated or required PD program is done regularly and embedded in the school's schedule. Some departments also have a departmental level PD program that is more focused and practical for instructional purposes. Like any organization and program, there are also some weaknesses in the otherwise robust PD program at NYC school. The extensive schoolwide PD program is more informative than practical. The program is also uneven in its instructional focus and its impact among or within departments. In some departments, there is a high level of teacher turnover rendering PD less effective and having to start over again with the new teachers. Exploratory questions about the different types of professional development activities, faculty participation and perceived relative impact were included in SOTAH for further ascertainment of the professional development effectiveness within the school.

The SOTAH responses by teaching faculty at NYC school to indicators of effective professional development vary widely. These responses are consistent with most of the strengths and weaknesses pointed out by department chairs. All teachers engage in one or two mandated PD activities. Most teachers at NYC school, 86% of the respondents, participate in schoolwide workshops and collaboration time, which is the PD activity that engaged the larger percentage of participants. Teachers have the option of participating in a wide range of additional activities, either required by their respective department or self-directed and self-selected at their own volition. In fact, each of the top four of the eight PD activities engages over 65% of the teaching faculty, which means that over two thirds of the teachers participate in two to three PD activities. Additionally, as an average, about 55% of the respondents have participated in over four different PD activities in the last 2 years.

Image IV.10

Findings: professional development

2

• Meso-level dimension

RQ #2. How does NYC school implement effective professional development and how do teachers perceive its relative impact on their instructional practices?

Strengths

- Robust and supportive professional development program
- Great variety of PD activities with high levels of participation
- PD activities are helpful and aligned with instruction
- Teachers do rely on each other for instructional guidance



Source: summarizing semi-structured interviews and SOTAH responses

The SOTAH responses from teachers suggest that PD activities that are embedded within the school schedule and are more practical for the teaching craft and professional growth of teachers tend to be their top PD activities either by mandate or by choice. That is the case with collaboration time and professional development workshops within the school or departments (86%) as well as participation in professional associations collaboration and workshops outside the school (69%). Similarly, the other two higher PD activities were mainly optional or have higher meaning for the professional growth of teachers, such as classroom observation of colleagues and other teachers either within or outside the school (67%) or participation in activities with practical applicability to their teaching craft and daily practice such as PD focusing on assessment (66%). In contrast, the PD activities with the lower rates of participation tend to be either not very practical, like participation in conferences and seminars led by researchers or teachers (45%) or not very meaningful as a professional growth priority such as homework focused professional development (37%). The lowest participation were some limited mandated programs for certain teachers, such as school required coaching and mentoring (37%) or PD activities that are too costly, taxing and time consuming of teachers' busy schedules such as the case of certificate or degree programs (35%).


There is not only wide faculty engagement and participation but around 50% of the respondents as an average find these PD activities helpful, focused or professional (26%) as well as aligned with their teaching and instructional materials (23%). Teachers rated these indicators of effective PD experiences as the two top indicators consistently. Only an average of 4% of the respondents found no or little effectiveness in the various PD activities. Another area of NYC school's strength is the high reliance level of its teachers on each other (61%) and to a lesser extent their department chairs and teaching team leaders (22%) as the main source for trusted professional

and instructional support. When we add together all these sources, mainly led by other teachers or teaching team leaders, we can conjecture that 80% to 90% of the teachers indeed rely on other teachers' input for their own professional development and growth. These findings are consistent with insights from broader research supporting the evidence that teachers tend to seek and support each other.

Similarly, the respondents at NYC school widely use external sources for instructional support, such as departmental and outside PD and workshops (34%) and a combination of virtual professional resources (47%), which include teaching and learning blogs (24%), virtual professional networks (14%) and internet pedagogical sources (9%). By the same token, the majority of teachers make their major decisions on instructional approaches when they have more time to think creatively and reflect (Summer or long school breaks or during school prep time before actual school teaching begins) or when they are actively engaged with their colleagues and teaching teams discussing and preparing curriculum and teaching plans. This pattern by which teachers rely on other teachers and colleague networks as the main sources of information for instructional support further highlight the need to use mutual professional support among teachers as an effective strategy for professional growth. It is critical to provide the time within the school schedule or during school breaks for teachers to address their instructional approaches. I wonder to what extent do PD programs take advantage of those patterns in the timing of teaching professionals to rethink their instructional approaches or alternatively, creating the time-space to do so during their regular teaching year.

Graphic IV.11

Findings: professional development

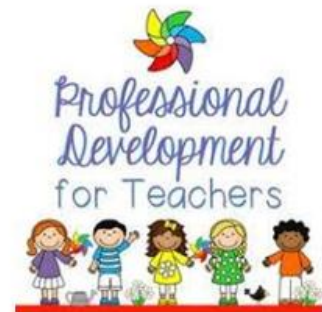


2 • Meso-level dimension

RQ #2. How does NYC school implement effective professional development and how do teachers perceive its relative impact on their instructional practices?

Weaknesses

- School PD program is more informational than practical
- Most mandated or narrowly focused PD components have low instructional impact
- Student support structures appear limited



Source: summarizing semi-structured interviews and SOTAH responses

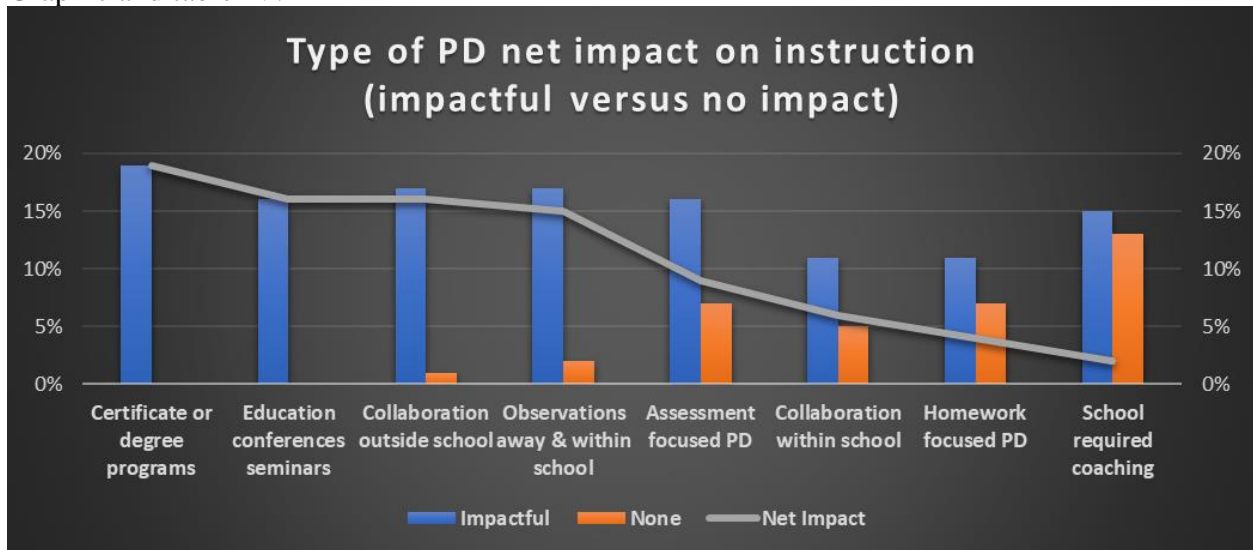
As reported by the teaching faculty perceptions, the extensive and robust PD program at NYC school also has some weaknesses. One of the most obvious weaknesses is that when teachers

were asked about the main professional person they rely on as their source for instructional support, only about 6% selected school leaders and senior administrators. This is consistent with the previous SOTAH findings regarding moderate to low levels of agreement with indicators of senior leaders providing instructional leadership. This might indicate two things simultaneously. One, is that NYC school has a clear division of labor in the education or teaching craft: teaching faculty focusing on teaching versus senior leaders focusing on administration. This might also indicate an undercurrent of distrust and lack of confidence of the official or hierarchical evaluation and instructional support system within the school. This interpretation is consistent with the low scores in teachers' perception of senior leaders knowing their strengths or providing helpful feedback as pointed out in the previous section on school leadership and climate. An additional weakness at the meso-level, the issue of student support structures, was not addressed in the SOTAH section on PD but it appears in the subsequent survey sections in the context of a few questions regarding student engagement. For now, it should suffice to point out that the responses by teachers at NYC school seem to indicate limited school student support structures.

The other weakness has to do with the relative effectiveness of the NYC school robust PD program. Department chairs agreed that most of the schoolwide PD experiences were more informative than practical. This is consistent with SOTAH options selected by the teachers at NYC school when asked about the effectiveness of their PD experiences. Although teachers consistently rated these PD experiences as helpful and aligned, there are two interesting patterns suggesting some weaknesses in the PD program. First, three important indicators of PD effectiveness, such as spaced experiences (16% of the respondents) level of agency at choosing the PD activities (16%) and the impact of PD activities on their instruction effectiveness (15%) consistently scored at lower rates than the higher rated activities expressed in more general terms such as aligned or helpful. Second, the rank-order or proportion of teachers selecting the indicators of effectiveness (impactful or none of the above) changed for each PD activity. To understand this as a signal of weakness, it is critical to subtract how respondents rate a specific PD experience as impactful on their instruction versus (or minus) the proportion or respondents stating that it has no impact whatsoever. We can conceptualize this type of pattern as “net impact.”

When we examine all eight types of PD experiences with this angle, it becomes clear that voluntary and longer-term experiences (such as certificate or degree programs) or regular voluntary held experiences (such as education conferences, workshops outside the school or class observations outside or within the school) are the types of activities that have a stronger net impact at improving instructional effectiveness. This is consistent with the research findings about the most effective PD practices, which are typically long-term programs such as certificate or degree programs and those chosen by teachers' own initiative or self-efficacy (OECD, 2019). Similarly, the other PD activities with a stronger net impact at improving instruction are those structured at regular intervals or spaced, which is consistent with the findings and insights from cognitive psychology regarding the effectiveness of spaced practice for learning. By contrast the PD activities that were too narrowly focused (such as assessment and homework focused PD) or were mandated or required by the school were the ones with the lowest levels of net impact on instruction, which is also consistent with the literature research on professional development.

Graphic and table IV.12



Teachers' perception of PD effectiveness: net impact	Impactful	None	Net Impact
Certificate or degree programs	19%	0%	19%
Education conferences & seminars	16%	0%	16%
Collaboration time & workshops outside school	17%	1%	16%
Classroom observations outside & within school	17%	2%	15%
Assessment focused professional development	16%	7%	9%
Collaboration time & workshops within school	11%	5%	6%
Homework focused professional development	11%	7%	4%
Peer coaching or mentoring required by school	15%	13%	2%

Source: elaborating from SOTAH responses

The paradoxical contrast of strengths and weaknesses at NYC school raises the question of why most PD and school programs do not articulate strategies for taking advantage of the findings from research about professional development. An impactful professional development program builds on practicing and training for evidence-based instructional strategies and must include an important element of self-efficacy and choice by the teachers (mandatory programs tend to reduce instructional impact or backfire). Moreover, an effective PD program needs to involve both a long-term commitment and regularly spaced practice and training. Additionally, it is critical for an effective PD program to use the tendency of teachers supporting teachers without evaluative or hierarchical dynamics structuring or supervising the PD process. The timing and patterns for teachers using PD and preparing their instructional approaches is typically crunched in a busy schedule and massed in what is known as “PD days” in most schools. In that sense, schools can contribute more to craft an effective PD program by creating collaborative, non-evaluative peer to peer coaching and mentoring and research optional time-space structures for teachers to think, experiment and focus on their teaching craft, including beyond the busy regular school schedule. The question is how could NYC school do so? This brings us to the recommendations for improving and making its robust PD program more effective.

IV.4. Recommendation #2: Enhance effective professional development options

NYC school has a robust supportive teacher professional development program with many components and high to moderate levels of participation. PD activities are generally helpful and aligned with faculty teaching and subject contents. Teachers do rely on and support each other for practical instructional guidance outside the professional development program. The school PD program also has some weaknesses. Teachers and department chairs perceive the school's robust PD program as more informational than practical for their instructional strategies. The mandated nature of some components of the professional development program might be counterproductive with very little instructional impact for improving the teaching craft. There seems to be limited evidence-based training resources for student learning support specialists. School student support structures seem also limited to maximize instructional impact on student outcomes. The evidence and findings from SOTAH survey and qualitative semi-structured interviews raises the question if it is possible for NYC school to enhance and refine its robust PD program to make it more impactful by taking advantage of current patterns of practice. The short answer is yes, indeed it is possible, but the critical question is how to do it?

First, NYC school needs to establish a clear-cut boundary between legally school required training and professional development. Although it is common for schools, both private and public, to articulate and present the legally school required training as part of their PD program, these two should be separated and demarcated from each other. The blurred merge between these two aspects of educational institutions is a general problem that undercuts the effectiveness, meaning and purpose of domain knowledge or skills based professional development. Otherwise, most teachers also merge mandated training with PD in their minds and start viewing professional development as an imposed and cumbersome burden to their already busy schedule. Once the legally school required training is clearly demarcated and separated from genuine professional development, improving the school's PD program and teacher engagement becomes a more manageable issue and the focus is on the teaching craft and profession which will make PD more effective (Avalos, 2011).

Second, NYC school should offer its extensive PD program as a cafeteria plan where teachers can choose some options of self-selected broad professional development activities every year besides the required PD by the school, department or teaching team. For instance, NYC school can make engaging in 3 to 5 PD activities every year an expectation in the teachers' evaluation and growth plan but allowing teachers to make choices among alternative PD activities. It is critical to count the required PD activities within the school, department or teaching teams as part of that menu of expectations, as to provide choice to both departmental approach and culture and individual self-directed choices and autonomy. Thus, if a department already mandates 2 PD activities such as departmental workshops or coaching and mentoring or class observations or collaborative planning, the teacher just needs to add one or more self-directed activities. These additional activities could be outside or within the school and could include other types of PD activities such as professional conferences, certificate or degree programs, etc. NYC school can use the strength of its collegial and distributed leadership approach by providing the general guidelines of PD expectations, but the specific articulation and implementation should be left to each department while always keeping an element of choice and self-direction for each individual teacher. The idea is for departments and teachers to have the autonomy and self-

efficacy of focusing on the areas more useful for improving their teaching craft or professional growth. This is consistent with the findings on teachers' autonomy self-directing their own PD (King 2014; Kwakman, 2003; Penuel, Gallagher & Moorthy, 2011; Reiser, 2013).

Third, NYC school should adapt and enhance its regular school schedule and its pre- or post-school sessions to provide critical time for spaced effective PD opportunities that are more meaningful in the context of actual teaching. For instance, the school schedule should include regular interval time slots for teaching teams, coaching and mentoring, class observations or departmental focused workshops. This could be done by adding “instructional PD flex time” every cycle and reserving some prep or free periods for every teacher. This will allow teachers to choose how to use their flex and prep time depending on their goals to fulfill the PD expectations as self-directed choices or to use them for some mandated PD by departments or both. These allotted flex and prep time periods should be in addition to the regular teaching teams collaborative time for curriculum, lesson planning, assessment or homework design. Incorporating more flexible PD in the school's regular schedule will automatically increase PD effectiveness through more voluntary and spaced or distributed practice. This will also make PD more engaging and effective at modeling how teachers can enhance student learning. PD research shows that professional development is only effective when spaced and sustained over long periods. This is consistent with the recommendations from the broad body of research on effective PD (Darling-Hammond, Hyler, Garner & Espinoza, 2017; Guskey & Link, 2018).

Fourth, NYC school could enhance the opportunities for teachers supporting and maximizing their teaching and learning practices through a voluntary and non-evaluative coaching and mentoring program led by the most effective or “master teachers.” This will take advantage of the pattern of teachers helping each other and using each other as their main professionals and sources of instructional support. Informal opportunities for non-evaluative collaboration and feedback are key for the implementation of evidence-based strategies through voluntary coaching and mentoring from master teachers and/or department chairs of their novice and/or less experienced teachers. This can be a productive way for NYC school to take advantage of its distributed leadership style delegating instructional leadership to department chairs and teaching team leaders. This will also allow for incorporating master teachers with informal authority and influence as coaches and mentors to scale up and maximize evidence-based instructional strategies through the scheduled formal and informal flex times for collaboration.

Besides incorporating scheduled time for those activities, the school could incentivize master teachers to coach or mentor other teachers by either reducing their teaching load (such as reducing one or two sections) or keeping their teaching load but adding the extra coaching and mentoring duties as an extra-section with the corresponding proportional salary increase. The coaching and mentoring could also be incentivized and structured additionally during school breaks, when most teachers address their instructional approaches according to SOTAH responses. Many top private schools' PD practices have similar programs regarding induction of new teachers or on-boarding programs for experienced teachers but new to the school. This is consistent with a broad body of research on PD effectiveness when articulated through induction and mentoring programs and facilitating informal professional networks among teachers (CCSEA, 2016; Ingersoll & Strong, 2011; Kraft, Blazar & Hogan, 2018; Schleicher, 2016; Sherer, Norman, Bryk, Peurach, Vasudeva & McMahan, 2020).

Fifth, NYC school should continue providing a well-resourced professional development program but curating and enhancing the quality of the choices offered through evidence-based PD opportunities and resources. Similarly, departments, divisions or the overall school could contact and hire these evidence-based professionals and their programs and services. It is critical to engage learning scientists or experienced teachers familiar with learning science as providers for professional development training on effective evidence-based teaching strategies. For teaching faculty, I recommend the services of either of these learning scientists and teams: Daniel Willingham's Science & Education, <http://www.danielwillingham.com/> Bridging (neuro)Science & Education: <https://sites.google.com/view/efratfurst/home>; Retrieval Practice: <https://www.retrievalpractice.org/> The Learning Scientists: <http://www.learningscientists.org/>

This is probably the best way to maximize teachers' professional development quality and get them to apply true and proven teaching and learning strategies with face to face or even online or hybrid arrangements. These resources and programs can also be used to help students and student support professionals at understanding effective learning strategies that they can apply to improve their educational outcomes. These resources are provided by learning scientists, in many cases collaborating with teachers, and their PD programs cut out fads, fashions and neuro-myths included in many standard educational PD workshops and training. When matching these evidence-based PD resources and professionals with improvement teaching teams in each department within NYC school, they can provide effective, meaningful, practical and useful instructional support to improve teaching impact and learning strategies.

These recommendations are consistent with the findings in this capstone project. They are also consistent with the insights from a recent synthesis of the broader research findings on effective professional development for teachers by some leading scholars. The benefits of agency, autonomy of teachers in the context of long term, spaced and evidence-based learning, PD and training has been pointed out by a broad body of research (Darling-Hammond, Hyler, Garner & Espinoza, 2017; Guskey & Link, 2018; Guskey, 2021). Similarly, these recommendations are also consistent with the findings in the international comparative studies carried out by the OECD's TALIS research on professional development and effective educational systems (OECD, 2009, 2016). Professional development for teachers focusing on the effective teaching and learning strategies uncovered by cognitive psychology and the bright spots within teaching practices would result in improved student learning and outcomes. This approach will need to be enhanced through support programs helping disadvantaged students to acquire the needed content knowledge and skills while practicing and acquiring effective learning and studying strategies. I will address this part of providing evidence-based learning strategies training for students in more detail in the next chapter. The critical point of the analysis and recommendations on professional development is that it should be laser-focused on broad evidence-based instructional strategies, which brings us to the next two chapters and respective sets of recommendations.

CHAPTER V

The micro level: Instructional practices

Chapter contents

V.1. Operationalizing instructional practices

V.2. Data results on instructional practices

 V.2.1. Evidence from semi-structured interviews on instruction

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V.3. Findings and analysis of school instructional practices

V.4. Recommendation #3: Maximize evidence-based teaching and learning strategies

Chapter V. The micro level: Instructional practices

The micro-level of the four-dimensional conceptual framework of this capstone project addresses the interaction between teachers, curriculum and students at the school classroom level. It is at this micro-level of actual teaching where faculty instructional approaches and methods shape the contents and sequencing of the curriculum. This is where one can explore the impact and degree of effectiveness of instructional teaching on student learning and acquisition of domain bounded knowledge and skills. The crucial question at this level is: to what extent do teachers at NYC school utilize evidence-based teaching and learning strategies in their pedagogical approach and curricular development?

In this chapter I explore instructional practices at NYC school. The school senior leaders stated during the initial stages of this capstone project that direct and explicit instruction was the predominant approach within the school. Senior leadership was interested in ways that those instructional practices could be maximized through evidence-based strategies with a focus on assessment and homework. I will explore the granular level of faculty responses regarding assessment and homework practices in the next chapter. In this micro-level chapter, I will focus on the curricular planning and instructional practices.

V.1. Operationalizing instructional practices

The micro-level of classroom instruction is where teachers or teaching teams design and implement their curriculum development, the specific lesson plans, devise activities, labs and other class tasks and assignments to encourage and facilitate student learning. I will focus on the insights from education research on direct or explicit instruction and learning science to operationalize this dimension in a set of variables and indicators addressing various critical aspects of effective instruction. I explore these variables and indicators in a specific section dedicated to instructional practices at NYC school in the Survey of Teaching, Assessment and Homework (SOTAH).

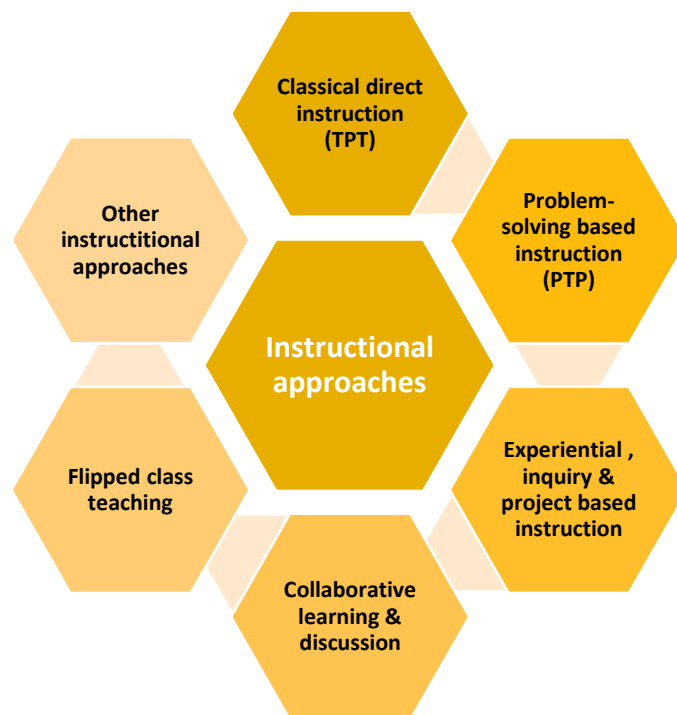
The predominant approach among teaching practitioners is what is known as direct and explicit instruction (Rosenshine, 2012). This approach mainly involves teaching small steps for short segments of time, then applying and practice the newly acquired knowledge and skills complemented with questioning and followed by subsequent instruction and practice cycles. This is known as explicit direct teaching, teaching-practice-teaching (TPT) or we can refer to it as classical teaching. There is a related strategy that reverses the process of direct explicit instruction by starting with problem-solving, then teaching from the inferences and struggles encountered through the problem-solving process and followed up by more practice and subsequent teaching cycles. This is known as the problem-solving based approach or practice-teaching-practice (PTP).

Most teachers combine both direct explicit instruction or classical approach and problem-solving based sequences, depending on the concept, student knowledge or types of skills relevant for the material and topic studied. Most teachers supplement these two main direct approaches with additional implicit or indirect teaching approaches such as collaborative learning and discussion,

questioning and elaboration on the reasoning of the answers, typically articulated through pedagogical philosophies such as the Harkness or the Socratic methods. Most teachers in various disciplines also use labs and projects applying the knowledge and skills to different contexts or situations, role-playing and skill-based practices, etc. In fact, education researchers and teaching practitioners have connected these direct and indirect teaching approaches under the broad set of effective explicit instructional principles (Ashman 2018, 2021; Hattie, 2009; Stockard, Wood, Coughlin & Rasplia Khoury, 2018).

An inquiry into instructional practices is more about what combination of approaches teachers use than using a single instructional approach. The relevant question is to what extent teachers combine various instructional approaches in their classroom practice. The use of different combinations of teaching approaches are influenced by teachers’ own experiences and the expectations and practices within their disciplines or within different schools’ pedagogical philosophies.

Image V.1



Source: own elaboration from education research and conversations with NYC school department chairs

SOTAH addresses to what extent teachers use one instructional approach or a combination of several instructional approaches through a set of questions, Q2.2 through Q2.7. This set of questions inquire about the frequency teachers use these various instructional approaches: always or most of the time, about half of the time, sometimes, or not applicable/never. The indicators were classical direct teaching (teaching-practice-teaching sequence), problem-solving based direct teaching (practice-teaching-practice), experiential or project based, collaborative learning and discussion, flipped classroom or other instructional approaches. These indicators of frequency and specific approaches can provide insights into the extent to which teachers at NYC

school combine these different instructional approaches for designing the curriculum and tasks implemented in the classroom.

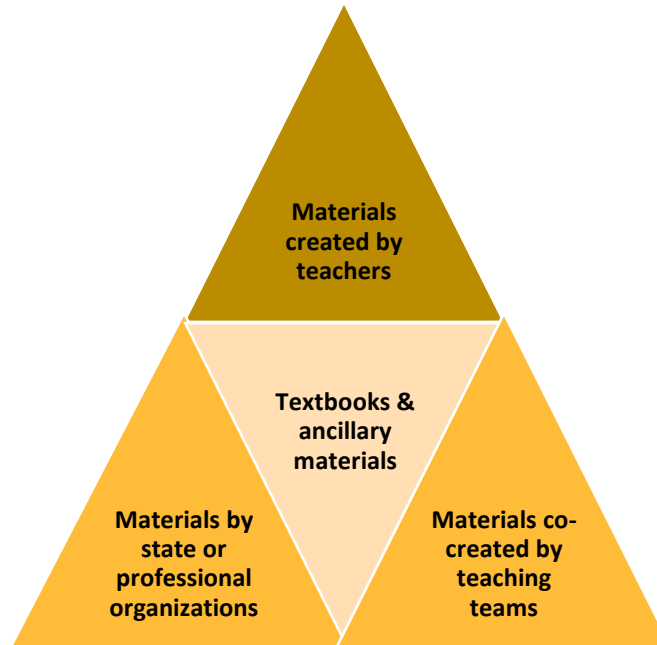
The subsequent question is related to the teachers' relative autonomy and dynamics selecting the main sources for their instructional materials. The extent to which teachers use one instructional approach or different combinations of various instructional approaches will shape how and what type of curriculum materials and sources they will use for their teaching craft. Public schools, districts or states sometime can require certain curricular materials and sources that teachers need to follow. Independent schools typically delegate the selection of materials to their departments and teachers. In that sense, the degree of teachers' autonomy and self-efficacy can affect how teachers decide, select and use different types of sources and materials for curriculum organization, lesson planning and classroom tasks. The culture of the school and the characteristics and number of courses/levels within a given discipline or department can also impact the dynamics in that process of lesson designing and planning. In some cases, the individual teacher will be the main creator of teaching materials. In other cases, the curricular development and lesson planning created will be more a teaching-team oriented collaborative work to co-create those materials.

Teachers are extremely busy and have strong time constraints for curriculum and teaching planning. In fact, teachers dedicate as an average, the equivalent of one day (7 to 8 hours) per week to lesson and activity planning (OECD, 2015). Thus, it is common among teachers to focus the energies in selecting appropriate textbooks and their related ancillary materials. In those cases, curriculum development and planning are closely mapped by the textbook and ancillary materials. Consequently, teachers primarily using a textbook as the main source for lesson planning and applying learning assignments and tasks, typically adhere to the sequence and instructional approaches embedded in the textbook. It is critical for any teacher to have high quality textbooks to guide their instructional practice despite the recent counter-productive fad of not having textbooks and instead, expecting teachers to create their own textbooks. In fact, OECD's PISA research suggests the critical role of high-quality textbooks in high educational performing countries like Shanghai and Singapore which encourage teachers' feedback and ideas to continuously improve the contents, sequence and tasks embedded in those textbooks (OECD, 2015). Similarly, one characteristic found among many highly effective instructional practices and teachers is the use of high-quality textbooks (Ashman, 2018; Oates, 2014).

Most teachers and most schools use a combination of sources. The textbooks provide the underlying curriculum guide and map as well as a logically related and structured set of activities and tasks for student learning and practice. The materials and underlying sequence from the textbooks are typically supplemented with materials created by teaching-teams, professional organizations and the individual teacher. Yet, exploring which of these are the primary source for curriculum development and lesson planning is critical to understand the instructional approaches of a school or department or teacher. SOTAH addresses this aspect of different types of curriculum and teaching materials used for instruction in question Q2.8. The respondents have to choose one of four different sources as the primary source to design their lesson plans: materials created mainly by the teachers, by their teaching teams, by the state or professional organizations (such as the College Board), or simply provided by the textbooks and ancillary

materials selected for that course. The other exclusionary option is to choose that none of these sources are applicable to their courses.

Image V.2



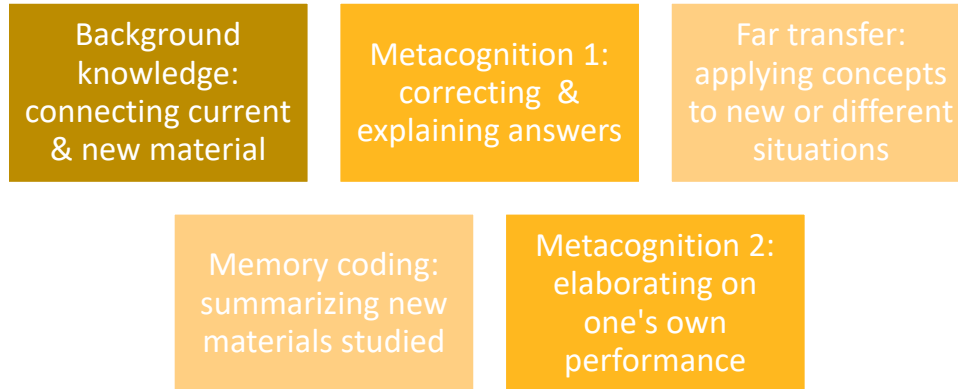
Source: elaboration from direct and explicit instruction research and own experience as classroom teacher

Additional critical variables for instructional practices are the extent to which teachers aim at developing students' high-level critical thinking. According to learning science there are four major learning processes: background knowledge and skills, memory coding for short and long-term storage and retrieval, near and far transfer of knowledge and skills to different and unique situations and metacognition (De Bruyckere, Kirschner, & Hulshof, 2020; Wiley et al. 2016; Willingham, 2020). Associated with these learning processes are some key elements that all educators and administrators pinpoint as crucial for high level learning: critical thinking, problem-solving and creativity as application of knowledge and skills to new and unique situations or different domains. The broader and deeper our knowledge and skills within a specific domain the more effective will be the learning and the capacity to assimilate and understand new knowledge and skills within that specific domain.

We can combine the insights from the principles of direct and explicit instruction with those from learning science and cognitive psychology regarding four main processes for learning. This study explores these processes in more detail in the assessment section but SOTAH also explores these processes in this instructional section through question Q2.9 and some aspects of question Q2.16. Question Q2.9 asks about how frequently teachers use these various instructional processes: always or most of the time, about half of the time, sometimes, or never/rarely. This question assesses the frequency in the actual classroom teaching practices regarding these four learning processes through five indicators of instructional practices. First, teachers purposefully connect new and previous materials (background knowledge activation). Second if teachers ask students to correct and explain their answers (metacognition1). Third, if the classroom tasks

include applying learned concepts to new and different situations (far transfer). Fourth, if teachers present summaries of the new materials for their lessons (memory coding). Fifth, if teachers ask students to assess and elaborate about their own performance (metacognition²). In addition to question Q2.9, later on question Q2.16 includes two additional indicators about metacognition and classroom climate: if students feel comfortable discussing mistakes or asking questions (metacognition³) about the materials and if students stay engaged and focused even when making errors during class (psychological safety).

Image V.3



Source: summarizing for crucial learning processes

There is an increasing number of works produced by the collaboration of researchers and teachers applying the findings from learning science regarding the six proven effective and evidence-based learning strategies to teachers' actual instructional practices (Agarwal & Bain, 2019; Benassi, Overson, & Hakala, 2014; McDaniel, 2014; Pomerance, Greenberg & Walsh, 2016; Weinstein and Sumeracki, 2018). These collaborative works have energized a renewed emphasis on the evidence-based learning strategies of retrieval, spaced practice, elaboration, interleaving, dual coding and using different concrete examples to illustrate an underlying abstract concept. There are also some attempts by education researchers and teaching practitioners of bridging both direct and explicit instruction principles and learning science's evidence-based strategies (Ashman 2018, 2021; Boser 2017a; Deans for Impact, 2015; Fernández-Castro, 2019; Sweller, Van Merriënboer & Pass, 2019). These explicit instructional principles overlap and reinforce some of the learning processes and the six proven evidence-based effective learning strategies uncovered by cognitive psychology. These six learning strategies can be articulated into a set of variables and indicators about to what extent teachers use them in their instructional approaches.

Specific tasks and instructional techniques using these six proven learning strategies can be the indicators to the extent of which teachers might be using them correctly or misunderstand how best to apply these learning strategies in their classroom. SOTAH asked directly about teachers using these learning strategies in the classroom in questions Q2.10 through Q2.15. The questions provided three choices: one exemplifying the correct application of the strategies, a second one reflecting a common misunderstanding or neuro-myth about those strategies and a third one simply stating that the teacher does not use such strategy or that it does not apply to their courses. This idea was inspired by Pomerance, Greenberg and Walsh (2016) grouping these six

effective learning strategies versus the most common misunderstandings or related neuro-myths about these strategies.

Table V.4

<p>Q2.15. Retrieval practice: recalling concepts and material</p>	<ul style="list-style-type: none"> •Recalling material by writing on a blank piece of paper without consulting notes/text (correct application) •Consulting notes/text, re-copying or re-reading material (misunderstood) •Does not apply to my courses
<p>Q2.11. Distributed or spaced learning</p>	<ul style="list-style-type: none"> •For shorter periods multiple times within a unit and in subsequent units (correct application) •Once or twice within a unit for longer periods or before assessments (misunderstood) •Does not apply to my courses
<p>Q2.14. Interleaving: changing task order</p>	<ul style="list-style-type: none"> •Mixing order and sequences of different types of models or problems (correct application) •Practicing and solving blocks of similar models or problems (misunderstood) •Does not apply to my courses
<p>Q2.13. Elaboration or elaborative questioning</p>	<ul style="list-style-type: none"> •Synthetizing or elaborating on relevant characteristics of learned concepts (correct application) •Expressing feelings and opinions on learned concepts (misunderstood) •Does not apply to my courses
<p>Q2.10. Dual coding: pairing concept-rich text with images</p>	<ul style="list-style-type: none"> •Simultaneous or synchronous pairing (correct application) •Pre or post view of concept-rich text and the corresponding images (misunderstood) •Does not apply to my courses
<p>Q2.12. Concrete examples to illustrate abstract concepts</p>	<ul style="list-style-type: none"> •Very different and apparently unrelated examples underlying abstract concept (correct application) •Similar or closely related examples (misunderstood) •Does not apply to my courses

Source: summarizing correct and misunderstood learning strategies by Pomerance, Greenberg and Walsh (2016)

The SOTAH’s instructional section also includes a question, Q2.16, exploring student classroom engagement by inquiring about six indicators of instructional practices. One indicator is about teachers asking students to practice in subsequent units, concepts and skills studied in previous units (retrieval and spacing) as well as the practice of drawing diagrams or pictures or see related images of the materials studied (retrieval and dual coding). There are also several additional indicators of student engagement. One indicator is about metacognition (correcting errors) and the other is about classroom psychological safety climate. In addition, student engagement

includes indicators about student support through learning specialists and in the current COVID-19 pandemic, about distance or hybrid learning.

The instructional section of SOTAH ends with three specific questions about several aspects of curriculum and teaching. One is about the average number of units or performances covered by the different courses (question Q2.17). The standards and sequencing of units are also indirectly shaped through state education standards as incorporated and reflected in textbooks or professional associations' standards. Another question is about the application of the teachers' instructional approaches to courses with different ability grouping: AP/honors, regular, or mixed ability grouping (question Q2.18). The last question of the instructional section explores teacher agreement or disagreement regarding the impact of distance teaching and learning during the pandemic on expanding and improving their instructional approaches and curriculum development strategies (question Q2.19).

V.2. Data results on instructional practices

When discussing the problems of practice at NYC school, senior leadership framed the school approach as predominantly direct instruction although including other approaches. During the semi-structured interviews with department chairs, their view was consistent with the characterization of the school senior leadership regarding instructional practices. Department chairs seemed comfortable and knowledgeable about their department teachers' practices and skills as well as about effective instructional strategies that were relevant for their disciplines. This is consistent with the collegial and distributed leadership approach of the school, leaving the instructional leadership to each department and their respective chair. The themes from the semi-structured interviews were detailed, expanded and quantified by NYC school's teacher responses to SOTAH section on instructional practices.

V.2.1. Evidence from the semi-structured interviews on instructional practices

Department chairs stated that direct instruction is the predominant teaching approach but that most teachers use a combination of additional and different pedagogical approaches and methods. A couple of department chairs emphasized that their teachers experiment with different instructional approaches and combinations of approaches consistently. These additional approaches range from class or group discussions, lab experiments and project or inquiry-based learning and skill-based practices to student lead collaborative learning. Two different department chairs explicitly mentioned that some of their higher-level courses use Socratic circles or the Harkness method. Visual and performing arts department chairs emphasized also variability and experimentation with teaching methods but in these disciplines "the focus is related to creativity and artistic or performing skills and role playing," more than traditional academic knowledge and skills.

Department chairs attributed the differences of incorporating different combinations of instructional approaches among courses to three main reasons. First, the preferred pedagogical philosophies of individual teachers and their professional background and experiences using

different approaches. Second, the characteristics of the curricula and levels of difficulty of the various courses. This tends to be consistent with the specific discipline expectations, requirements and standards. Third, the need to adapt the level of knowledge and skills sophistication to the developmental needs of the students and their background knowledge and level of readiness for those courses. As another department chair summarized succinctly, “the student is the curriculum in the sense that we need to adjust to where they are. We have students with very different backgrounds and abilities.” Most department chairs value the wealth of professional experiences and the richness of different instructional approaches and respected the instructional choices and preferences of their teachers. A couple of department chairs expressed that they would like to, “see more emphasis on project-based or inquiry-based approaches in certain courses.” Overall, department chairs positively viewed the diversity of experiences and approaches their departmental members use in their classrooms.

Additionally, department chairs did point out a set of issues and patterns within and among departments, disciplines and courses. First, most departments have some form of teaching teams but there is a wide variability in the level of collaboration among teachers or teams. Even when there is collaboration within a given department or within a given teaching team, the collaboration might range from very high among specific teams to almost no collaboration at all among other teachers within the same department. As a department chair puts it, “some teams work better than others.” There seems to also be a wide range of patterns of established teaching teams and individual teaching among and within departments. Department chairs pointed out to three main causes on the limits of teaching teams’ collaboration. First, many disciplines and courses do not have enough sections and students for teachers to form a team, which typically occurs when only one teacher is responsible for those disciplines or courses and cannot form a team. Second, the teaching load and the school schedule gives little structure and time for team collaboration. As a couple of department chairs mentioned, “with singleton courses it is not possible to have a team” or “I don’t want to demand more time from my teachers on top of their teaching load.” Third, in some departments there is a more individual teacher approach culture although there might be general collaboration and support at an informal level among teachers instead of formal teaching teams.

The characterizations of department chairs are consistent with teachers’ responses in SOTAH regarding using a combination of instructional approaches and how the two forms of direct instruction (TPT and PTP) seem to underpin the other approaches. Similarly, different groups of teachers work primarily either individually or as part of teams for preparing their instructional materials. Teachers’ different backgrounds and beliefs are also captured by their responses to questions regarding their actual pedagogical practices and the various degrees to which they are using several combinations of instructional approaches and evidence-based strategies, or as we will see in the subsequent chapter, as captured by the different approaches to assessment and homework.

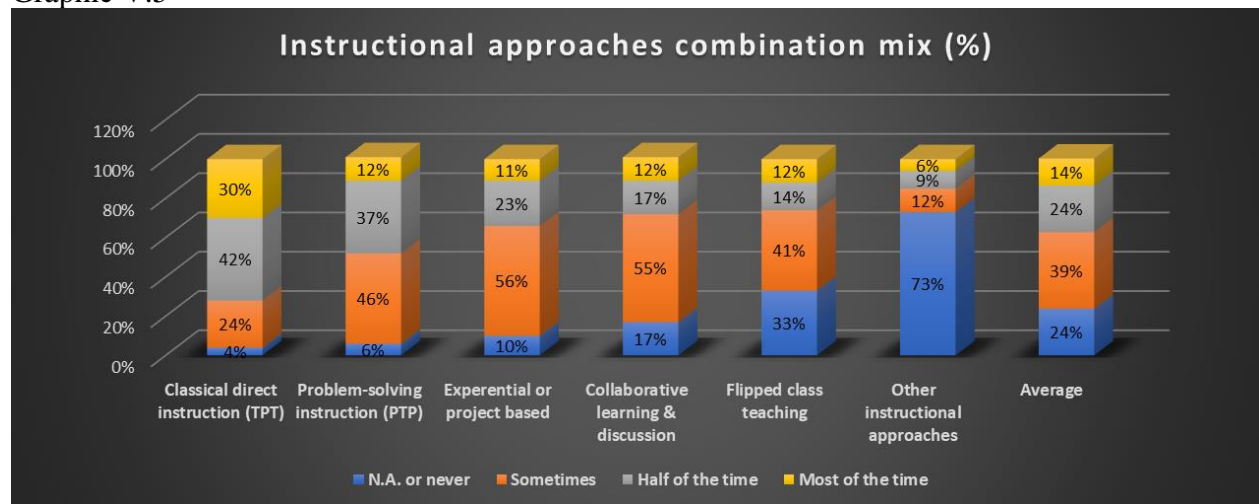
V.2.2. Evidence from SOTAH responses on instructional practices

SOTAH questions Q2.2 through Q2.7 asked teachers at NYC school to select how frequently they use one of six main instructional methods: classical direct instruction, problem-solving

instruction, experiential or project-based, collaborative learning or student led discussions, flipped classroom or other approaches, with the option to write-in or name those alternative specific approaches. The evidence from the teacher responses support the idea that all teachers use a variety of instructional approaches although direct instruction is the key one underpinning the other approaches used. The main difference is around what approaches teachers use most of the time, about half of the time, sometimes or never but all the teachers clearly use a combination of instructional approaches.

As a reference, I calculated the average of how frequently teachers at NYC school use the six instructional approaches included in SOTAH options. As an average, 14% of the respondents selected that they use always or most of the time one of the six instructional approaches outlined in SOTAH. This contrasts with 24% of the respondents stating that they use half of the time several more approaches and 39% of the respondents stating that they use additional instructional approaches sometimes on top of their first and second most used approaches. An average of 24% of teachers stated that one of the six instructional approaches does not apply or is never used in their courses, but as the detailed data indicates the vast majority of those never using one of the six instructional approaches are concentrated within the “other approaches” indicator. The open-ended responses to what these other instructional approaches include ranged from journaling and reflection to singing and dancing movement or from modeling and role-playing to lab experiments.

Graphic V.5



Source: SOTAH responses Q2.2, Q2.3, Q2.4, Q2.5, Q2.6, Q2.7

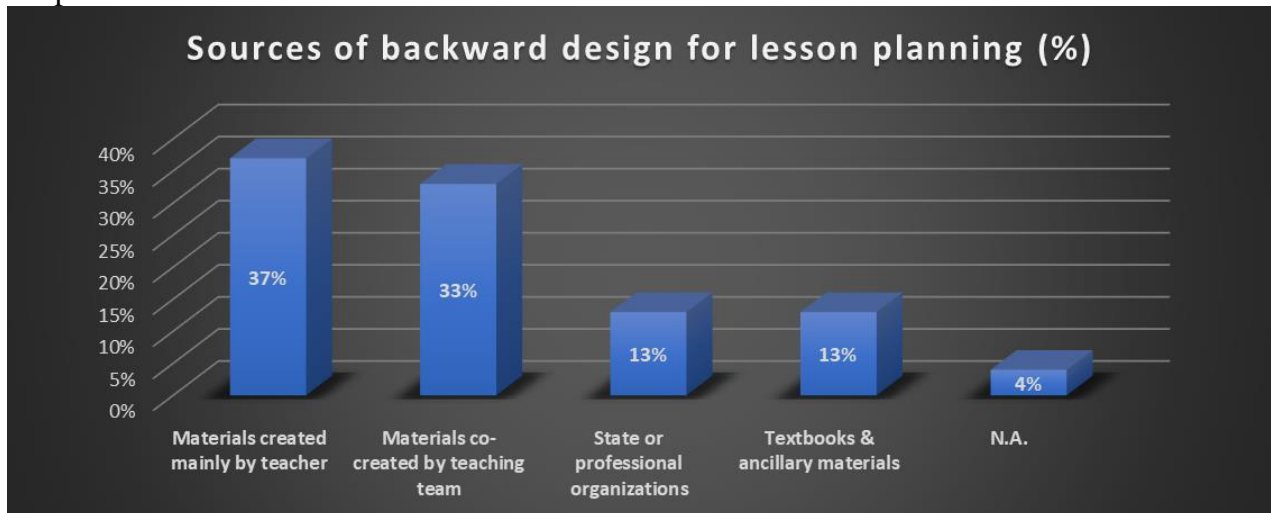
Direct instruction, in its classical sequence of teaching, practice, teaching (T-P-T) is the approach used most frequently most of the time (30%), half of the time (42%), or sometimes (24%). Only 4% of the respondents stated that this instructional approach does not apply or never use this approach in their courses. The alternative application of problem-solving instruction, through the sequence of practice-teaching-practice (P-T-P) is the second most used approach: 12% most of the time, 37% half of the time, and 36% sometimes. Only 6% of the respondents selected that this does not apply or never use this approach in their courses. The experiential or project-based instructional approach is the third most used approach: 11% most of the time, 23% half of the

time, and 56% sometimes. About 10% of the respondents selected that this does not apply or never use this approach in the courses.

The collaborative learning and group discussion approach is the fourth most used approach: 12% of the respondents selected that they use it most of the time, 17% half of the time, and 55% sometimes. About 17% of the respondents selected that this does not apply or never use this approach in their courses. The flipping the class approach, with asynchronous assignments outside class time and going over the assignments during class, is the fifth most used approach: about 12% of the respondents stated that they use this most of the time, 14% half of the time, and 41% sometimes. About 33% of the respondents selected that this does not apply or never use this approach in their courses. Other instructional approaches were least frequently used: 6% most of the time, 9% half of the time, and 12% sometimes. About 73% of the respondents selected that this does not apply or never use other approaches beyond the five major ones in their courses.

SOTAH question Q2.8 addresses the sources for curriculum development and lesson planning using backward design. Teachers at NYC school could choose only one of four options as the source most frequently used for their courses’ curriculum development, lesson plan and classroom tasks design and preparation. The sixth option was the exclusionary “not applicable” to my courses. Likely, most teachers use a combination of these sources, but I wanted to force the answer about which one is the most frequently used by teachers. In that sense we should analyze later-on these responses with that caveat.

Graphic V.6



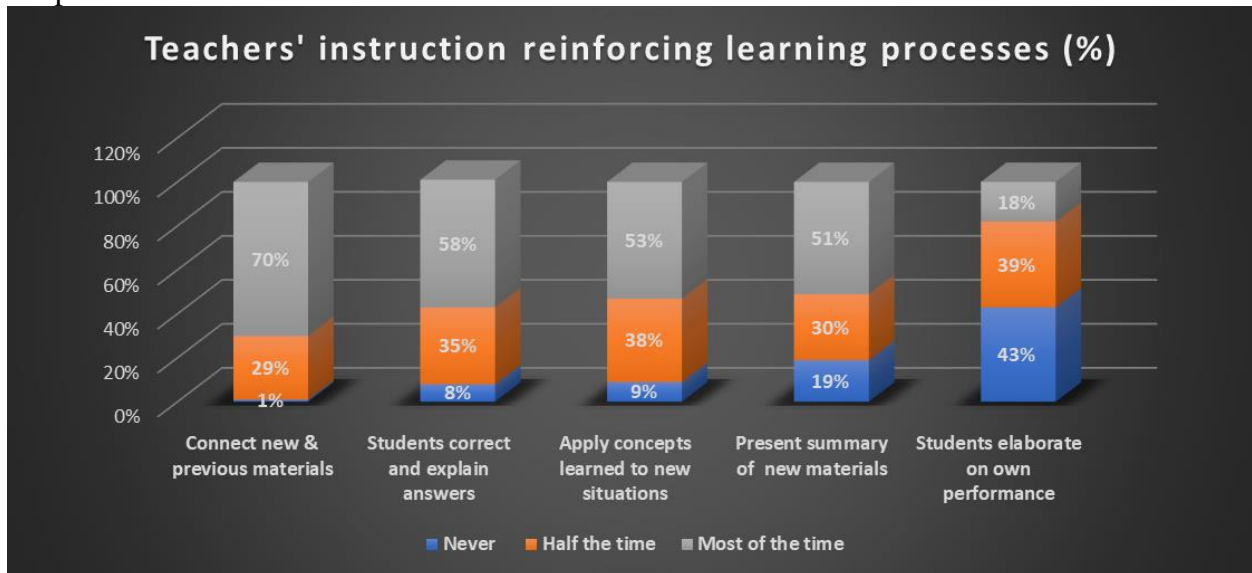
Source: SOTAH responses Q2.8

When asked about the sources for the curricular and lesson planning using backward design, teachers at NYC school stated that they use mainly materials created by each individual teacher (37% of the respondents) or created by their teaching team in collaboration with each other (33% of the respondents). Well below these two main sources for curriculum design and lesson planning, are materials developed by professional organizations such as the College Board or the State (13%) or the sources provided by the textbooks and ancillary materials they use for their

courses (13%). About 4% of the respondents answered that these sources for curriculum development and lesson planning do not apply to their courses.

The subsequent SOTAH question Q2.9 asks teachers at NYC school about the frequency using five effective direct instruction strategies incorporating some of the insights from cognitive psychology and neuroscience regarding learning processes. This was a forced question in which teachers had to select if they never/rarely, about half of the time or always/most of the time used each of the five instructional strategies. These five strategies included: presenting a brief summary of the materials or skills taught (memory coding), connect and integrate those with previous knowledge and skills (background knowledge), asking students for explanations about their correct or incorrect answers (metacognition1), ask students to elaborate about their knowledge and skill levels (metacognition2), or applying the learned materials and skills to different contexts or situations while scaffolding the task with cues (far transfer).

Graphic V.7



Source: SOTAH responses Q2.9

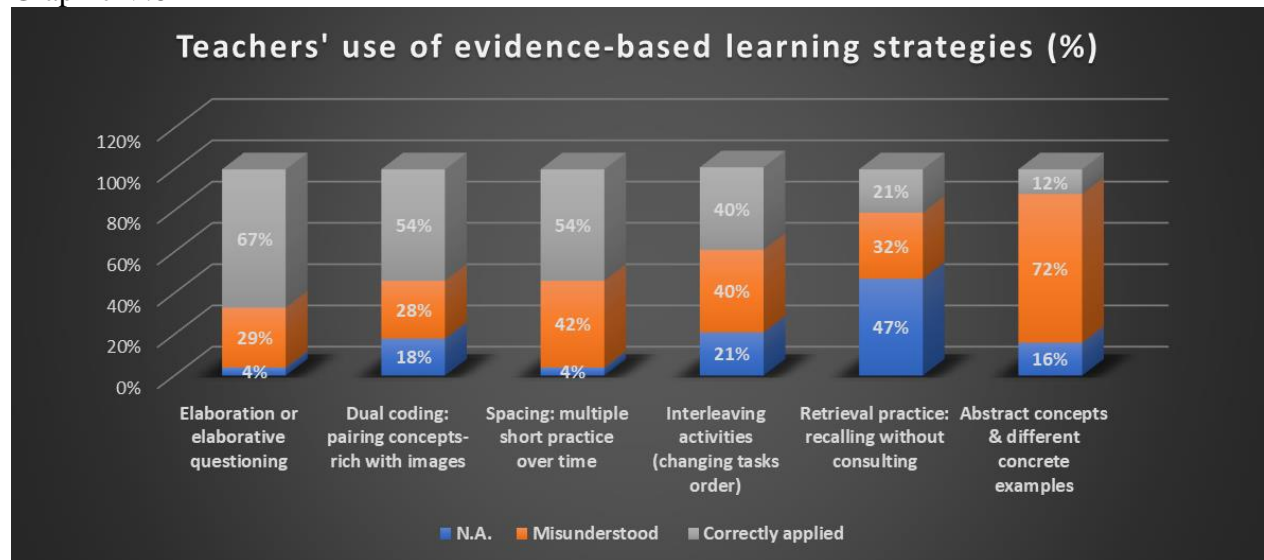
The teachers at NYC school are familiar with and use all five of the main instructional strategies incorporating these learning processes in their teaching practice at very high to high and moderate levels depending on the specific strategy. Connecting new and previous materials to activate background knowledge or skills and facilitate the acquisition of new learning is the most frequently used learning strategy. In fact, 70% of the teachers stated that they use this strategy most of the time and 29% about half of the time. Only 1% stated not using the connection of current teaching to previous materials.

The other three learning strategies are used at high to moderate levels in the following decreasing order. Teachers stated that they use metacognition1 by having their students correcting and explaining their answers most of the time (58%) or half of the time (35%) while only 8% don't use this strategy. At similar but slightly below levels, teacher responses about the far transfer strategy of making students apply concepts learned to new situations indicate that 53% of the

teachers use this technique most of the time, 38% half of the time while 9% stated that they never use this strategy in their courses. The following most used technique was that teachers present summaries of new materials at the beginning of every lesson most of the time (51%) or half of the time (30%). About 19% stated that they don't do the new materials introductory summaries. The metacognitive strategy used at much lower rates than the rest, is asking students to elaborate and think about their own performance and outcomes (metacognition2): 18% of the teachers ask students to do so most of the time, 39% half of the time while 43% don't use this metacognitive strategy.

SOTAH questions Q2.10 through Q2.15 asks the teachers at NYC school about their use of the six most effective learning strategies uncovered by cognitive psychology's experimental research. Each of these six questions has three choices about applying these strategies in their classroom teaching: One is the correct application, a second one is an incorrect and commonly misunderstood application of those strategies. The third one is the not applicable or don't use in my classroom option, which is also considered as an incorrect answer in this study. The respondents understanding and application of the six most effective evidence-based teaching and learning strategies in their classroom practice varies greatly.

Graphic V.8



Source: SOTAH responses Q2.10, Q2.11, Q2.12, Q2.13, Q2.14, Q2.15

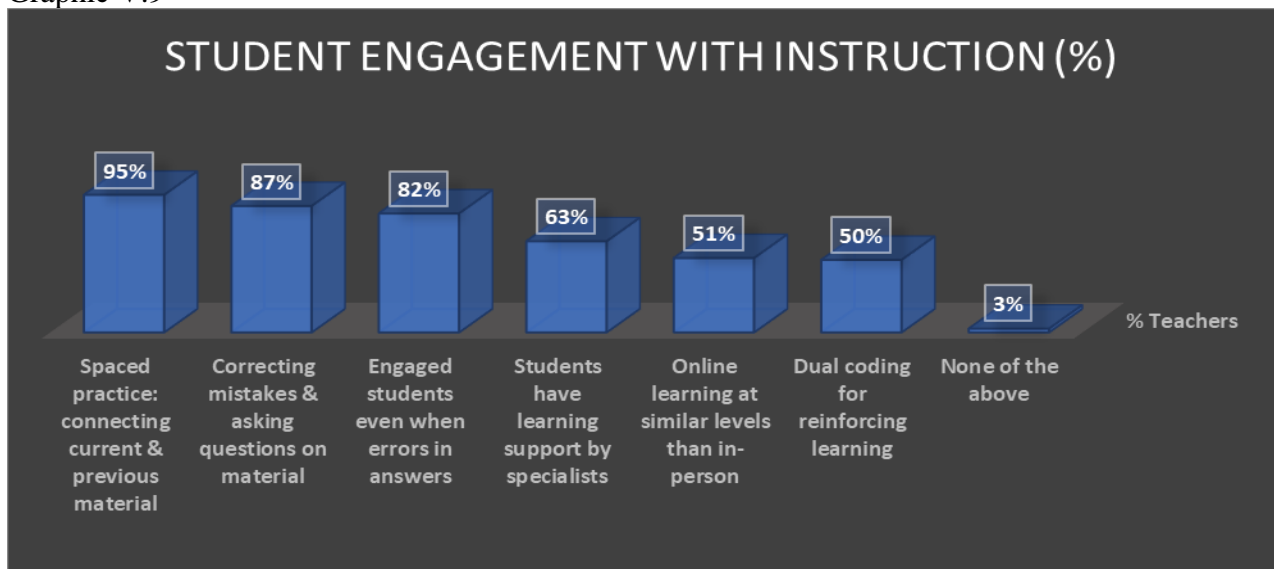
The most widely and correctly understood and applied learning strategy is elaboration or elaborative questioning as worded in Q2.13. Indeed, 67% of the teachers selected as a practice to ask students to synthesize information, extract key concepts and elaborate on their acquired knowledge whereas only 29% seem to misunderstand this strategy by emphasizing expression of students' feelings and opinions and only 4% chose that this strategy does not apply to their courses. Teachers understand and selected correctly the application of three additional effective evidence-based learning strategies at more moderate levels. About 54% of the respondents indicate that they use dual coding correctly while 28% misunderstand this strategy and 18% stated that does not apply to their courses as worded in Q2.10. Similarly, another 54% of the teachers selected spacing strategies in their classroom teaching and planning correctly as worded

in Q2.11 while 42% seem to misunderstand it and 4% stated that it does not apply to their courses. We need to qualify this number with a subsequent behavioral indicator in the classroom, which indicates a much higher percentage of using spaced practice correctly.

Slightly below, about 40% of the respondents agreed with the statement that they incorporate interleaving correctly as worded in Q2.14 but another 40% misunderstand its application by using blocks of similar types of activities or problems and 20% selected that this strategy does not apply to their courses. Retrieval practice seems to be misunderstood at a higher rate than other learning strategies as worded in Q2.15, since only 21% of the respondents selected correctly asking students to write down what they remember un-aided by their notes whereas 32% allow students to consult their notes and materials and 47% stated that they don't use this strategy. The larger misunderstanding is regarding the use of concrete examples to illustrate underlying abstract concepts as worded in Q2.12. Only 12% correctly agreed with the statement that they use very different concrete examples to illustrate the underlying abstract concept whereas a high 72% selected incorrectly using very similar or closely related examples as an effective strategy.

The very high level of understanding and application of the five learning processes with a high to moderate level of correct understanding and application of two of the six effective evidence-based learning strategies is somewhat consistent with a few of the answers to the question on student engagement. In question Q2.16, SOTAH asks teachers at NYC school to select their instructional practices among six items related to student engagement but this question also includes two effective learning strategies (spaced practice and dual coding) and an indicator of metacognitive strategy (correcting errors). The responses are consistent with their previous answers: high use of spaced practice and the metacognitive strategy of error correction and moderate use of dual coding. The other three indicators in the question on student engagement are related to the classroom psychological safety climate and student support plus an indicator about student learning in the context of distance or hybrid learning during the pandemic.

Graphic V.9



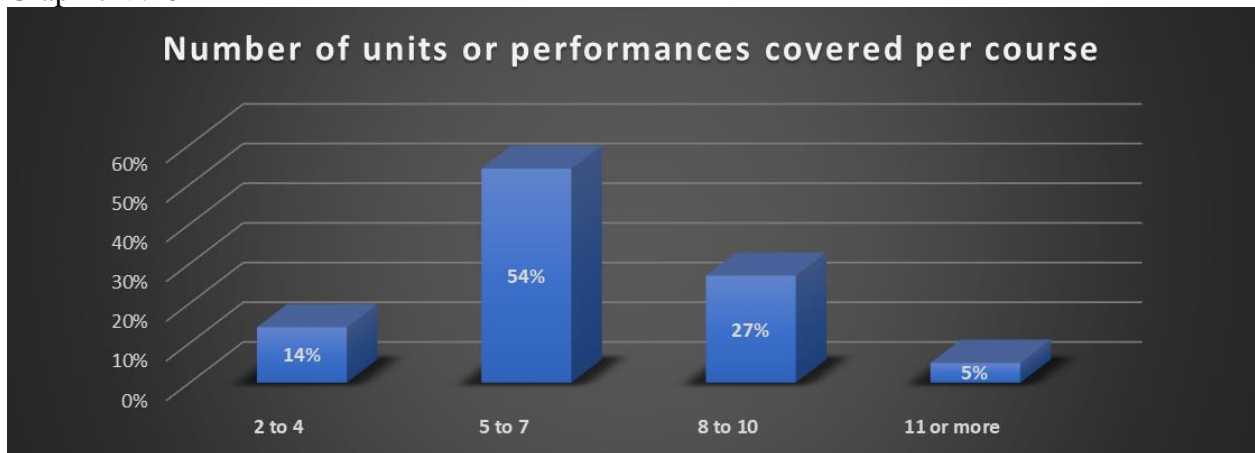
Source: SOTAH responses Q2.16

The great majority of NYC school’s teachers responded positively at correctly using the learning processes and strategies articulated as indicators of student engagement. The highest level was that 95% of the teachers selected that they use spaced practice making students review current and previous materials. This is a much higher rate of using spaced practice in instruction than their responses to the more abstract application of spaced practice in the previous questions, correctly selected by 54% of the respondents. About 87% of the teachers selected that in their classroom students feel comfortable correcting mistakes or asking questions. The selection of the effective learning strategy of dual coding (drawing diagrams, images or pictures of the material learned) was selected by 51% of the teachers, the lowest of the six student engagement indicators. This proportion of teachers using dual coding is consistent with the 54% of teachers understanding and correctly applying dual coding in their courses in SOTAH question Q2.10.

Regarding the other three indicators of student engagement, 82% of the teachers agreed that even when students made mistakes they stay engaged in the classroom (psychological safety climate). About 65% of the teachers selected that students in their classroom have learning support by specialists (student support). This is consistent with the responses to the subsequent question on applying their instructional approaches and strategies to different ability-grouping courses. Finally, 51% of the teachers chose the statement that students were learning at similar levels with online teaching than with in-person teaching. However, there is an interesting contrast with the subsequent SOTAH question regarding online instruction as we will see below.

The majority of teaching faculty at NYC school organize and distribute their curriculum in the different courses either in 5-7 units (54% of the teachers) or 8-10 units (27% of the teachers). Only 14% of the teachers structure their courses in 2 to 4 units (mainly performing arts’ focus on quarter, trimester or semester performances or artistic artifacts). Even a lower proportion of about 5% of the teachers structure their curriculum through 11 or more units.

Graphic V.10

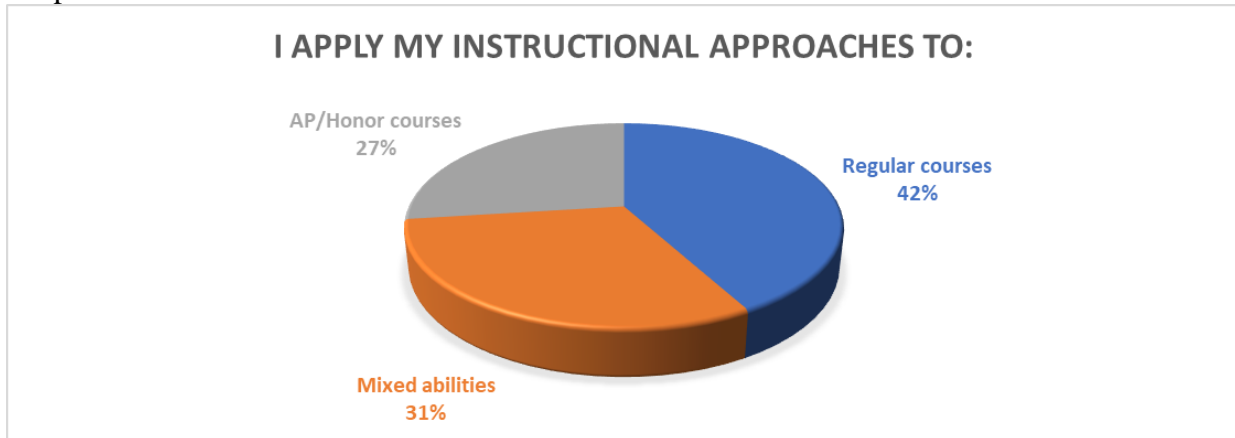


Source: SOTAH responses Q2.17

SOTAH question Q2.18 asks teachers if they apply their instructional approaches and strategies to various ability-grouping classes and courses. The responses of teachers at NYC school were that they indeed apply their instructional and teaching strategies to mixed ability grouping (31% of the respondents), regular courses (42% of the respondents) or AP/Honors courses (27% of the

respondents). This seems to indicate that most teachers are assigned a combination of different ability-grouping courses and it is consistent with the indicator in Q2.16 that 65% of the teachers have students in their classes that require learning support by specialists.

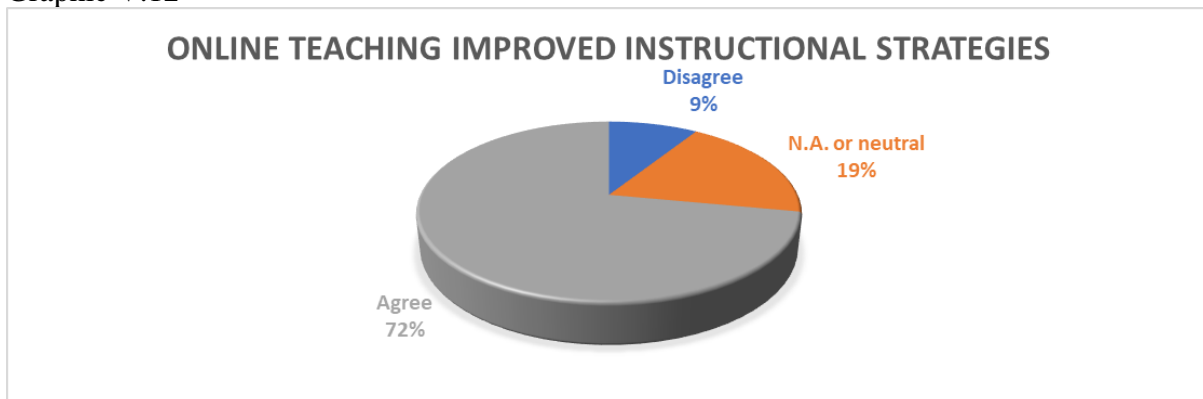
Graphic V.11



Source: SOTAH responses Q2.18

SOTAH's last question, Q2.19 on instructional practices was about the current or recent experience of online or hybrid teaching due to the COVID-19 pandemic versus their regular practice during in-person teaching. The options were simply agreeing, disagreeing or selecting not applicable or neutral. It is interesting that 72% of the teachers at NYC school agreed with the statement that online teaching has contributed to improving their instructional approaches and strategies (only 9% disagree and 19% of the respondents chose N.A. or neutral).

Graphic V.12



Source: SOTAH responses Q2.19

V.3. Findings and analysis of instructional teaching practices

Department chairs consider their teaching faculty members as the strength of their department and the school. They proudly spoke of their faculty members' professionalism, extensive wealth of experience and diversity of professional backgrounds during the semi-structured interviews. Similarly, department chairs were enthusiastic about the high level of teaching skills and the willingness of teachers to experiment with different instructional methods and combining them in creative and innovative ways. Most academic departments acknowledged that direct instruction was one of the most broadly used approaches but combined with other instructional methods. Some departments such as performing and visual arts and world languages mentioned that they tend to use a stronger emphasis on artistic creativity and performance, role-playing and skill-based approaches. Other academic departments emphasize combinations of approaches with more collaborative learning, discussion through Harkness or Socratic circles, or project-based learning as in some humanities. Science and math emphasize combinations with more problem-solving, inquiry-based approaches and lab experiments as well as using collaborative learning, including Harkness and Socratic circles, at higher level courses. A few courses within every department also use asynchronous learning (flipping the class) and other alternative approaches, from journaling and reflection to artistic movement and voice training. Department chairs also viewed as strengths the informal collaboration between individual teachers as well as the cooperation of their existing teaching-teams.

The areas of weakness mentioned during the semi-structured interviews were first, that the teaching loads, preparation, other school demands, and the schedule do not provide teachers with a flexible structure and enough time for collaboration, whether individual informal cooperation or within teaching teams. Most department chairs expressed concern regarding the difficulty of teaching students with great variability in their levels of preparation and disparity of academic abilities for the expectations in their courses. A couple of department chairs expressed the wish that some of the courses under their supervision would use some more project-based or more skill-based and less traditional methods in the actual combination of approaches while a few others were concerned about teachers turn-over.


The evidence from SOTAH responses by the teaching faculty at NYC school supports in general terms the overall assessment by department chairs regarding the strengths and weaknesses of the school instructional dynamics and practices. Direct instruction in its classical sequence or in its problem-solving based sequence are the two key approaches underpinning classroom instruction. Moreover, all teachers use a combination of a variety of additional instructional approaches either most of the time, half of the time or sometimes complementing direct classical or problem-solving instruction. The wealth of approaches using different instructional combinations of pedagogical methods is indeed a strength.

Similarly, teachers at NYC school eagerly collaborate informally with each other at an individual level within or across departments, as already highlighted in SOTAH's previous section on professional development, demonstrating a high level of reliability on colleagues and peers for instructional support. There is also a parallel and well-established dynamic of teaching-teams in some departments and courses with numerous levels and sections. The SOTAH question Q2.8 on the sources used primarily for curriculum development and lesson planning forced teachers to

choose just one source among four alternative sources. The two predominant ones were individual teacher preparation followed closely by teaching-teams collaboration. Individual teachers' work and teaching-teams' collaborative work are the core sources for curriculum development and planning when we consider SOTAH responses to this question. However, these two core sources are complemented with the professional organizations' materials and those from the textbooks selected and their related ancillary materials at NYC school. This interpretation is consistent with the descriptions of teachers' practices by department chairs. This is also consistent with most teachers practices from what I have observed in other schools.

Graphic V.13

Findings: instructional practices



• Micro-level dimension

RQ #3. To what extent do teachers at NYC school utilize evidence-based learning strategies in their pedagogical approaches?

Strengths

- Diverse professional backgrounds and teaching experience
- Strong collaborative instructional planning among teachers
- Wide combination of instructional approaches
- High level of evidence-based learning strategies compared to a national sample




Source: semi-structured interviews and SOTAH responses

An additional strength is that most teachers at NYC school apply and are knowledgeable of the four main learning processes, including metacognition, and related strategies in their instructional practices as illustrated by the responses to Q2.9. The percentages of teachers stating the frequency of applying these processes to their instructional practices often or at least half the time are extremely high. For instance, 99% of the teachers stated that they explicitly connect current concepts and materials to previous or forthcoming ones (activating previous knowledge and establishing connections to current or new knowledge). Similarly, 91% of the teachers stated that they apply learned concepts and materials to new situations (far and near transfer). Slightly below but still very high, 81% of the teachers stated that they summarize new material (facilitating memory coding). Metacognition through correcting errors ranged from 93% in Q2.9 and 87% in Q2.16, while a substantial 57% of the teachers encourage student metacognitive self-awareness in the responses to Q2.9. When we average the percentages of these three metacognitive strategies by teachers at NYC school, the net result is an average of 79% of the teachers applying metacognitive strategies in their instructional practices.

It is illustrative to compare the 79% average of teachers at NYC school using metacognitive strategies with some type of national sample reference, which fortunately we have. According to the survey carried out on a national sample of teachers by Boser (2019), around or above 60% of teachers use metacognitive strategies in their instructional practices. Despite some ambiguities in the data reported with Boser's study, as far as I know, it is the only and first national level survey exploring teachers' use of evidence-based learning strategies besides the previous survey within a case study carried out by Morehead, Rhodes & DeLozier (2016) and a previous study by McCabe (2011). In other words, Boser's teacher national sample is the only empirical study that can be used as a point of reference for specific case studies, like this capstone project. Boser's reported data of "around 60%" of the teachers in his national sample using metacognitive strategies, give us a comparative reference to SOTAH's 79% average of teachers at NYC school using metacognitive strategies.

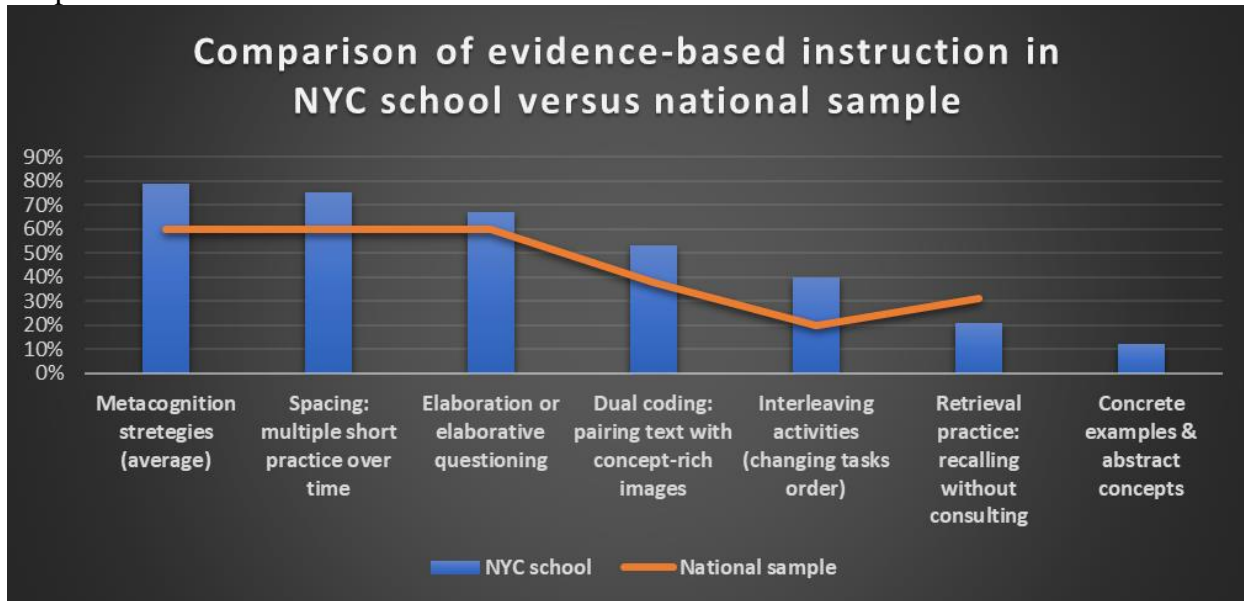
This comparison should be taken with extreme caution. The online survey on teachers practice and their understanding of evidence-based instructional strategies by Boser (2019) worded the questions on metacognition differently than the questions in SOTAH. The return rate of Boser's survey was about 42% (N=214) of the potential teachers contacted (515) versus SOTAH's 63% return rate, with a sample of 65 teachers completing the survey from 103 potential teachers at NYC school. Yet, this survey by Boser offers the only available national-level reference to similar questions from public and private school teachers regarding the use of effective learning strategies in their instruction. Boser's survey includes two sets of questions about five of the six effective evidence-based strategies (it does not include direct questions about the use of different concrete examples to illustrate an underlying abstract concept). The first set are direct questions asking teachers if they apply these learning strategies in their instruction (retrieval, spacing, interleaving, dual coding and elaboration). The second set of questions present six different scenarios requiring teachers to select under which circumstances a student will learn more using various learning strategies from situations originally created and drafted in surveys to students by McCabe (2011) and subsequently modified by Morehead et al (2016).

In this section of the capstone project on instruction, I am comparing the responses by teachers at NYC school to SOTAH questions on the effective learning strategies with the averages provided in the national sample reported by Boser (2019). Similar to metacognitive strategies, I worded these direct questions in SOTAH differently than the direct questions in Boser's survey. I will address the responses to the second set of questions on learning scenarios in the subsequent homework chapter of this capstone project. An additional caution is that Boser (2019) reported the "roughly 60%" as averaging the responses to both the direct questions and the learning scenarios in his survey. Thus, we should take this comparison as a heuristic general reference to make sense of SOTAH responses as compared to the national sample.

Most teachers at NYC school apply and are knowledgeable of three of the six effective evidence-based learning strategies at high rates as demonstrated in their answers to Q2.10 through Q2.15 besides the overall 79% applying metacognitive strategies. The teacher responses to SOTAH questions about correctly applying the six learning strategies in their classroom practices were high in two of them: 67% using elaboration or elaborative questioning and 75% applying spaced practice. This percentage on spaced practice is an average from two separate sources: Question

Q2.11 and an indicator in Q2.16 on student engagements signaling spaced practice in the classroom. The more general question Q2.11 about teaching practice resulted in 54% of the teachers stating that they apply spaced practice in their classroom. By contrast, the more specific indicator in question Q2.16 about making students review previous concepts while studying new ones (another form of spaced practice), 95% of the teachers selected using this approach. That would result in an average of 75% of the teachers using spaced practice ($54\% + 95\% / 2 = 75\%$). This average is higher than the average of “around 60%” reported by Boser’s survey (2019).

Graphic and table V.14



Use of evidence-based instructional strategies	NYC school	National sample
Metacognition strategies (average)	79%	60%
Spacing: multiple short practice over time	75%	60%
Elaboration or elaborative questioning	67%	60%
Dual coding: pairing text with concept-rich images	53%	38%
Interleaving activities (changing tasks order)	40%	20%
Retrieval practice: recalling without consulting	21%	31%
Concrete examples & abstract concepts	12%	38%
Average	50%	38%

Source: NYC school data from SOTAH responses. National sample data reported by Boser’s survey (2019).

Additionally, teachers at NYC school apply other effective evidence-based learning strategies: dual coding by an average of 53%. This percentage is an average calculated from the 54% of the teachers in Q2.10 stating that they practice dual coding in class correctly with the 51% of the teachers selecting the specific indicator of having students drawing diagrams, images of pictures of what they are studying in Q2.16 on student engagement. The net result is an average of 53% of the teachers using dual coding ($54\% + 51\% / 2 = 53\%$). Thus, the stronger awareness and correct applications of learning strategies by the teachers at NYC school are on metacognition,

elaboration or elaborative questioning and spaced practice followed by dual coding. This is higher than the 38% of teachers using the dual coding strategy in Boser's national sample.

Below the 50% mark, teachers at NYC school correctly selected the other three effective evidence-based learning strategies in their instructional practices. There is an equal split between the correct and incorrect application of the interleaving strategy in SOTAH question Q2.14. Indeed, 40% of teachers selected the correct application of interleaving (changing the order of related concepts, problems or skills) versus an equal 40% selecting the blocked strategy (practicing in consecutive blocks the same or similar concepts and problems or skills). There is confusion among most teachers about using blocked versus interleaving. In fact, recent experimental research on the topic by Carvalho & Goldstone (2021) suggests that teachers' trial and error practice might be correct about using both strategies. We can summarize this tried strategy as a two-step instructional approach. To explain a concept or skill for the first time begin with blocked practice. Then, to expand and relate that concept or skill to other concepts and skills, then apply interleaving. The responses to SOTAH by teachers at NYC school and the true and tried explicit instructional strategies seem to illustrate and support the need to research these issues further. In that sense, the responses to the interleaving indicator can be considered 80% correct (40% interleaving and 40% blocked practice as the best strategy) but for the purpose of this study and comparison to Boser's survey, we will stipulate that 40% of the teachers at NYC school apply correctly interleaving in their instruction versus the 20% in the national sample reported by Boser (2019).

The scores regarding the remaining evidence-based strategies progressively decreased. About 21% of the teachers at NYC school stated in their response to SOTAH question Q2.15 that they use retrieval practice, which is the only value below Boser's national sample of 31%. The lowest level using any of the six evidence-based learning strategies by teachers at NYC school was 12% of the respondents, who stated that they use different concrete examples to illustrate the underlying abstract concept in their responses to SOTAH question Q2.12. Paradoxically, a high 72% of the teachers selected incorrectly using very similar or closely related examples as an effective strategy. We don't have a national sample to compare this learning strategy with since Boser (2019) did not include a direct question on this in his survey. A way of looking at this apparent misunderstanding of using different concrete examples to explain an underlying abstract concept is very similar to the misunderstanding with interleaving. We need to distinguish in teachers' survey questions about interleaving and using concrete examples between the first teaching step of presenting material for the first time versus using these strategies in the subsequent steps of practicing and reviewing, as I will discuss in the recommendations of this chapter and in the concluding chapter.

Although SOTAH and Boser's survey (2019) used different structured questions on the direct application of effective learning strategies for instruction by teachers, it is informative and interesting to compare both results. An additional caution interpreting this comparison is that Boser did not disaggregate in his reporting the average responses from direct questions versus responses to knowledge of effective learning strategies under different scenarios in his summary of findings regarding elaboration and spacing. Thus, this comparison is mainly a general background reference, but I have included it here because it provides a national sample to contrast, make sense, and interpret SOTAH responses by teachers at NYC school.

Graphic V.15

Findings: instructional practices

3

• Micro-level dimension

RQ#3. To what extent do teachers at NYC school utilize evidence-based learning strategies in their pedagogical approaches?

Weaknesses

- Limited use of retrieval in instructional practices
- Unclear use of interleaving and of different concrete examples in instruction versus student practice
- Limited student support in academics



Source: semi-structured interviews and SOTAH responses

From this heuristic comparison and taken with a great deal of caution, there is still a clear emerging pattern: the teachers at NYC school apply evidence-based learning strategies in their instructional practices at higher rates than the average percentages reported from the national sample survey by Boser (2019). The two exceptions are retrieval practice and the unknown percentage of teachers using different concrete examples to illustrate the underlying abstract concept. Moreover, the responses of teachers at NYC school to SOTAH and the comparison of these responses to Boser's survey also points out some weaknesses in NYC school's instructional practices. We can qualify these weaknesses when triangulating the answers within SOTAH's instruction section with the subsequent responses regarding assessment and homework sections. For now, one of the takeaways from this comparison is that teachers at NYC school would benefit from PD training on the application of interleaving, retrieval practice, and the use of different concrete examples to illustrate the underlying abstract concept.

The teachers at NYC school organize their courses around a certain discrete number of units in academic disciplines or artistic artifacts and performances by the arts: over 81% of the teachers organize their curriculum within 5 to 10 units. The number of units and their structure and curricular sequence are related to standards and sequencing shaped through state education or professional associations' standards as incorporated and reflected in textbooks and ancillary materials. There was not any issue from the semi-structured interviews with department chairs or teachers' SOTAH responses regarding the number and sequence of units in their courses. Similarly, teachers seem to have a clear idea that effective instructional practices apply to different ability grouping classes. Most teachers at NYC school are assigned a combination of different ability-grouping courses. Teachers seem to have a clear idea that they should equally

apply their instructional approaches to all ability grouping courses they teach, as their responses to SOTAH question Q2.18 indicate they do: mixed ability grouping (31% of the responses), regular courses (42% of the responses) or AP/Honors courses (27% of the responses). This is consistent with the previous response to the student engagement question (Q2.16) in which two thirds of the teachers indicated that students in their classroom receive some form of learning support by the school specialists.

Teachers' perception about the effectiveness of online teaching due to the pandemic is broadly favorable. There was a high level of agreement about the positive impact of online teaching on their instructional strategies. Indeed, 72% of the respondents to SOTAH question Q2.19 stated that distance online or hybrid teaching has helped them at improving their instructional strategies. However, we need to put that in context when triangulated with the indicator on student online learning in question Q2.16. In that question, there is a lower percentage of teachers, 51% of the respondents, selected that students were learning at similar levels with online teaching than with in person teaching. I will also triangulate these responses in the next chapter with the responses to similar questions about online distance learning impact on improving assessment and homework strategies. The point here is that there is little doubt that online learning and resources will continue to be a critical part of teaching and learning for schools once the pandemic is over. Improving the effective use of online resources can enhance students' learning and will be critical for strengthening educational outcomes and student engagement.

V.4. Recommendation #3: Maximize evidence-based teaching and learning strategies

Department chairs proudly referred to the professionalism of their teachers and to the fact that almost all teachers used a combination of instructional approaches and have a great wealth of experience and teaching skills. Most academic departments acknowledged that direct instruction, either as classical or as problem-solving based, was one of the most broadly used approaches while combining them with other methods consistent with the knowledge and skills required by the specific course. These findings were supported by the responses of teaching faculty at NYC school to SOTAH questions on instructional practices. Using a variety and combination of instructional approaches is a strength at NYC school. Teachers at NYC school have an ample variety of professional backgrounds, instructional skills and experience and apply their instructional approaches equally to all ability grouping classes.

Teachers are cognizant and use high levels of metacognitive strategies as well as most evidence-based teaching and learning strategies as compared to the levels used by teachers in a national sample. Teachers at NYC school could maximize their instructional practices through a deeper training on all evidence-based teaching and learning strategies, especially retrieval practice. Two additional evidence-based strategies misunderstood on their application are interleaving and use of different concrete examples to illustrate an underlying abstract concept. Students need further academic support and training on effective learning and studying strategies to improve educational outcomes and performance. The critical question is how can NYC school maximize the strengths of its instructional practices and improve the weaknesses? I recommend five interrelated actions to do so.

First, the wealth of combining different instructional approaches is already one of the strengths of NYC school. The wealth and reliance on teachers' individually created materials and those created by their teaching teams at NYC school is impressive. Yet, to maximize its impact it is critical for NYC school to use its distributed leadership and strong PD program to encourage each department and teacher to use that strength with the best curriculum programs and textbooks. Selecting the most evidence-based effective curricular programs and their related textbooks and ancillary materials might provide an instructional core upon which the creative and innovative teachers and teaching-team materials can be applied to and build on with their own approaches for greater impact on student learning. This will allow the high autonomy and professional experience of the teachers to be maximized at improving student learning without added unrealistic demands of creating their own "textbooks" and instead use high impact textbooks that are readily available. Encouraging each department and teacher to select the best and most effective evidence-based textbooks and ancillary materials for their respective disciplines will maximize the current high level of teaching effectiveness and student learning and it is consistent with the recommendations from international comparative research on this issue (Oates, 2014; OECD, 2019). A good starting point for NYC school is for departments and teachers to select the next curricula and related textbooks after exploring some evidence-based evaluations of those programs, such as the US DOE's Institute of Education Sciences, What Works Clearinghouse's research resources and website: <https://ies.ed.gov/ncee/wwc/FWW>

Second, maximize instruction by creating teaching evidence-based improvement teams (TEBIT) within each department. Teachers and teaching teams must adapt and design the evidence-based strategies to the specific domain knowledge and skills expectations and practices within their courses and departments' current instructional practices. These TEBIT or improvement teams would be more productive if there is a high degree of autonomy within departments on how to apply and approach the evidence-based learning strategies within their specific subject domains. A fruitful way to incorporate the insights from learning science on evidence-based learning strategies into the schools' instructional practices is by using the processes of design thinking epitomized by improvement science and the use of improvement teams.

Indeed, many of the pedagogical and teaching traditions at NYC school already incorporate some of the insights and strategies outlined by cognitive psychology. These effective teaching practices are the bright spots that can generate plausible hypotheses about high impact instruction for further testing. From organizational research we know that improvement is more effectively achieved when building upon these bright spots (Heath & Heath, 2011). Improvement science provides some of the key tools for adapting, exploring, testing and scaling up these bright spots to the specific conditions of districts and schools engaged in improvement projects. These processes must involve all stakeholders at defining and diagnosing areas of improvement in students' learning and must include and be led by the teaching practitioners through sets of rapid testing cycles or PSDAs. These "Plan, Do, Study, Act" (PDSAs) rapid cycles allow for testing of plausible hypotheses under the specific conditions of each department or course (Bryk, Gomez, Grunow & LeMahieu, 2017; Fernández-Castro, 2019; Schechter, 2008).

Third, the school should support teaching evidence-based instructional teams (TEBIT) with focused PD for those teams as they request it. The practical application of all evidence-based

learning strategies to domain-based instruction can be maximized through department teams guided by learning scientists or experienced master teachers familiar with learning science. A critical reference for these improvement teams could be the practical oriented book on *Powerful Teaching* by Agarwal and Bain (2019) emphasizing retrieval and spaced practice strategies while simultaneously using metacognition. The angle of the work of these scholars use two of the strengths of instructional practices at NYC school (metacognition and spaced practice) to improve one of its weaknesses: retrieval practice. Agarwal, a cognitive scientist, and Bain, an experienced teacher deeply familiar with learning science, can also be excellent PD training providers. These scholars and their website are probably one of the best resources to maximize the application of these three evidence-based learning strategies to K-12 instruction (Retrieval Practice: <https://www.retrievalpractice.org/>).

For a practical application of all six learning strategies, the team of cognitive psychologists at The Learning Scientists, <http://www.learningscientists.org/>, are also a great resource for online information or hiring their services for PD training. A further online resource by teachers and educators themselves, applying all six evidence based learning concepts, are the ideas developed within the website, The Effortful Educator: <https://theeffortfuleducator.com/>. In addition, for teaching faculty that wish to connect to other well-established instructional practices for elaboration and elaborative questioning, already practiced by many teachers and courses at NYC school, I recommend the following training organizations and opportunities: Phillips Exeter Academy Summer Institute on the Harkness method for Educators: <https://www.exeter.edu/programs-educators> (see Hassan, 2015; William, 2014 for a the Harkness method). The AVID organization PD and training sessions, which include training on Socratic Circles and Socratic Questioning: <https://www.avid.org/> (see Matthews, 2015 for an overview of the AVID program). Another resource focusing on crafting effective high-level questioning (Rothstein & Santana, 2011) is the Right Question Institute, RQI: <http://rightquestion.org/>. Elaboration and elaborative questioning practices can be used as the anchor for retrieval and spacing practices as well as dual coding and different concrete examples to illustrate an underlying abstract concept during class sessions. The strength of NYC school using elaborative questioning or elaboration highlights another promising area where teaching teams could begin testing and scaling-up instructional improvements and student learning under the specific conditions of each course, department or the overall school.

Fourth, schedule time for teaching evidence-based instructional teams (TEBIT) to apply these learning strategies in their curricular and instructional plans and execute them in the classroom. Spacing the application of evidence-based learning strategies throughout the academic year in the context of curriculum and lesson planning is critical for the execution. Spacing the application of learning strategies is best accomplished when this process is part of the teacher or teaching teams' planning schedule. The benefits of long-term, spaced practice (Carpenter & Agarwal, 2019; Carpenter, Cepeda, Rohrer, Kang, & Pashler, 2012; Kang, 2016) and evidence-based learning PD as the most effective training strategy for implementing changes has been pointed out by a broad body of research as I highlighted in the literature review. TEBIT can maximize their impact on student learning by enhancing the use of all evidence-based teaching strategies, especially the ones used less frequently, such as retrieval practice, or those that are slightly confusing on how to apply them to the various steps of instruction such as interleaving and different concrete examples.

There are two evidence-based strategies that need further clarification and experimentation or Plan, Do, Study, Act (PDSA) rapid testing cycles if teams are provided with scheduled time, PD support and authority to do so: interleaving and using different concrete examples. Most teachers somehow know by trial and error that effective instruction needs both blocked and interleaving strategies for effective teaching as recent experimental research from cognitive psychology by Carvalho & Goldston, (2021) demonstrates. These authors found out that using interleaving as an effective learning strategy depends on the purpose of the concept being taught or the practice being tested. Interleaving is effective when the purpose is to create interrelated concepts represented by contrast to each other. However, if the purpose is to represent a concept in isolation to emphasize its central characteristics and properties, a blocked approach is more effective (Carvalho & Goldstone, 2021). In most situations, teachers must use both strategies: blocked strategy when presenting the concept for the first time is typically followed by blocked presentations of related and similar concepts (the first step of direct teaching). Subsequently, after having presented two or more concepts or problems and skills somehow related to each other, interleaving is the best strategy for relating these different concepts to each other and for students' learning to connect and contrast the various concepts and elements of the related material or unit(s).

Likewise, teachers, by trial and error, also tend to use similar concrete examples when first explaining an abstract concept. This is another form of near transfer of knowledge and skills. It is after the basics are understood that the best strategy to consolidate and enhance the understanding of the underlying abstract concept is more effective to use very different and apparently unrelated concrete examples. Applying a concept to very different situations or looking for underlying common principles from very different concrete examples is the key for successfully accomplishing the complex process of far transfer and developing critical thinking and problem-solving skills (De Bruyckere, Kirschner, & Hulshof, 2020; Hammer et al. 2005; Willingham, 2020). More specifically, learning scientists could guide teaching improvement teams on how interleaving and different concrete examples could be incorporated in an effective way in the various steps of the instructional process of various subjects. This could include classroom experiments and testing to ascertain when is more effective to use interleaving versus blocked explanations or to explain an abstract concept with similar versus different concrete examples at various steps of the teaching process. While schools ask teachers to develop student critical thinking and problem-solving skills, very few schools or administrators provide the needed PD training guiding teachers on how to design instructional tasks to execute and implement that complex process of sustained high cognitive demand and far transfer (Tekkumru-Kisa, Stain & Doyle, 2015, 2020). Addressing how to implement these two evidence-based strategies can be a critical way of providing such support for both teachers' instruction and students' learning. The next recommendation is precisely about the need to also train and educate students about evidence-based learning strategies.

Fifth, provide evidence-based learning strategies training for all students and provide enhanced school support structures in the form of space, schedule, sponsored mentoring or tutoring for underprivileged and struggling students, including the possible resource of a newly created teaching fellows program. For student support professionals and preparing students themselves to acquire better studying strategies, I recommend the services and resources by the Learning

Scientists: <http://www.learningscientists.org/>. This team of cognitive psychologists have experience producing blogs, guides, materials as well as training students in the acquisition of effective learning and studying strategies that are evidence-based. The Learning Scientists recommend two additional resources. One is for practicing spacing and retrieval for students (and teachers): <https://www.podsie.org/>. The second resource is a brief seven-minute student friendly oriented video the Learning Scientists produced with Memorize Academy reviewing all the evidence-learning strategies applied to studying techniques: <https://www.youtube.com/watch?app=desktop&v=CPxSzyIrcI&feature=youtu.be>. Moreover, supporting students' capacitation and training regarding the six most effective evidence-based learning strategies will contribute to students thinking about their own learning and thus, developing their metacognitive skills (Lovett, 2013; Tanner, 2012; Weimer, 2012; Wiley et al. 2016; Zohar & David, 2009). Student training on evidence-based learning strategies and metacognition will be more effective within the context of broader student support structures. This strategy requires further action in the form of devising school designs, programs and structures that facilitate equal accessibility and academic quality for all students (Campbell-Whatley, Wang, Toms & Williams, 2016; Fernández-Castro, 2018; Gardner, 2015; Hammond, 2015; Lu & Wieberg, 2016; O'Day & Smith, 2019).

Addressing the metacognitive strategy of having students thinking about their own learning can also improve the third area of weakness: limited effectiveness of student support and the difficulty of teaching mixed ability grouping. Most teachers at NYC school have a combination of courses with multiple ability grouping of students (AP/Honors, regular, and mixed abilities). Similarly, student support programs should adopt the same approach at helping students to use homework, self-tests and other retrieval and spaced practices for learning. This will help at both improving deeper and longer-term learning for students, reduce their anxiety and stress regarding standardized tests while improving both their engagement and achievement (Agarwal et al, 2014; Metcalfe, 2017; Weinstein & Sumeracki, 2018). Student training on effective studying strategies built on evidence-based learning will improve the overall positive impact on student outcomes, regardless of the current support level or ability grouping in place. This will also provide students with the tools for thinking about their own studying strategies' strengths and weaknesses. This brings us to the last chapter of this capstone project on how to improve assessment and homework practices in a manner consistent with evidence-based learning strategies.

CHAPTER VI

The granular level: Assessment and homework

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 - VI.1.1. Common shared variables of assessment and homework
 - VI.1.2. Specific variables and indicators of assessment
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Chapter VI. The granular level: Assessment and homework

The granular level of the four-dimensional school learning model of this capstone project is where the specific classroom assessment and homework assignments take place. Assessment and homework designed through instructional practices and strategies are some of the key elements in this complex triadic engagement and interaction between curriculum, students and teachers to measure and reinforce learning. The crucial question is: how do current assessment and homework practices at NYC school utilize high-quality design and strategies consistent with evidence-based learning and departmental or discipline standards?

In this chapter I explore assessment and homework practices at NYC school. The school senior leaders stated during the initial stages of this research project that the middle school division has a more traditional approach to assessment and homework while the upper school tends to use more progressive forms. Senior leadership was interested in understanding current assessment practices and moving the school towards more effective assessment of students' learning, growth and mastery of curricula contents and skills. School leaders emphasized the problem of practice of how to assess authentic and relevant learning as related to the various subjects' curricular knowledge and skills expected to be mastered by students, including critical thinking, problem-solving and creativity skills.

Similarly, the senior school leaders were interested in understanding the current homework practices to inform school policy related to student workload. Senior administrators wanted to know how the school could support teachers to increase the quality and effectiveness of homework while reducing the time students dedicate outside the school to these academic assignments. The goal is to design a homework policy that can create better balance in the quality of life of students and opening time for them to pursue co-curricular educational goals, from the arts and athletics to character and community service. This greater balance can also contribute to develop the whole student, explore broader interests, increase learning and student opportunities to be accepted into the most competitive colleges of their choice.

VI.1. Operationalizing assessment and homework practices

The granular level is where teachers or teaching teams design and implement the specific course level formative and summative assessments and asynchronous homework assignments and tasks. Formative and summative assessments are the instruments for evaluation of student learning and of their mastery of knowledge and skills within specific curricular domains. Education quasi-experimental research as well as cognitive psychology experimental research demonstrate the positive impact of both formative and summative assessments on improving student learning outcomes while providing additional insights on how these could become more effective learning tools (Raupach et al. 2013; Rowland, 2014; Wissman, Zamary, & Rawson, 2018). Still, there is a need to adapt these findings to the conditions of authentic educational situations (Woolridge, Bugg, McDaniel & Liu, 2014) but the overall positive impact of formative and summative assessments on learning has been demonstrated. We can extrapolate these findings to the other related granular-level instructional tasks: homework assignments.

Asynchronous or homework assignments and tasks reinforce and further develop student learning and mastery of the curricular materials and skills. The evidence about homework assignments is that they are more effective from grade 6 on and in moderate but progressive quantity, the 10 minute increase per grade principle (Cooper, 2015; Cooper, Robinson & Patall, 2006). The main mechanism rather than the progressive introduction and increase in quantity of homework and time needed to complete it as a student matures is the quality of these homework assignments. To be effective for learning, homework must focus on the discipline standards and be conceptually relevant for the subject matter at hand (Bas, Sentürk, & Cigerci, 2017; Boser, Benner & Smithson, 2019; Cooper, 2015; Cooper, Robinson & Patall, 2006; Terada, 2018). When looking in more detail into what quality means, we can find that effective homework practices incorporate, in different forms, the evidence-based proven learning strategies highlighted by cognitive psychology: retrieval and spaced practice, interleaving and elaboration and dual coding or abstract and concrete examples (Kontur, de La Harpe, & Terry, 2015; Ramdass & Zimmerman, 2011; Roschelle, Feng, Murphy & Mason, 2016; Valle, Regueiro, Núñez, Piñero & Rosário, 2016).

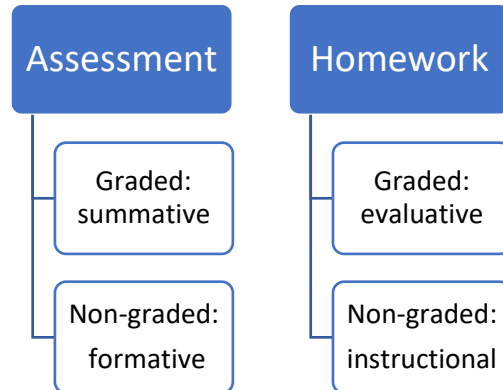
For the purpose of this capstone project, I will focus on the insights from learning science, as well as some insights from education research on effective assessment and homework practices to operationalize this dimension in several sets of variables and indicators. I explore the variables and indicators of these two granular level elements of instruction at NYC school in two specific sections of the Survey on Teaching, Assessment and Homework, (SOTAH): block 3 on assessment and block 4 on homework. From the direct and explicit instruction insights and the practical experiences of teaching practitioners, there are some common key variables to consider for both assessment and homework practices.

VI.1.1. Common shared variables and indicators of assessment and homework

One of the critical issues about assessment is that of grading, which is at the core distinction between summative and formative assessments. Most education researchers and scholars do not apply that criteria of summative versus formative to homework, since the predominant view is that homework is mainly formative or instructional. Yet, I argue that the same principle underlying the summative versus formative criteria of assessment also applies to homework. In practice, most teachers use both: graded homework (evaluative) and non-graded homework (instructional). The first key variable and its indicators for this granular dimension is to explore the extent to which teachers use grading (evaluative or summative) and non-grading (formative or instructional) criteria and tools regarding their assessment and homework assignments.

Summative and formative assessments and homework can provide critical feedback for teachers to adapt and change their instruction and plans to improve and maximize student learning. This broad flexibility of formative assessments and instructional homework, plus the use of practice summative assessments and evaluative homework are ideal for incorporating evidence-based learning strategies. SOTAH addresses the variables of summative (graded) and formative (non-graded) assessments in Q3.4 and evaluative (graded) and instructional (non-graded) homework in Q4.4. These indicators are supplemented by additional triangulation indicators in subsequent questions, such as Q3.15 on relative weight of different learning components for overall grade or Q3.19 and Q3.20 on the use of non-graded or formative practice assessments.

Image VI.1



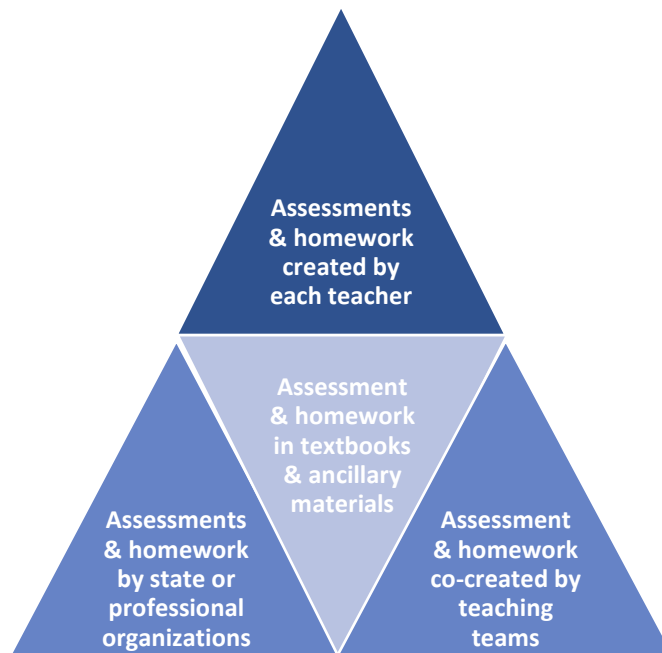
Source: summarizing direct and explicit instruction principles and applying them to homework

As I argued in the previous section on instruction, teaching is a very complex activity, which includes a great deal of assessment and homework assignments associated with various sources typically used for curriculum development, lesson planning and classroom tasks design. This variable involves indicators related to the teachers' relative autonomy and dynamics selecting the main sources for their assessments and homework assignments, materials and tasks. According to the principles of explicit instruction, assessment and homework design will likely be derived from the instructional approaches and materials of specific courses and disciplines.

The degree of teachers' autonomy and self-efficacy can affect how teachers decide, select and use different types of sources and materials for assessment and homework. As it was the case with instructional practices, we can expect four types of indicators regarding the creation or selection of assessment and homework assignments. In some cases, the individual teacher will be the main creator of the assessment and homework assignments and materials. In other cases, there will be more of a teaching-team oriented collaborative work to co-create those assessments and homework assignments and materials.

Most teachers use a combination of sources, typically combining their own individually created sources, with those co-created by teaching teams and those from professional organizations and textbooks. Yet, it is critical to know to what extent teachers primarily use one of these sources as their key one for the assessment and homework assignments at NYC school to understand its practices. When considered together, assessment and homework assignments and design are related to the instructional approaches of various courses and departments. SOTAH explores these variables and indicators in question Q3.5 (main sources for assessment assignments) and question Q4.5 (main sources for homework assignments).

Image VI.2



Source: summarizing direct and explicit instruction principles and applying them to homework

The assessment and homework sections of SOTAH also include two similar and specific questions about application of these instructional tools to various types of ability grouping and online distance or hybrid learning situations. The application of teachers' assessment and homework practices with different ability grouping: AP/honors, regular, or mixed ability grouping is addressed in questions Q3.16 for assessment and Q4.12 for homework. The other variable explores the impact of distance teaching and student learning during the pandemic on expanding or improving teachers' assessment and homework strategies (question Q3.17 for assessment and Q4.13 for homework). Besides operationalizing the common variables and indicators mentioned above, there are also specific variables and indicators that are different for assessment versus those for homework given the characteristics and discrete functions of each of these instructional tools.

VI.1.2. Specific variables and indicators of assessment

Like instructional approaches, assessment typically involves a combination of multiple formats and instruments throughout the academic year and across the curriculum flow and structure as students acquire and learn the domain bounded concepts, materials and skills. Different combinations of assessment instruments can vary widely across departments or even within the same department there might be a wide variation. The types of assessment used might vary depending on the characteristic of the curriculum within a specific course and the level of student mastery expected of the learned material and skills. Similarly, the teaching faculty's instructional and pedagogical approach, together with the professional standards and expectations of specific disciplines, will also impact different combinations of assessments. All departments and courses will use a variety of assessment tools but some, such as the Performing and Visual Arts

Department, will tend to rely more on progress rubrics addressing artistic or performing skills, role-playing and artifact or performance production and less of traditional academic exams.

Image VI.3

Main types of graded assessments		
Unit tests & quizzes	Labs, artifacts, performances, projects or reports:	Formal oral presentations or demonstrations
Multi-unit & term tests	Individual-based	Other forms of assessment
Final or year-end exams	Group-based	

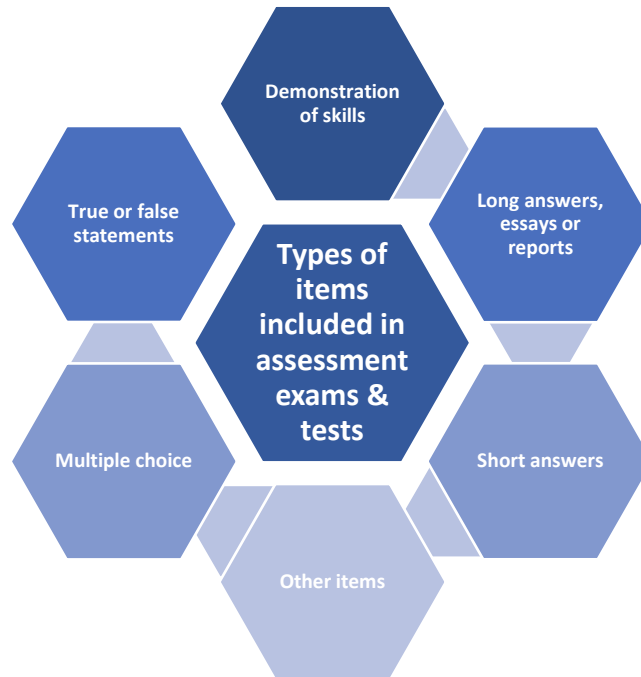
Source: summarizing direct and explicit instruction principles and personal teaching experience

There are three mayor types of graded assessments used by most departments or disciplines, although performing and visual arts do not typically include the first of these three categories except for their more academically oriented courses such as art history. On the other hand, most academic disciplines include exams or tests as one of the main forms of assessment. These exams or tests typically include ongoing partial quizzes of certain sections within a unit as well as unit tests. These more limited unit tests are generally supplemented with multi-unit or term tests, most times coinciding with the end of a quarter or trimester. The most comprehensive exams are either a final or year-end exam, mostly supplemented with or split into mid-year or semester exams or in other cases with a year-end or semester project. SOTAH addresses the indicators to explore the combination of assessment formats and instruments in question Q3.6.

Another critical variable is the combination of items included within exams and tests. The type of items included within various assessments are related to what they can measure regarding actual student learning and mastery of the specific knowledge and skills relevant within the specific course. Most disciplines include several types of exams and tests with different proportions and composites of the various items included. Some assessment items focus on the evaluation of mastery of certain specific types of knowledge or application of skills. Sometimes specific courses use various sets of narrowly focused exams or tests, each with a single specific type of item as its main foci. After students complete each narrowly focused exam, teachers combine the results of these sets of narrowly focused tests to provide an overall composite assessment of student learning and mastery.

The variable of test items includes several indicators related to the most used evaluative items to measure competency or mastery. These include multiple choice questions, truth or false statements, short questions or problems expecting short answers or solutions. Some items are complex and long questions or problems requiring complex and multi-step elaboration, explanation and solutions. Other items include application of skills and different disciplines might include other alternative types of assessment items. SOTAH question Q3.7 addresses the indicators of different items included in assessment. This question explores the frequency teachers use these various assessment items: always or most of the time, regularly or about half of the time, or never/rarely. This will provide an indication of the predominant practices or trends using certain combinations of assessment items at NYC school.

Image VI.4



Source: summarizing direct and explicit instruction principles and personal teaching experience

Cognitive psychology and learning science demonstrate that there are four critical processes for learning: background knowledge, short and long-term memory coding, near and far transfer and metacognition (De Bruyckere, Kirschner, & Hulshof, 2020; Tulving, 1974; Whitman & Kelleher, 2016; Wiley et al. 2016; Willingham, 2020). These disciplines also demonstrate the effectiveness of six proven learning strategies reinforcing these processes: retrieval, spaced practice, interleaving, elaboration, dual coding and using different and relevant concrete examples to illustrate an underlying abstract concept (Pomerance, Greenberg & Walsh, 2016; Weinstein & Sumeracki, 2018). I explore these learning processes and strategies in two different ways. In the subsequent section on homework, I explore the application of the six learning strategies to different homework assignment scenarios or situations, as I will discuss later-on. Within this section on assessment, I focus on how these learning processes can be assessed through what educators call high-level thinking: critical-thinking and problem-solving skills and creativity. I examine these high-level thinking skills in SOTAH through the insights of cognitive psychology as summarized by De Bruyckere, Kirschner & Hulshof, (2020) and Willingham, (2020).

The key question guiding most of the accountability debates within education is to what extent assessment captures and measures the complex learning processes and mastery of knowledge and skills within a discipline. SOTAH addresses the practices of the teachers at NYC school regarding the application of the major learning processes underlying critical-thinking, problem solving and creativity in questions Q3.8 through Q3.13. This set of questions asks about how teachers assess learning by exploring if they intuitively understand the correct application of the learning concepts and processes behind the various higher-thinking skills mentioned. I also included a related question about retrieval. Each question has three scenarios: one correctly

applying a specific learning process to their assessments, a second one is a commonly misunderstood application of that process and the third one is “does not apply to my courses” option, which is also considered as misunderstood. One of the questions, Q3.12 has in fact, four scenarios but only one represents the correct application of the underlying learning process. The summary of this variable and related indicators is included at the end of this section.

A related variable to understand teachers’ views on student assessment is exploring the motivations informing their assessment decisions. In SOTAH question Q3.14, I articulate the indicators of motivation for assessment into five main drivers. First, the use of assessment to measure student learning progress by teachers and for improving their own instruction. Second, teachers doing assessments mainly because it is expected or required by their department, school (or district and state in public schools). Third, teachers viewing assessment as the means to increase student learning of contents and skills and students becoming aware of their own progress and/or areas for improvement. Fourth, to inform parents of student progress so they can help their children improve. The fifth indicator is other reasons. Each of these indicators could be the main reason for different teachers, and in some cases, most teachers might consider several of these indicators as reasons for assessment. Yet, I forced teachers to choose one as the primary motive to understand the main assessment motivation drivers at NYC school.

The SOTAH question Q3.15 explores student classroom engagement by inquiring about six indicators of assessment practices. One indicator is about students self-testing themselves through practice quizzes, which is a form of retrieval practice (we will address teachers providing practice tests in another question). The second indicator is about students self-testing themselves through purely retrieval practice: writing down on a blank piece of paper what they know on a topic. Additionally, there is an indicator about teachers providing opportunities for students to review and re-do partial or whole assessments when not meeting the standards (metacognition by correcting errors). There are also three additional indicators of student engagement. One indicator is about student support through school sponsored assessment preparation or tutoring. The other two indicators were related to teachers’ expectations of student performance in their courses and how teachers evaluate the actual student outcomes on standardized tests. The last choice was the exclusionary “none of the above” option.

A critical variable of assessment is the weighting of different categories or components of any student overall grade. SOTAH question Q3.18 articulates the indicators of the categories most used for grading and asks teachers to indicate the approximate percentage weight of the grade of each indicator. These categories included: final assessments (exam, product or performance), semester or multi-unit assessments (tests, products or performances), unit or section assessments (including section quizzes). Moreover, there were categories for on-going class assessment in the form of projects, labs, essays, performances, etc. The question also included grading categories and weights for homework assignments, class attendance/engagement or participation, or other forms of assessment. The two final questions of SOTAH assessment section inquire about the teachers’ use of formative or practice exams. Question Q3.19 is a simple yes or no option. When teachers responded yes, there was a subsequent question, Q3.20, exploring to what extent these non-graded formative assessments are based on similar criteria, formats and structures used in summative assessments.

Table VI.5

<u>SOTAH questions:</u> <u>Learning processes</u>	<u>Three possible options for application of learning processes:</u> <u>Correct, misunderstood and coded as misunderstood</u>
Q3.8. Assess student learning through exams or tests using retrieval processes (long and short-term memory coding)	<ul style="list-style-type: none"> • Recalling material unaided and without consulting notes, textbooks or other materials (correct application) • Aided by consulting their own notes, textbooks, materials or open-book exams (misunderstood if retrieval is the purpose) • Does not apply to my courses (coded as misunderstood)
Q3.9. Assess creativity through tasks involving application of knowledge and skills (near versus far transfer situations)	<ul style="list-style-type: none"> • Applying learned knowledge or acquired skills in novel ways or to very different contexts in low-stake situations (correct application) • Applying learned knowledge and skills to similar contexts in high stake situations (misunderstood) • Does not apply to my courses (coded as misunderstood)
Q3.10. Assess critical thinking skills as students develop specific knowledge (long and short-term memory coding)	<ul style="list-style-type: none"> • Applying and developing competencies and mastery over long-term, gradually, progressively and slowly (correct application) • Applying and developing competencies over the short term (misunderstood) • Does not apply to my courses (coded as misunderstood)
Q3.11. Assess critical thinking by evaluating process to reach conclusion (near versus far transfer)	<ul style="list-style-type: none"> • Self-directed processes following subject matter conventions and standards, without emotion interfering with reason or the cannon (correct application) • Following instructions and guidelines, completing every step with accuracy and fidelity (misunderstood) • Does not apply to my courses (coded as misunderstood)
Q3.12. Assess overall student learning of subject (long and short-term memory coding)	<ul style="list-style-type: none"> • Growth and progressive build-up of knowledge and skill competencies (correct application) • Accuracy and growth of knowledge -separate from skills (misunderstood) or • Develop skill competencies -separate from knowledge (misunderstood) • Does not apply to my courses (coded as misunderstood)
Q3.13. Assess transfer of knowledge and skills capacity to other contexts (near versus far transfer)	<ul style="list-style-type: none"> • Very different and dissimilar contexts but providing scaffolding or guiding cues (correct application) • Similar or closely related contexts (misunderstood) • Does not apply to my courses (coded as misunderstood)

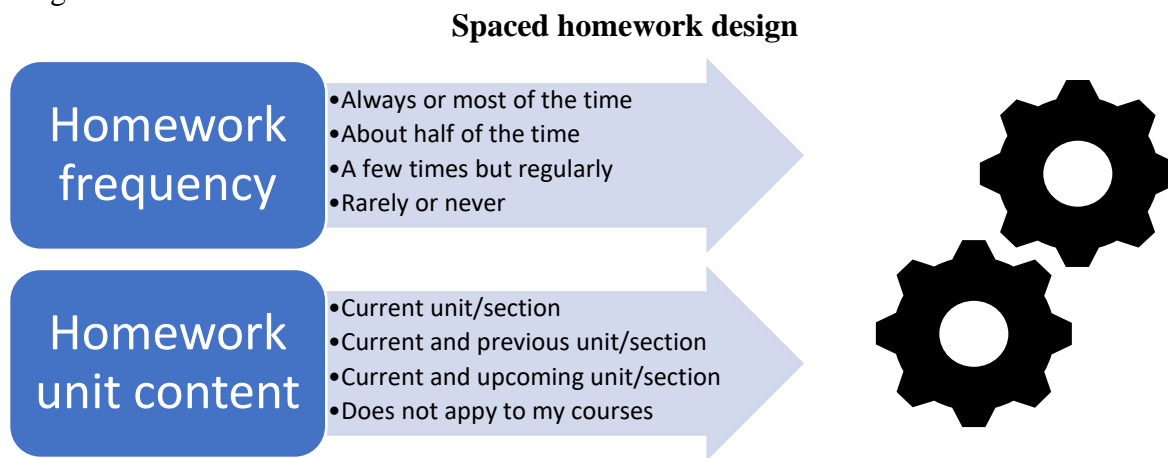
Source: summarizing insights from cognitive psychology on critical thinking, problem solving and creativity by De Bruyckere, Kirschner & Hulshof (2020) and Willingham (2020).

VI.1.3. Specific variables and indicators of homework

Two of the most impactful variables on homework effectiveness are their frequency and the unit content characteristics of the assignments, which together are the basis for spaced homework design. SOTAH question Q4.6 asks teachers at NYC school how frequently they require students to do homework or class preparation. The indicators were four simple statements related to frequency: always or most of the time, about half of the time, a few times regularly for every unit and the last option was rarely or never.

The unit content characteristics for retrieval and spaced practice is also critical and it was addressed in SOTAH question Q4.7. The indicators of unit contents and spaced practice were four statements about the format of the design and the materials included in the homework assignments according to: the current unit or product (non-spaced retrieval and practice), the current and past sections and units or products (retrieval and spaced practice), current and future sections and units or products (retrieval and preview of upcoming material or asynchronous preparation). The fourth choice was the exclusionary “does not apply to my courses” option. Different departments and disciplines will likely have different approaches to homework assignments as will different teachers. However, when considered together, homework frequency and the unit contents of the assignments are a powerful tool for learning through retrieval tasks and spaced homework design. SOTAH explores the extent to which teachers use these tools to their maximum advantage.

Image VI.6



Source: own elaboration to explore spacing in homework

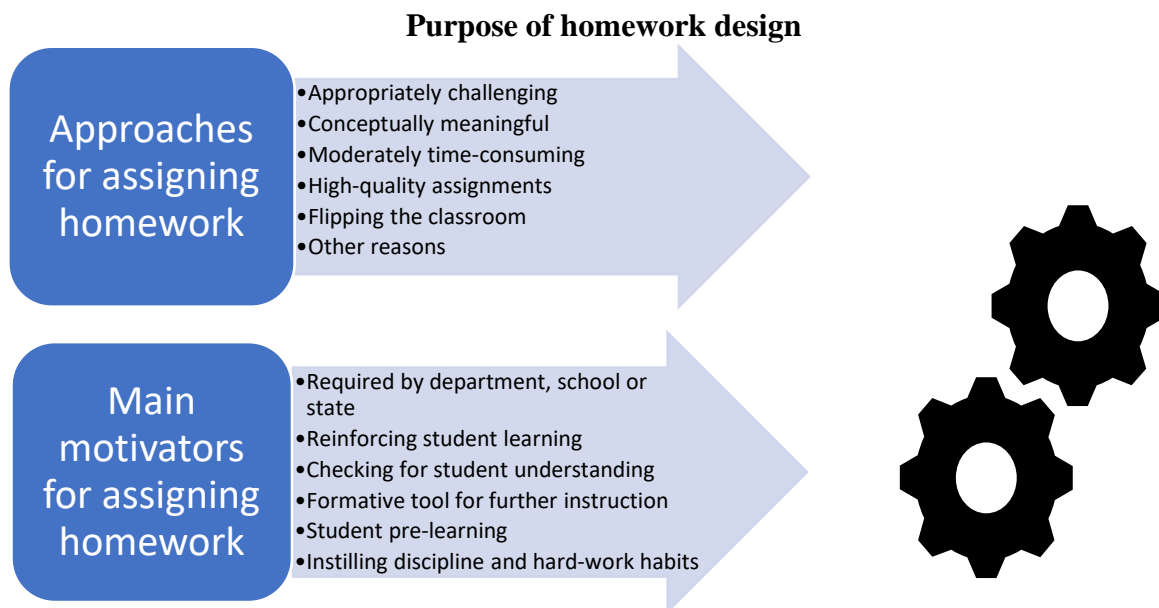
It is also insightful to explore how teachers perceive student engagement with homework. This variable is addressed by SOTAH question Q4.8 with a set of hybrid indicators exploring several aspects of homework. The first two indicators are about the use of evidence-based learning strategies in homework assignments. One is the use of interleaving: changing the order for doing or reviewing the materials. The other one is the use of concrete examples to illustrate the abstract concepts studied in the class as a part of homework assignments. The other four indicators are about the perception of teachers regarding student homework practices by exploring the following characteristics: the school providing mandated study time within its facilities, the agency of students at completing homework on their own initiative during free periods or time,

whether students complete all their homework, and finally the perceived quality of the students completed homework and preparation tasks. The seventh indicator was the exclusionary “none of the above” option.

At the core of the problems of practice at NYC school is the issue of homework load, as it is also an issue in other public and private schools. More specifically, the key issue is the time required of students to complete their assignments since excessive homework time is often in conflict with time required for other co-curricular activities. SOTAH addresses this issue in question Q4.9 which explores teachers’ time expectations for their students completing their courses daily homework assignments. There are six indicators grouping the expected time within the most common time-frames: above 1 hour (61 minutes or more), between 46 to 60 minutes, between 31 to 45 minutes, between 16 to 30 minutes, between 6 to 15 minutes or less than 5 minutes to no time at all, per class/session. The time expectations and homework load assigned by teachers is typically not only related to the characteristics and demands of their courses but also related to the purpose and the motivation behind the design of the homework assignment.

A critical element of homework design is the purpose behind it. This includes two variables: the teachers own pedagogical approaches or beliefs as well as the main motivations behind those beliefs. SOTAH addresses these two variables in questions Q4.10 and Q4.11. The variable of homework approaches has six indicators assessing the underlying teachers’ beliefs about what is the most important criteria for assigning and designing homework assignments in specific ways. These six indicators are that homework should be appropriately challenging (not too easy or too difficult), conceptually meaningful and engaging, moderately time-consuming, high quality (over high quantity), as a preview for class discussion or for flipping the class, or as for other reasons. Forcing teachers to choose one of these indicators provides insights about the teachers’ primary approach, although most teachers otherwise would likely choose several indicators as relevant.

Image VI.7



Source: own elaboration from literature insights to explore purposes in homework design

The variable of homework motivation underlying the various teachers' approaches and beliefs also has six indicators about the primary driver of that motivation. These six indicators are that teachers assign homework because: the department, school or state requires it, it is critical for reinforcing student learning, as a way of checking for student understanding, as a formative tool to inform instruction, as an asynchronous mechanism for pre-learning of upcoming material to be discussed in class, as a discipline inducing tool for hard-work habits. The seventh indicator is the exclusionary belief that teachers should not assign homework at all.

Regardless of the purpose and time expectations of homework assignments, I wanted to explore if teachers at NYC school understand the six evidence-based learning strategies when applied to specific homework scenarios or situations. This is also an attempt to triangulate their understanding of the effectiveness of these learning strategies in a different context than direct instruction. SOTAH questions Q4.14 through Q4.20 explore seven scenarios (the six proven learning strategies plus metacognition through generation) inspired by the learning scenarios originally created by McCabe (2011), modified by Morehead et al. (2016) and applied to teachers' understanding of evidence-based learning strategies by Boser (2019). I slightly modified these scenarios and adapted them as homework assignments (see appendix D). Each scenario includes three questions about the specific conditions under which students will learn more versus conditions under which students will not learn as much.

These seven homework learning scenarios ask teachers at NYC school to select what options reflect the specific conditions of the assignment (A or B options) that will result in more student learning or if they think students will learn about the same under both conditions (option C). Each scenario is an example of using correctly or incorrectly the six learning strategies (retrieval, spaced practice, interleaving, elaboration, dual coding and using different and relevant concrete examples to illustrate an underlying abstract concept) plus metacognition through original self-generation of mnemonic devices. One of those three conditions is the correct answer and the other two are incorrect: I changed the order of the correct answers between A and B, but C is always incorrect.

Table VI.8

<i>SOTAH questions with homework scenarios</i>	<i>Homework assignment including evidence-based learning strategies</i>	<i>Homework assignment including misunderstood learning strategies</i>
Q4.14. Concrete examples	Different or apparently unrelated concrete examples illustrating an underlying abstract concept	Abstract concept definition or similar concrete examples to underlying abstract concept
Q4.15. Dual coding	Simultaneous dual coding	Sequential (before or after) dual coding
Q4.16. Elaboration or elaborative questioning	Elaborative questioning by asking proving questions: How, what, when, why, etc.?	Memorizing concept definition or sequential steps in procedure
Q4.17. Metacognition (original generation)	Metacognition through original self-generation of mnemonic devices	Metacognition by providing already created mnemonic devices by others
Q4.18. Retrieval practice	Retrieval practice by writing on blank page what was read without notes or materials	Reviewing by re-reading what was read and consulting notes or materials
Q4.19. Interleaving	Changing the order and sequence of doing tasks, reviewing different concepts or solving different problems	Blocking or massing the same sequential order to do tasks, reviewing the same or similar concepts or solving sets of similar types of problems
Q4.20. Spaced practice	Spaced reviewing, studying or doing tasks in short but frequent subsequent segments of time through a long period	Massed practice reviewing, blocked studying, doing a single task through a very long segment of time

Source: adapting learning scenarios originally created by McCabe (2011), modified by Morehead et al. (2016) and as used by Boser (2019) for homework assignment scenarios (see appendix D)

VI.2. Data results on assessment and homework practices

The problems of practice around assessment and homework are linked to the patterns discussed regarding instructional approaches but senior leaders emphasized a different set of challenges and opportunities for each. Regarding assessment at NYC school, the main concern by senior leadership was that the actual practices by divisions do not align with each other. According to school leaders, the middle division uses more traditional formats of summative assessments and mainly traditional tests and grading. By contrast, school leaders thought that the elementary and upper divisions tend to be more progressive in the types of assessments teachers use to evaluate learning, even if some courses also use some more traditional assessment practices.

Regarding homework, the school senior leadership concern was more practical. The main concern was about the time limits that could contribute to improve and provide balance to NYC school students' academic and co-curricular commitments. The primary focus of concern is related to the fact that the current school's policy establishes 45 minutes of homework per day/subject at the upper division and 20 to 30 minutes of homework per day/subject at the middle division. The established homework policy translates into roughly 3 to 4 hours of homework per day at the upper school for most students taking all 5 required academic subjects. At the middle division the established policy results in about 2 to 3 hours per day. The current homework time is even higher when considering commitments to performing arts preparation time and even more so when also considering the time commitment for other co-curricular programs. Either way, this policy implies that the after class academic homework commitment exceeds the high end of that range of what most administrators, researchers and parents consider appropriate or effective. According to senior leaders, current homework time commitment does not seem to be conducive to a balance of academic and co-curricular programs to provide the best overall educational experience and opportunities for NYC school students. Similarly, the senior leadership would like to improve its homework effectiveness for student learning and redefine the school's homework policy if needed, so homework is a more integral and effective tool for learning even with less time dedicated to it.

VI.2.1. Evidence on assessment and homework practices from the semi-structured interviews

During the semi-structured interviews with department chairs, they agreed on certain aspects with the views of senior leaders, but their views were also slightly different. Department chairs viewed their faculty members as using a variety of assessment tools and approaches, including quizzes and unit tests, multi-unit semester or final exams as well as term or year-end projects, depending on the division and courses. Most department chairs emphasized that "all courses include multiple forms of assessments" such as labs or essays, on-going projects, presentations, performances or alternative approaches. The assessment practices within their departments were presented as part of the expectations for different courses, with varied levels of sophisticated curriculum or skills more than a dichotomy of traditional versus progressive types of assessment between the middle and the upper divisions. In fact, department chairs considered that, "the variety of assessment approaches emphasize mastery of skills of materials learned." The differences in assessment practices were attributed rather to individual teacher instructional approaches and the student mastery of the materials and skills' expectations within the various courses and related disciplines. The exception was performing and visual arts courses, that

except for their academic courses such as art history, typically do not provide assessments. Instead of assessments, art courses use progress rubrics emphasizing creativity for artistic artifact creation or progress rubrics about performing-based skills. Either way, department chairs valued the great variety and combination of assessment practices or progress rubric strategies.

Regarding homework, department chairs considered that their faculty members followed time limits set by school policy. In fact, most department chairs stated, “generally, teachers assign homework that requires less time to complete than the limits established by the school.” The only exception department chairs mentioned were, “some highly demanding courses such AP courses and some Honors courses require more homework for students to be successful.” Most department chairs view homework as an instructional tool to reinforce learning of the material studied in class. A couple of department chairs also mentioned that, “in more advanced courses, homework is used as a pre-study of material to be explained in class or discussed in a seminar-type format.” One department chair also mentioned that, “a couple of courses use homework as part of the strategy for flipping the class.” Performing and visual arts courses typically do not require homework except AP related courses. Similarly, although these courses do not require homework, they do demand skill-based practice as well as production preparation, which in many cases is equivalent timewise to homework expectations in academic disciplines. As an arts department chair stated, “production time can take as much as 4 or 5 hours per week for certain art events.” In the interviews, I did not include sport coaches to assess the athletic program demands of student time, but we can safely assume that it requires practice and game time.

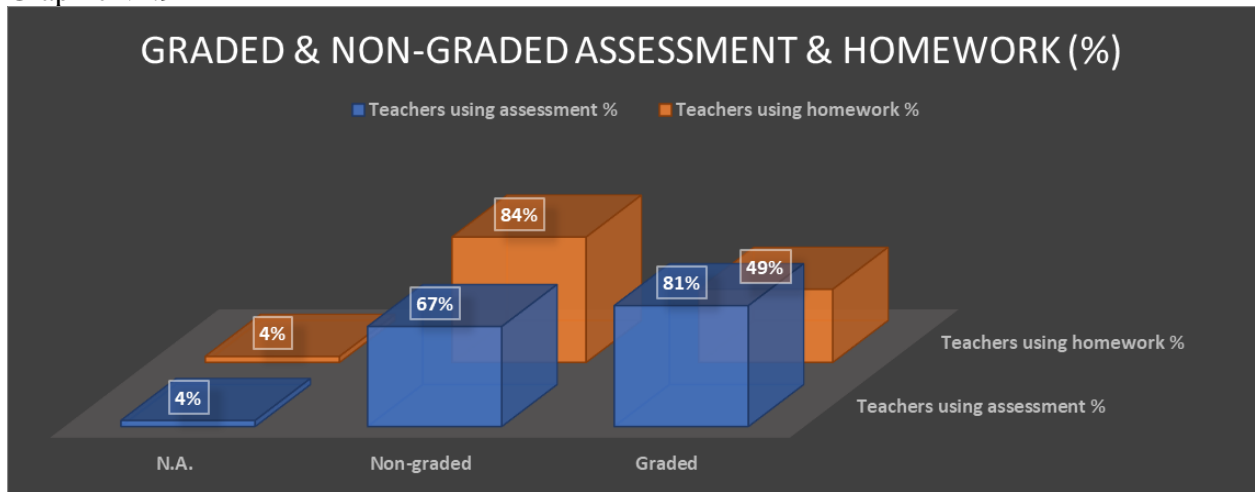
VI.2.2. Evidence from SOTAH common variables on assessment and homework practices

To explore teachers’ practices at NYC school about assessment and homework requires an understanding of the use of graded and non-graded assignments within these two variables. SOTAH addressed the variables of summative (graded) and formative (non-graded) assessment in Q3.4 and evaluative (graded) and instructional (non-graded) homework in Q4.4. The possible answers allowed teachers to choose graded, non-graded or both. Alternatively, they could choose the exclusionary answer of “not applicable to my courses” option.

The great majority of teachers or 81% of them selected as one or both of their answers that they use graded assessments. A slightly lower but still a considerable majority of the teaching faculty or 67% also selected that they provide non-graded assessments. Thus, most of the teachers providing graded assessments also provide non-graded assessments. Only 4% of the teachers selected that providing assessments (graded or non-graded) is not applicable to their courses.

When the teachers at NYC school were asked in SOTAH question Q4.4 about the use of graded and non-graded homework assignments or other forms of class preparation work, their answers make clear that most teachers do assign both. However, the great majority of teachers at NYC school, 84% of the respondents use homework or other forms of class preparation as a non-graded or instructional tool. Close to half or 49% of the teachers also use homework as a graded or evaluative tool. Only 4% of the teachers selected not giving any form of graded or non-graded homework assignments or any other form of class preparation.

Graphic VI.9



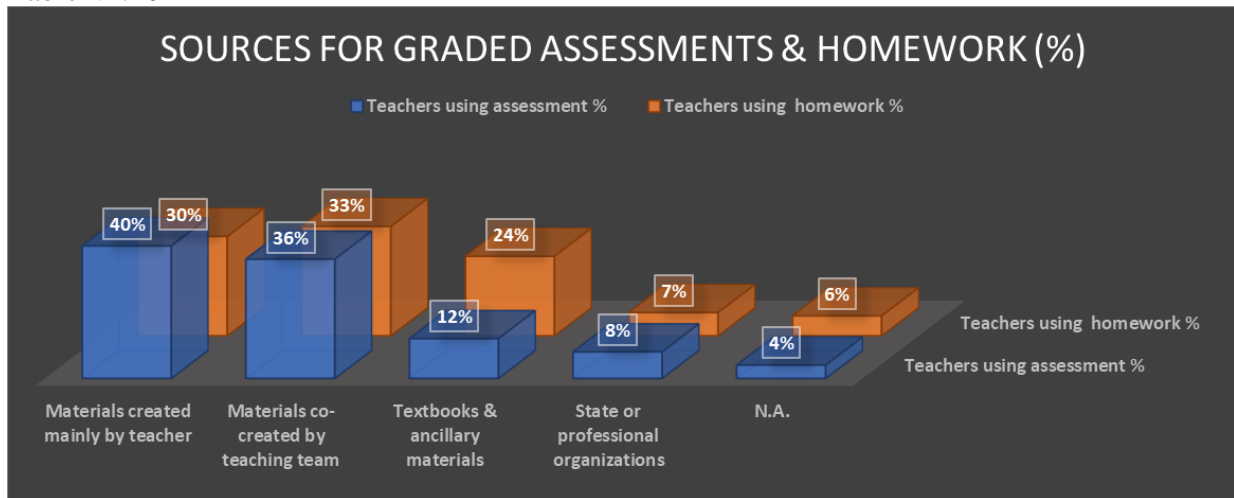
Source: SOTAH responses Q3.4 & Q4.4

When addressing the primary sources for assessment and homework design, we can expect some level of consistency between both. After all, the design of assessment and homework assignments are closely related to lesson planning and instructional strategies and materials for specific courses and disciplines. The degree of teachers’ autonomy and self-efficacy can affect how teachers decide, select and use different types of sources and materials for assessment and homework. SOTAH questions Q3.5 on the sources for assessment and Q4.5 on the sources for homework assignments forced teachers at NYC school to choose only one of the four stated sources as their primary one or alternatively the exclusionary “not applicable” option.

The greater percentage of teachers, at 40%, agreed with the statement that they individually created their own assessment materials. This was closely followed by 36% of the teaching faculty agreeing with the statement that their main sources for graded assessment materials was the result of their collaboration with their teaching team and colleagues in their department. At much lower percentages, 12% of the respondents agreed with the statement that the main source for their assessment was the textbook and related ancillary materials while 8% agreed that the main source was derived from professional organizations (the College Board or others) or the state. As in the previous question, only 4% of the teachers selected that graded assessment is not applicable to their courses.

Teachers at NYC school use similar sources for homework and other class preparation assignments than they use for assessment. However, there are some important changes in the relative proportions of how these sources are used as their primary sources for homework. The top one is the materials co-created by teaching teams at 33% but there is a clear reduction on the use of homework assignments created by the individual teachers to 30% (from 40% for assessments) whereas the use of textbooks and their ancillary materials jumps to 24% (compared to 12% for assessments). About 6% of the teachers report that homework assignments are not applicable to their courses. After these common variables to homework and assessment, we need to focus on SOTAH data results from the different specific variables associated with the discrete functions and characteristics of each of these two key instructional tools.

Table VI.10



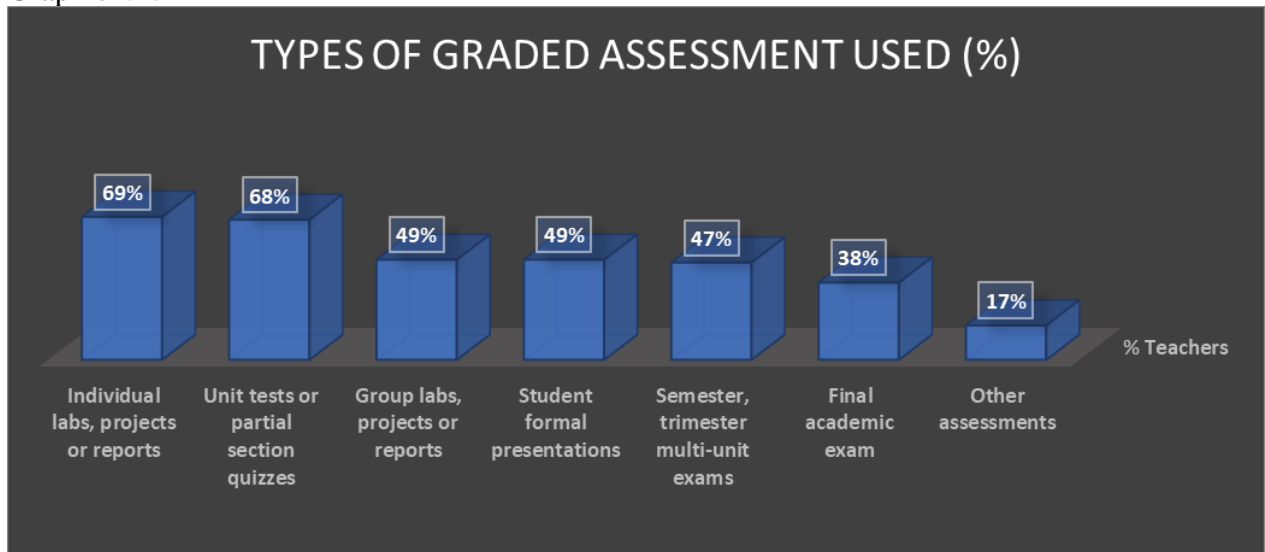
Source: SOTAH responses Q3.5 & Q4.5

VI.2.3. Evidence from SOTAH on specific variables of assessment practices

Assessment typically involves a combination of multiple instruments, formats and tools. There are three major types of graded assessments used by most disciplines. First, a variety of academic exams or tests. Second, different complex works or projects demonstrating the application of knowledge and skills to specific final products. The third one can be a combination of different forms of alternative assessments. One of the issues this capstone project intends to report on is to what extent teachers use these different types of graded assessments. Through SOTAH question Q3.6, teachers at NYC school could choose one, several or all the seven types of assessment stated as possible answers. These choices included final exams; semester, trimester or multi-unit exams; unit exams or partial quizzes; individual or group labs, projects, reports or artistic artifacts or performances; student formal presentations and finally other types of assessment.

The majority of teaching faculty at NYC school that completed this section of SOTAH use most frequently two types of assessment among the seven possible choices. Indeed, 69% of the teachers use individual labs, projects or reports. Just a slightly lower percentage or 68% of the teachers also use on-going unit tests or partial section quizzes most frequently. These were followed by two types of assessment used by close to half of the teachers. About 49% of the teachers use group labs, projects or reports. The same proportions of 49% of the teachers also use student formal presentations as graded assessments. Very close to those proportions, 47% of the teachers selected using semester, trimester or multi-unit exams. Next, about 38% of the teachers selected using final exams too. The lower percentages were the 17% of the teachers that selected using other graded assessments.

Graphic VI.11



Source: SOTAH responses Q3.6

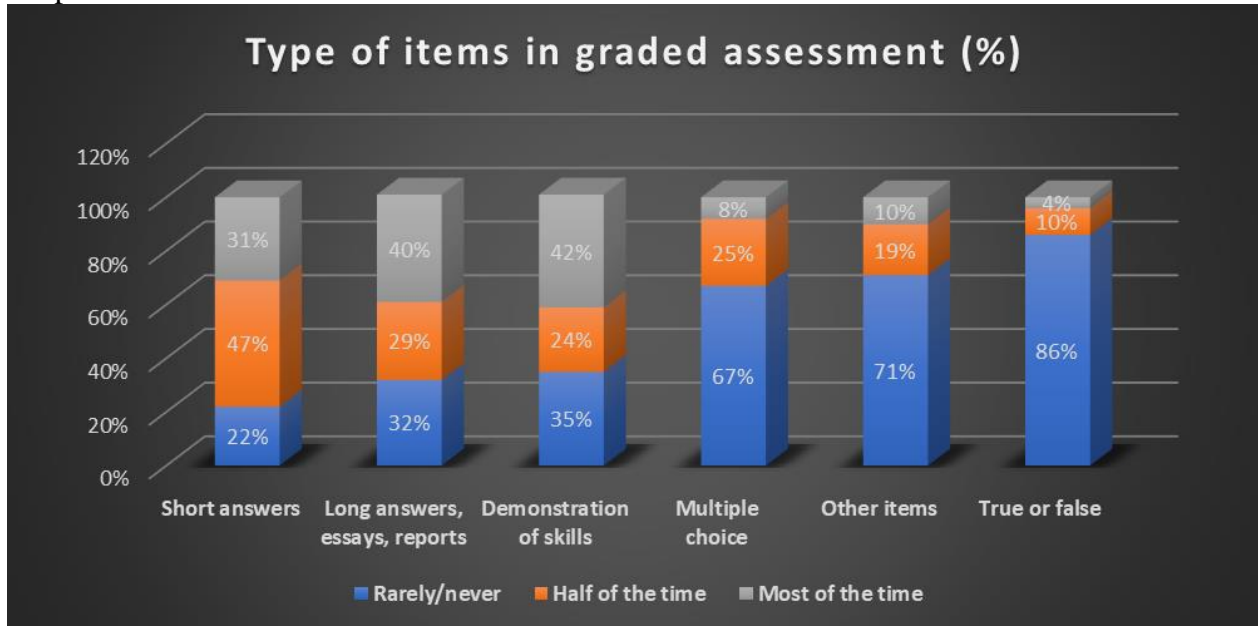
The effectiveness of assessment is not based only on the combination of different formats and instruments throughout the year. Another critical element is the type of items included within those various assessment instruments and whether they can capture and measure actual student learning and mastery of the subject matter. SOTAH inquires in question Q3.7 about the type of items included in graded assessments. The possible answers included six items: multiple choice, true or false statements, short answers, long answers (complex problems, reports or essays), demonstrating specific skills, or other types of assessment items. Teachers had to select the frequency they use for each of these six items in their assessments: Always/most of the time, regularly/half of the time; never/rarely.

There are three types of assessment items used by most teachers more frequently than other items. The majority of teachers at NYC school selected short answers to questions or problems as the most frequently used item, which 31% of the teachers agreed they use most of the time and 47% of the teachers use on a regular basis versus 22% of the respondents agreeing that they never or rarely use this item in their assessments. At similar levels, 40% of the teachers agreed with the statement that they use complex questions or problems requiring long answers, essays or reports most of the time while 29% of the teachers use them regularly versus 32% of the respondents stated that they never or rarely use this item in their assessments. The third item used most frequently is demonstration of specific skills, which 42% of the teachers agreed that they use most of the time, 24% that they use this item regularly versus 35% of the respondents stating never or rarely using this type of item in their assessments.

Teaching faculty use at much lower rates multiple choice, true or false questions or other alternative items. About 8% of the teachers use multiple choice types of items on their assessments most of the time and 25% regularly use them versus 67% stating that they never or rarely use this type of assessment item. Similarly, 10% of the teachers selected that they use most of the time other types of items and 19% of the respondents stated they use other types of items regularly versus 71% of the teachers stating that they never or rarely use other types of items in

their assessments. The lowest frequency was the use of true or false type of items: only 4% selected using this type of assessment item most of the time, 10% selected regularly versus 86% of the respondents selected never or rarely using true or false statements.

Graphic VI.12



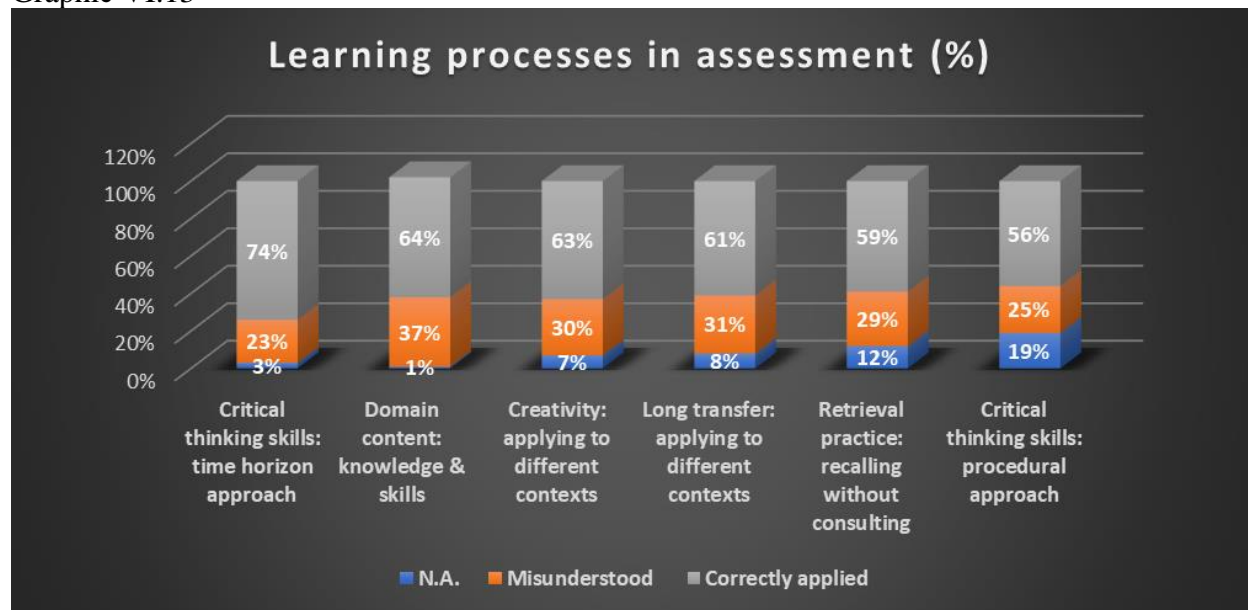
Source: SOTAH responses Q3.7

The following set of questions in SOTAH, Q3.8 through Q3.13, inquired about teachers’ beliefs on what type of learning processes their assessments are measuring. This set of questions explore the intuitive understanding of teachers about the most effective assessment practices for developing student metacognitive, critical thinking, creativity and problem-solving skills. There were three possible answers to each question about their assessment practices. One was a statement that correctly applied the best strategy according to what we know from cognitive psychology research on learning processes. The answers of the teachers selecting this option were classified as “correctly understood” the process. The second one was a typically misunderstood answer based on neuro-myths and other commonly accepted false fads about learning. The answers of the teachers selecting this option were classified as “misunderstood” the application of this specific learning process. The third was an exclusionary statement that the specific learning process in the question did not apply to their courses’ assessment, which for practical purposes was also coded as a “misunderstood” application. An average of 63% of the teachers at NYC school correctly understood the application of certain learning processes to their courses’ assessment, while 29% as an average misunderstood those applications or 8% as an average thought that these processes did not apply to their courses’ assessment practices.

The majority of teaching faculty understand and correctly apply the learning processes involved in assessment. The correct application was the highest regarding the time horizon needed for students to acquire and develop critical thinking skills, which was correctly identified by 74% of the respondents. Paradoxically, the lowest percentage of teachers, 56% of the respondents, correctly understand the procedures to support the development of critical thinking skills. In

between these two ranges, the majority of teaching faculty also correctly understand the application of learning processes to their assessment practices. About 64% of teachers understand the simultaneous development of content knowledge and skills. Similarly, 63% of the teachers correctly understand the process of applying learned knowledge and skills to different and diverse contexts to support student creativity. At slightly below levels, 61% of the teachers understand the application of far transfer of knowledge to a new or different context or situation to develop students critical thinking skills. The second lowest percentage was regarding long-term memory coding, which is related to one of the six evidence-based learning strategies. About 59% of teachers correctly understand the application of retrieval or recalling without consulting materials as an effective strategy for learning.

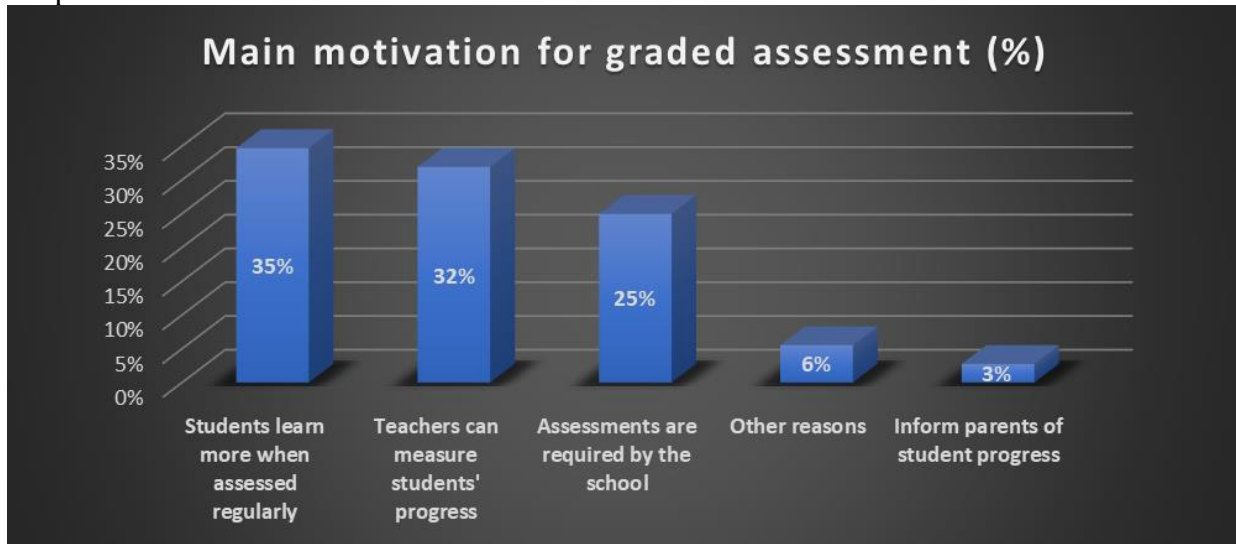
Graphic VI.13



Source: SOTAH responses Q3.8, Q3.9, Q3.10, Q3.11, Q3.12, Q3.13

A key variable to situate assessment as one of the crucial instructional strategies is to understand teachers' motivations informing their assessment decisions. Teachers at NYC school were asked to choose among five statements in SOTAH question Q3.14 about their primary motivation to assess students' knowledge and skills in their subject matter. Indeed, the highest percentage of teachers, 35% of the respondents, express agreement with the statement that regular assessments encourage student learning. This answer was closely followed by 32% of the teachers emphasizing their agreement with the statement that their motivation for assessment was mainly to measure students' progress acquiring knowledge and skills. When we combine two of the most frequently selected motivations of the respondents, they represent 67% of the teachers agreeing with either assessment as useful for student learning or for measuring student learning progress. About 25% of the teachers also selected a third one, as their main motivation: that assessments are expected and required by the school. The other choices were considerably lower, with 6% selecting the statement that their motivation for assessing students are due to other reasons. Only 3% agreed with the statement that the main motivation is to inform parents of the students' progress.

Graphic VI.14

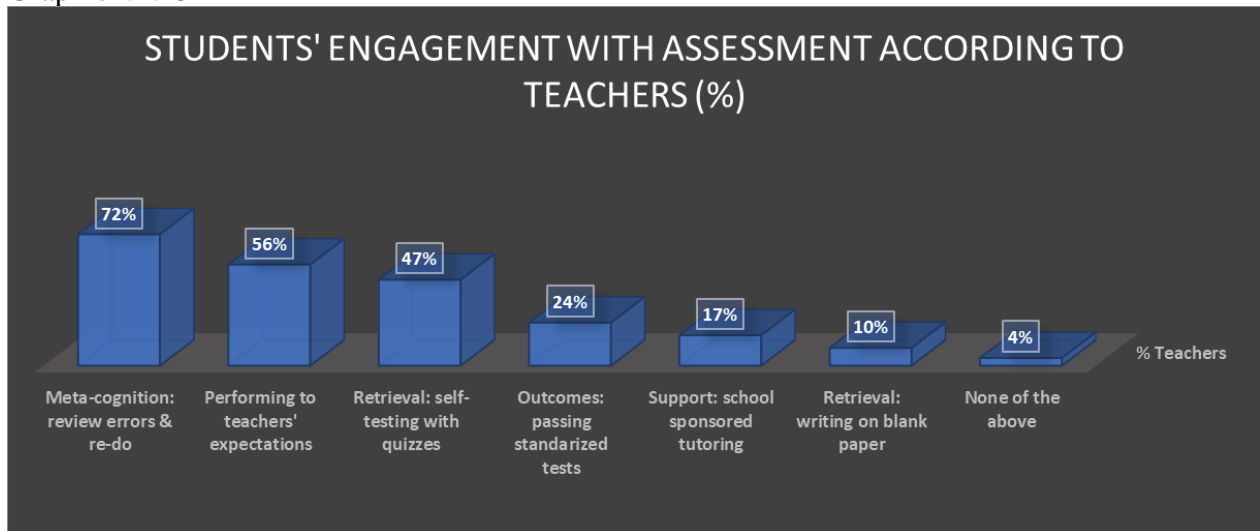


Source: SOTAH responses Q3.14

This capstone project also explores the modalities of student engagement with assessment according to the teaching faculty at NYC school in SOTAH question Q3.15. This inquiry included a battery of seven statements. Teachers could choose one, several, all or alternatively choose the exclusionary “none of the above” statement. Three of the statements referred to the use of retrieval or metacognitive strategies (students’ self-testing, practice tests and reviewing and correcting errors). The other three indicators of student engagement ranged from student’s assessment performance up to the level of teachers’ expectations, student outcomes in their standardized tests and finally, an indicator about the extent the school provides student assessment support through sponsored tutoring.

Teachers’ level of agreement with student engagement statements regarding assessment varied widely. Again, the highest level of agreement was with using metacognitive strategies for reviewing and correcting errors by 72% of the teachers. This was followed by 56% of the teachers agreeing with the statement that students perform to their expectations. The third highest level of agreement, at 47% teachers related to the statement that students engage in assessment through self-testing, which is one of the evidence-based learning strategies of retrieval practice. Paradoxically, only 10% of the teachers agreed that students use another effective retrieval practice: writing what they remember they learned on a blank piece of paper. There were two other indicators of student engagement. One is a way of triangulating student performance related to standardized tests (instead of the previous indicator of performance according to teachers’ expectations). About 24% of teachers selected that students perform at passing levels on standardized testing. The last item is more related to student support structures at the school: 17% of teachers agreed that students receive school sponsored tutoring to enhance their assessment performance. Only 4% of the teachers selected that none of the above applies to their student engagement with assessments.

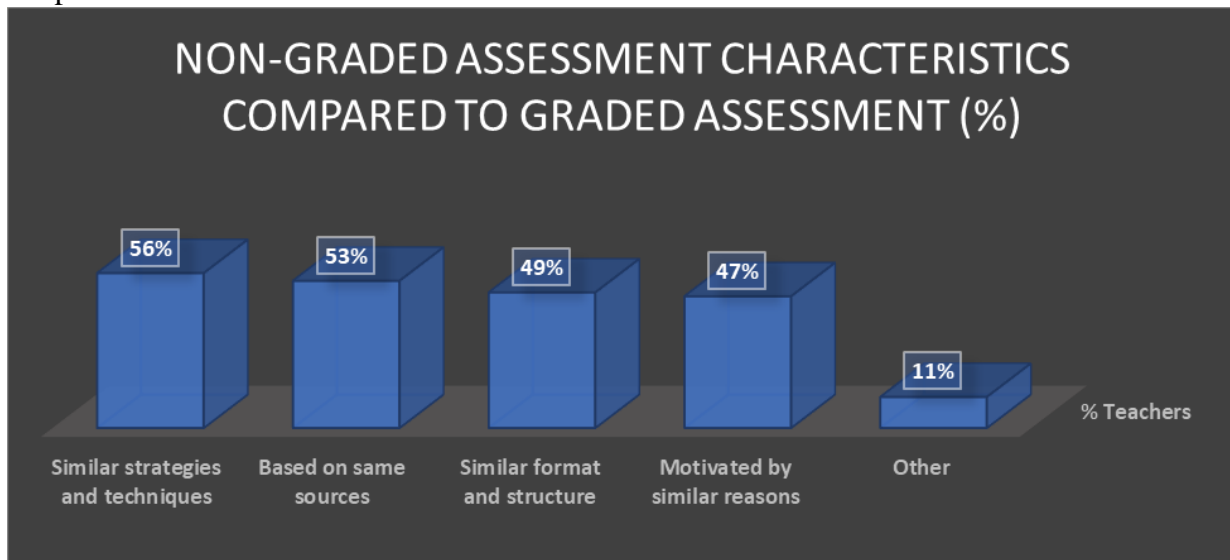
Graphic VI.15



Source: SOTAH responses Q3.15

I also tried to triangulate the actual level of non-graded formative assessment in the form of practice tests and the similarities in criteria, format, and structure to summative assessments. This was addressed in SOTAH question Q3.19 and the large majority of teaching faculty (82% of the respondents) at NYC school selected that they indeed use practice tests in addition to their summative graded assessments. An affirmative answer to this question channeled the respondents to a follow-up question regarding the characteristics of their non-graded assessments versus their graded assessments. SOTAH question Q3.20 explores the similarities strategies and techniques between modalities of assessments as well as the sources, format/structures and motivations informing the usage of non-graded compared to graded assessments.

Graphic VI.16

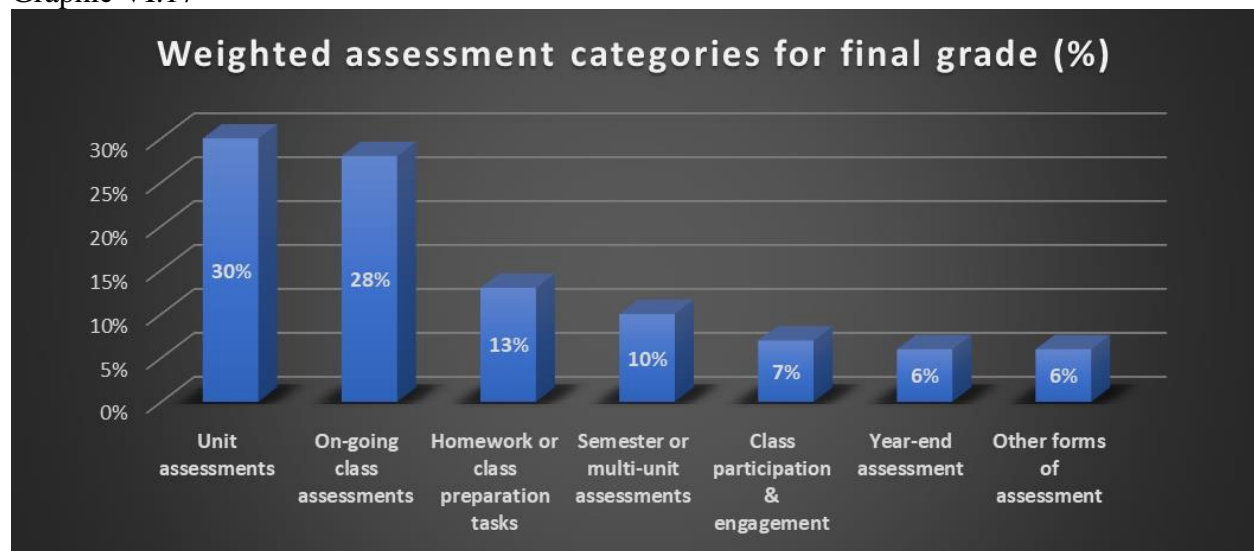


Source: SOTAH responses Q3.19, Q3.20

Above half, 56% of the teachers selected using similar strategies and techniques with graded and non-graded assessments while 53% of the teachers selected that the sources for crafting and designing both types of assessments are the same. Slightly below half or 49% of the teachers agreed with the statement that both graded and non-graded assessments use similar formats and structures and 47% of the teachers view their motivation to use both, graded and non-graded assessments, based on similar reasons. Only 11% of the teachers selected other characteristics as to describe the differences and similarities between their graded and non-graded assessments.

Since assessment involves many aspects, components and elements to evaluate student learning, a critical variable of assessment is the weighting of different categories for student overall grade. SOTAH question Q3.18 articulates the indicators of the categories most used for grading and ask teachers to indicate the approximate percentage of the grade of each indicator. These categories included: final assessments (exam, product or performance); semester or multi-unit assessments (tests, products or performances); unit or section assessments; on-going class assessment in the form of projects, labs, essays, performances; homework or class preparation assignments; class attendance, engagement or participation; or other forms of assessment..

Graphic VI.17



Source: SOTAH responses Q3.18

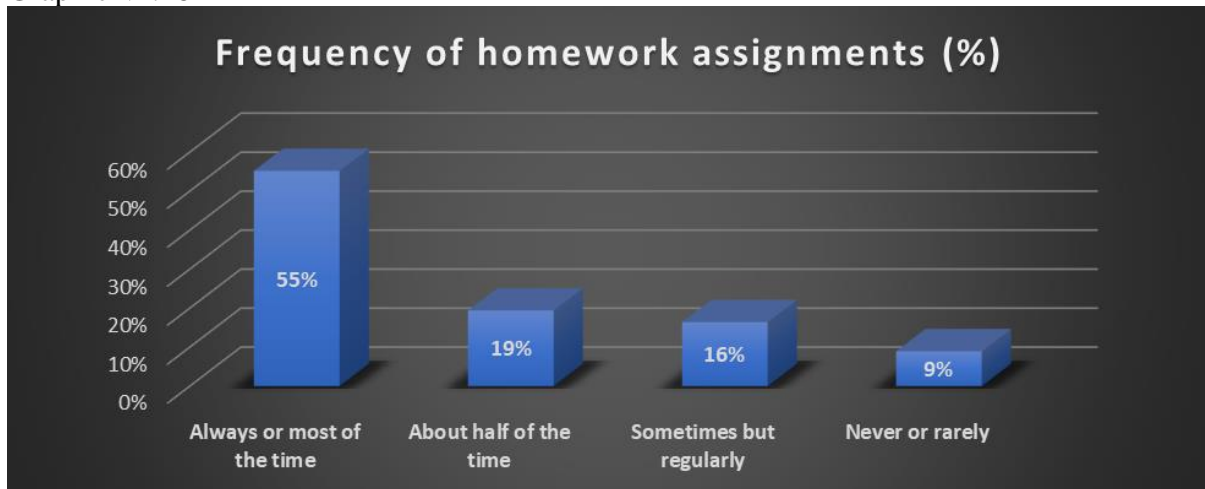
The means of the total values reported by the respondents provide an overall guide of average weight of each category or component of the final grade. Unit or section quizzes average 30% of the final grade while on-going class assessments average 28% of the final grade. These two categories, unit exams and on-going class assessments are the major drivers for the overall student grades and tend to count for 55%-60% of the final grade when combined. These are followed by homework or class preparation, typically counting an average of 13% towards the final grade and semester or multi-unit assessments, which weighted about 10% of the final grade. When combined, homework and multi-unit or semester exams represent almost 20% - 25% of the overall final grade. The tail end of the weight for the overall student final grade are formed by the components of class engagement or participation (7%), year-end assessments (6%) and other

forms of assessment (also 6%). These three components, when combined represent about 15%-20% of the final grade.

VI.2.4. Evidence from SOTAH survey on specific variables of homework practices

Like assessment and instructional practices, two of the most impactful variables on homework effectiveness is its frequency and the unit content characteristics of the assignments. The concept of frequency of homework or asynchronous class preparation are closely related to retrieval and spaced practice. Since we know from learning science that these are the two most effective learning strategies, it is important to explore the frequency of this practice. SOTAH explores the frequency of homework and class preparation in question Q4.6. This question includes four statements or indicators of frequency: always or most of the time, about half of the time, a few times but regularly for every unit and the last was rarely or never. The majority of teaching faculty at NYC school, 55% of teachers assign homework or other class preparation assignments always or most of the time. A second group of 19% of teachers assign homework about half of the time. About 16% teachers assign homework only sometimes but regularly. Only 9% selected rarely or never assign any type of homework or class preparation.

Graphic VI.18

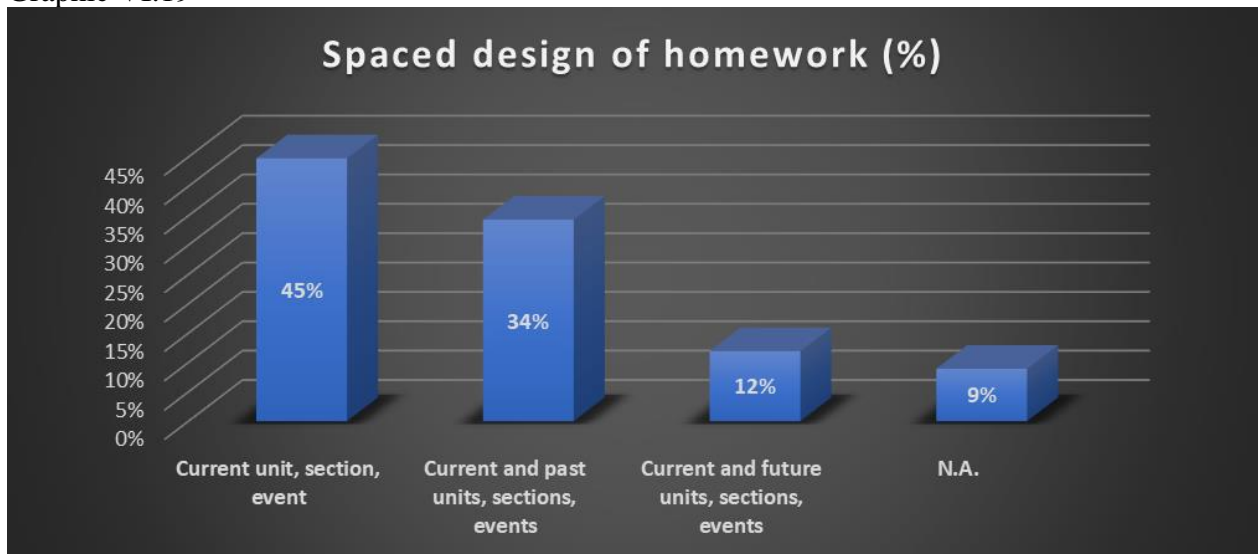


Source: SOTAH responses Q4.6

The homework content characteristics is what makes the frequency most relevant regarding the combined use of retrieval and spaced practice. SOTAH question Q4.7 includes a set of indicators for unit contents through four statements about the format of the design and the materials included in the homework assignments. One is using homework focused on the current unit or product (non-spaced retrieval and practice). The second, is mixing materials from the current and past sections and units or products (combined retrieval and spaced practice). The third one is mixing materials from the current and future sections and units or products (preview of upcoming material or asynchronous preparation). This is a different form of combined retrieval and spaced practice. The fourth choice was the “do not apply” to my courses option.

Almost half of the teachers at NYC school, 45% of the respondents, design homework and other class preparation assignments for reinforcement of material studied in class during the current unit, section or event. About a third or 34% of teachers use homework as combined retrieval and spaced practice: incorporating both current and previous material in their homework design. At a lower rate, 12% of teachers combine current material with upcoming or future material, which is a different form of combined retrieval and spaced practice. The lowest level of agreement was the 9% of teachers selected that neither of the previous three options applied to their courses or disciplines.

Graphic VI.19



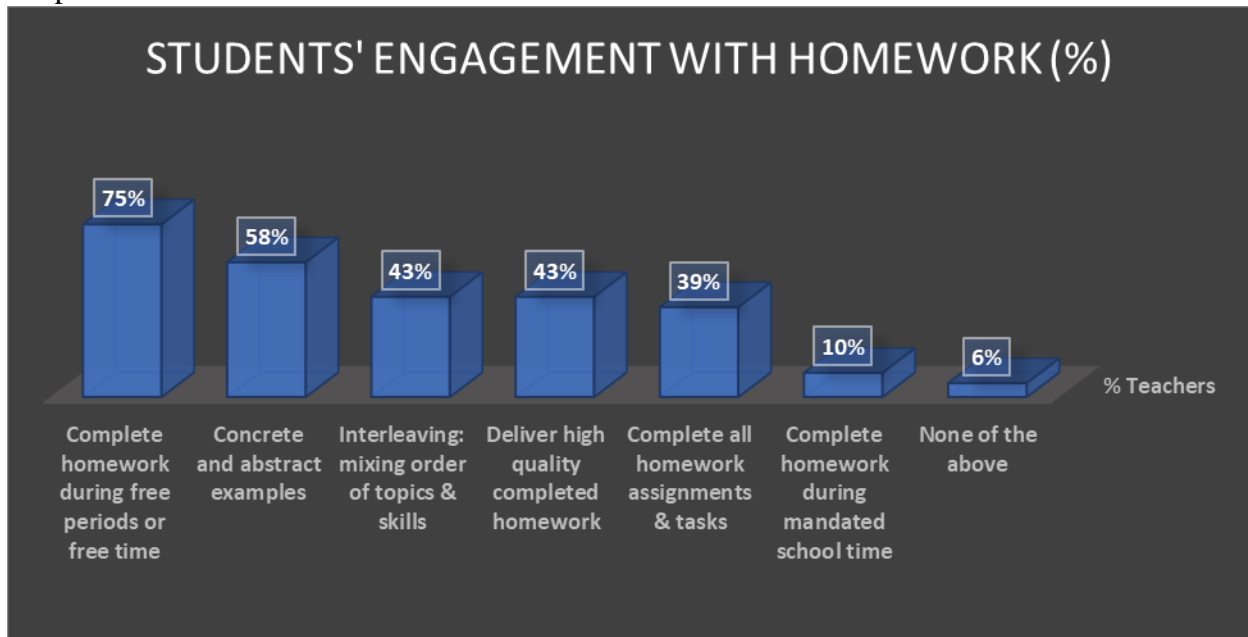
Source: SOTAH responses Q4.7

Related to the frequency and spaced characteristics of the homework assignments, I explored how teachers perceive student engagement with homework in SOTAH question Q4.8 through a set of hybrid indicators. The first two indicators explore the inclusion of interleaving and the use of concrete examples. Two other indicators explore the quality levels and degree of completion according to teachers' perception on whether students complete all their homework, and the quality of the students' completed homework. The two final indicators are related to how teachers perceive whether students do homework at their own initiative and during their free time or whether the school provides mandated study time within the facilities and schedule. The seventh indicator was the exclusionary option of "none of the above."

Teachers' perception of student engagement at NYC school regarding homework varied widely. The highest and lowest levels of agreement was with the statements that students use their own free time or free periods to complete homework assignments (75% of the teachers) versus using mandated school time to complete homework (10% of the teachers). The level of agreement with two statements inquiring about using effective learning strategies for homework were robust. About 58% of the teachers selected that students do use both abstract and concrete examples in their homework assignments and 43% of the teachers selected that students use interleaving at completing their homework assignments. At the same level as the last item, 43% of the teachers agree with the statement that students deliver high quality completed homework assignments and

a slightly lower percentage of 39% of the teachers selected that students generally complete all homework assignments and tasks. Only 6% of the teachers selected that none of the above applies to the students in their courses.

Graphic VI.20

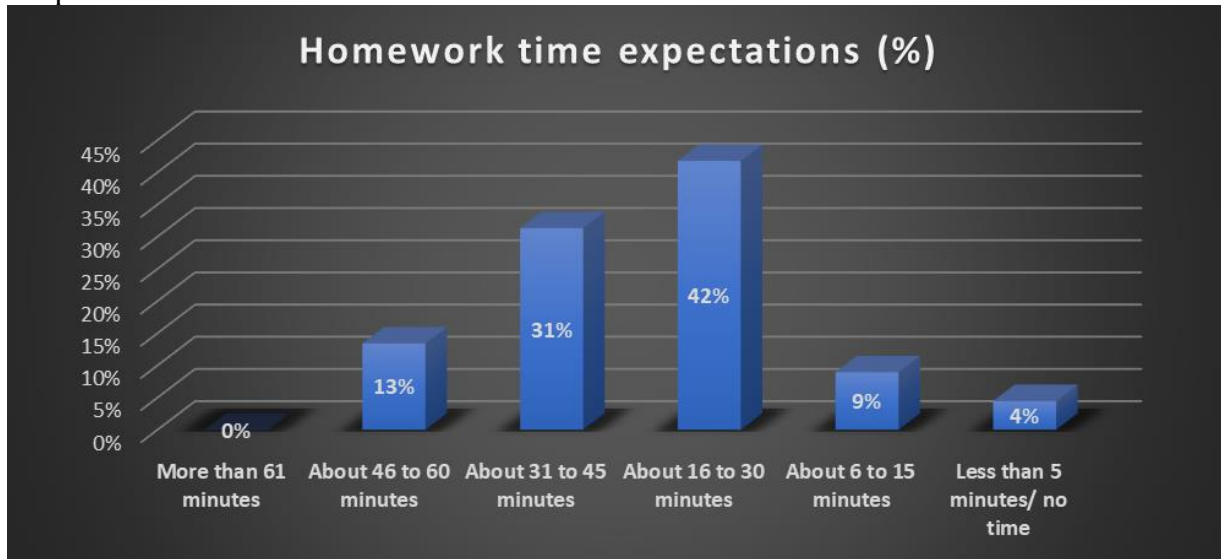


Source: SOTAH responses Q4.8

SOTAH question Q4.9 asks about the time students need to complete their homework or class preparation assignments. We can expect most responses to fall within the two ranges set by the school homework policy of a maximum of 45 minutes per class/day at the upper division and a maximum of 30 minutes per class/day at the middle division. Yet, it is critical to explore faculty perceptions and actual practices on this matter. There will likely be outliers at both sides of the high and low official limits. The possible indicators were six different time segments. These ranged from more than 61 minutes per class/day, 46 to 60 minutes, 31 to 45 minutes, 16 to 30 minutes, 6 to 15 minutes or less than 5 minutes to no time.

The teachers at NYC school are compliant with the homework time limits set by the school and in general, the great majority of the teachers estimate that they assign less time than the official limit. None selected that students needed more than 61 minutes and only 13% selected that students needed 46 minutes or more per class/day. About one third, or 31% of teachers stated that their homework time requirement was between 31 to 45 minutes, which is within the current upper division limit of 45 minutes per class/day. The majority of teaching faculty, 42% selected that their homework assignments needed between 16 to 30 minutes to complete, below the upper division expectations and in compliance with the range of the middle division limit of 30 minutes per class/day. The lower percentages of required homework expectations were 9% of teachers agreeing that their students complete the homework between 6 to 15 minutes. Only 4% of teachers selected that their students need 5 minutes to no time to complete their homework, which is consistent with the number of teachers stating in previous questions that they do not assign homework.

Graphic VI.21

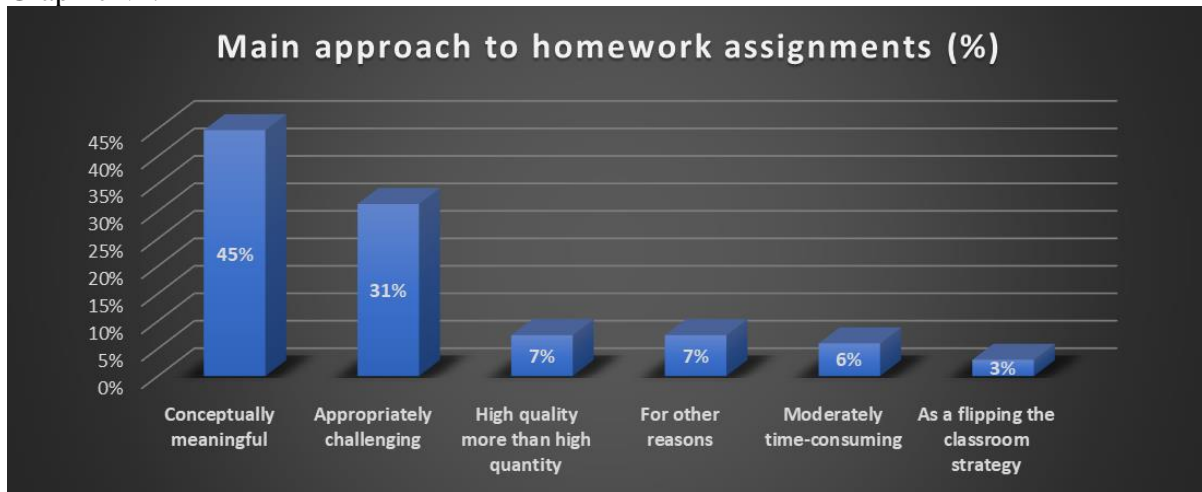


Source: SOTAH responses Q4.9

The issue of the purpose of homework can be considered through two related variables. The first variable is the approach underlying teachers' beliefs about what is the most important criteria for assigning and designing homework assignments in specific ways. SOTAH question Q4.10 provides six possible choices and teachers were forced to select only one of them. These approaches are designing homework as conceptually meaningful, appropriately challenging, as high quality (more than high quantity), as moderately time-consuming, as a flipping the classroom strategy or for other reasons. Most teachers would likely choose several of those reasons but forcing a choice of one of them provides a picture of the main drivers.

The majority of teaching faculty at NYC school, or 76% of the teachers, selected that their main approach to homework as a learning tool is designing either conceptually meaningful or appropriately challenging (not too easy or difficult) assignments. In fact, close to half or 45% of the teachers selected their homework assignments as being conceptually meaningful for what students are learning as their main criteria. Slightly below one third or 31% of the respondents selected the appropriate challenging level of the assignments as their main approach. Teachers selected the other four approaches at much lower levels. The focus on high quality of the homework and other reasons were selected respectively by 7% of the teachers. Just below the indicator of quality, there was the moderately time-consuming tasks required for the homework assignments as the main criteria, selected by 6% of the teachers. The lowest level was the 3% of the teachers using homework tasks as a flipping the classroom strategy.

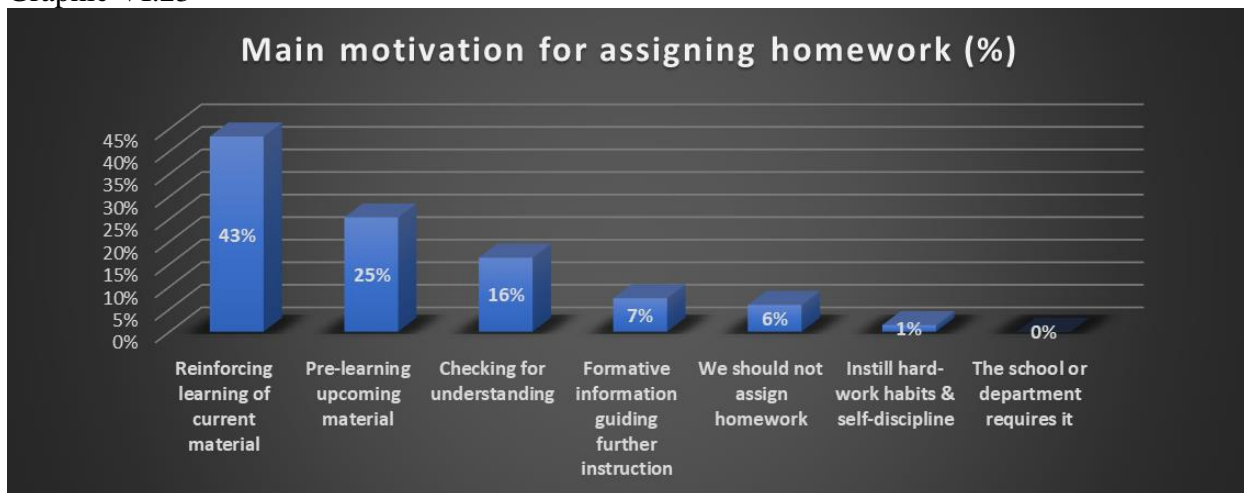
Graphic VI.22



Source: SOTAH responses Q4.10

The main approach to designing and assigning homework or class preparation tasks are related to the motivations underlying those approaches. SOTAH question Q4.11 explores teachers’ main motivation through several indicators as the possible primary drivers. Teachers were forced to choose one of the seven main motives. These included reinforcing learning of current material, pre-learning up-coming material, checking for understanding, as a source for formative information for further instruction, to instill hard-work habits and self-discipline, as part of the school or department mandated requirements or the belief that teachers should not assign homework at all. Most teachers would likely choose several of those motivations but forcing a choice of one of them provides a picture of the main driving motivation.

Graphic VI.23



Source: SOTAH responses Q4.11

The great majority of teaching faculty at NYC school, or 93% of the respondents, assign homework for four main motivations related to student learning and instructional purposes. More specifically, about 43% of the teachers selected the option of assigning homework for reinforcing

student learning of current material. About 25% of the respondents selected pre-learning upcoming material as the main reason for assigning and designing homework. At much lower proportions, 16% of the teachers selected the option of homework as a tool for checking for understanding followed by 7% as a teaching formative tool for further instruction or 1% as a tool to instill hard-work habits and self-discipline. No single teacher selected that assigning homework was motivated because it was required by the school or department. A small percentage, 6% of teachers believe that schools should not assign homework at all.

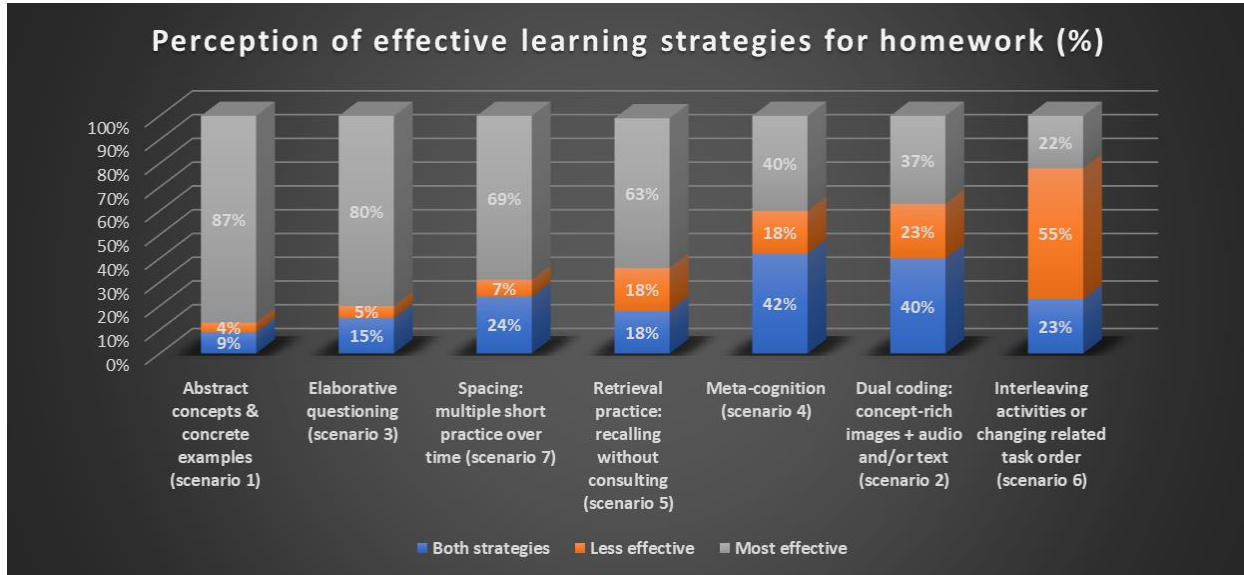
Finally, and to conclude the SOTAH homework section, I wanted to explore if teachers at NYC school understand the six evidence-based learning strategies when applied to specific homework scenarios or situations. Within SOTAH question Q4.14 through Q4.20, I ask teachers at NYC school to select what options reflect the specific conditions of a homework assignment that will result in more student learning (options A or B) or if they think students will learn about the same under both conditions (option C). One of those three conditions is the correct answer and the other two are incorrect. The order of the correct answers between A and B changed for every scenario but C is always incorrect. Each homework scenario is an example of using correctly or incorrectly metacognition in the specific self-generation of mnemonic devices and the other scenarios exemplify the six evidence-based strategies proven to increase learning: retrieval, spaced practice, interleaving, elaboration, dual coding and using different and relevant concrete examples to illustrate an underlying abstract concept.

There were two learning strategies correctly applied to homework scenarios that were clearly understood by the majority of teaching faculty at NYC school. The most widely and correctly understood learning strategy in the specific contexts of homework situations was the use of concrete examples to illustrate an underlying abstract concept in Q4.14 (scenario 1). About 87% of the teachers correctly selected that writing down a difficult word in the context of a sentence helped clarify the meaning of that word was more effective for learning. In contrast, only 5% selected the incorrect answer of students repeating the definition of the word as more effective (and 9% selected incorrectly C as learning equally under both strategies). The second learning strategy clearly understood by most teachers was elaboration or elaborative questioning as worded in Q4.16 (scenario 3). Indeed, 81% of the teachers selected that students asking questions (to themselves or to classmates) about a passage with the steps and procedure to solve a problem they had just read was more effective. In contrast, only 4% selected the incorrect answer that to memorize the steps of the procedure was more effective for learning (15% also selected incorrectly C as learning equally under both strategies).

In question Q4. 20 (scenario 7) about 69% of the teachers selected the spacing strategies as most effective. Dedicating 10 hours to learn the needed material to prepare for a test through shorter periods frequently distributed over a greater number of days resulted in more learning for students than the alternative strategy. Only 8% selected the incorrect answer of massing or concentrating the 10 hours for studying the same material into two single but longer time events as the most effective studying strategy (23% also selected incorrectly C as learning equally under both strategies). Similarly, for one of the many possible retrieval practice strategies in Q4.18 (scenario 5), about 63% of the teachers selected correctly as the best learning strategy to have students write down what they remember about a passage they just read. In contrast, 18%

selected the incorrect answer of students re-reading the passage as more effective (18% also selected incorrectly C as students learned equally under both strategies).

Graphic VI.24



Source: SOTAH responses Q4.14, Q4.15, Q4.16, Q4.17, Q4.18, Q4.19, Q4.20

Teachers correctly selected the application of the other three additional evidence-based learning strategies at more moderate to low levels. About 40% of the respondents selected in Q4.17 (scenario 4) the correct metacognitive strategy of students generating their own mnemonic device for remembering complex concepts with many elements as more effective. About 20% selected the incorrect answer of providing students with a ready to use device provided as part of the materials or created by the teacher (and 40% also selected incorrectly C as learning equally under both strategies). In question Q4.15 (scenario 2) about 37% of the respondents correctly selected the simultaneous dual coding learning situation of watching a video and visual while listening to an explanation was the most effective learning strategy. About 25% selected the incorrect answer of watching the video first and subsequently listening to the explanation as the best dual coding strategy (39% also selected incorrectly C as learning equally under both strategies).

The larger misunderstanding is the use of interleaving for homework in question Q4.19 (scenario 6). Only 22% of the respondents correctly selected that watching the video illustrating different painters and their paintings by showing them in different order and moving from one to another and back was the most effective learning strategy. In contrast, 55% selected the incorrect answer was more effective than the assignment showing them blocked together: a set of several paintings from the same artist followed by another set of several paintings from another artist (24% also selected incorrectly C as learning equally under both strategies).

VI.3. Findings and analysis of assessment and homework practices

VI.3.1. Analysis of findings from semi-structured interviews

During the semi-structured interviews, department chairs embraced their teachers' autonomy and they value their department members collegial approach, collaboration and sharing of materials regarding assessment and homework assignments. As a department chair succinctly said, "practical collaboration and sharing materials among teachers, individually or as a team, is one of the strengths of my department." Academic departments also emphasized as a strength that their teachers use a broad combination of different assessment formats and tools to evaluate student learning, emphasizing the on-going, term and end of the year use of both traditional exams as well as alternative forms of assessment and projects. Generally, department chairs stated, in a consistent manner with senior leadership, that most teachers use a combination of traditional and alternative assessments but there is more emphasis on projects, reports or alternative assessments at the upper division. Regarding traditional exams, all academic department chairs mentioned using some form of on-going unit or term assessment, typically including a variety of tasks, different types of questions and formats and an emphasis on complex or open questions as well as application of skills.

Department chairs did not mention any explicit weakness in their department assessment practices except in an implicit way. One was when they brought the issue that students at NYC school have a great variety of background knowledge and skills resulting in a wide set of outcomes. As another department chair said, "when you get students with so many different levels of abilities and heterogeneous backgrounds, it is very hard to achieve consistent outcomes overall for the whole class." The other implicitly stated weakness was expressed through the department chairs' own reflections wondering on how traditional assessment exams could capture and measure authentic student learning. Performing and visual arts pointed out that, except for the couple of AP courses within their departments (such as art history), assessment was more skill-based on artistic, creativity and performing skills. As an arts department chair said, "how do you measure creativity with traditional exams? We use progress rubrics instead to demonstrate the artistic growth of our students and their engagements in the arts." The progress rubrics also includes various formats and tools depending on the type of art explored in the course or activity. For art courses grading is secondary to student engagement and artistic progress. The arts department chairs also wondered, as the chairs of the academic departments, how assessments can measure authentic artistic creativity or performing skills.

Regarding homework, department chairs also saw as strengths, the autonomy, collaboration and sharing of materials and the variety of approaches among their teachers and courses. Most departments and courses focus on homework as reinforcing current learned material. A department chair summarized this perspective when s/he said, "homework is another tool for teaching and reinforcing the material we explain in class." Other departments and courses emphasize homework as a pre-learning asynchronous instructional tool to prepare for class discussion and subsequent learning. As another department chair said, "in some advanced and seminar types of courses, homework is rather preparation for discussion and application of tasks for the upcoming class." Department chairs saw their varied approaches to homework and the types of assigned work as a strength: every department and teacher uses homework somewhat

differently, but they had to be practical given time constraints. All department chairs stated that most teachers assign and design homework that requires less student time commitment than the school's set policy of 45 minutes per course/day at the upper division and 30 minutes per course/day at the middle division. As a department chair said, "in most of the courses, teachers are mindful of issues of equity. For instance, affluent families might hire tutors to help their children with homework. A way of teachers addressing this is by assigning homework below the maximum time limit school policy and try to reinforce learning activities during class that use to be assigned as homework." Performing and visual arts typically do not assign homework except for the few AP courses in their program. Instead, students are expected to dedicate preparation time by practicing skills or putting in production time, which in many cases require similar time commitments overall than academic homework.

Department chairs mentioned a few weaknesses about homework only implicitly. First, the busy schedule and teaching commitments of faculty limit their time as they prioritize instruction and assessment, which by implication does not leave much time for designing homework. Second, two department chairs believe some students from affluent backgrounds might be receiving tutoring help with homework creating a disparity of outcomes and performance. Another implicit weakness was indicated when some of the department chairs wondered if there is too wide a variety of approaches among and within departments about homework even when they lauded the variety of approaches as a strength. In the case of performing and visual arts, there was a predominant view that homework was not necessary except for the few academic courses within the arts. Their concern seemed to be more about the competing interests and time demands between academic homework, athletics and the time commitment students need to put into artistic activities and performances.

VI.3.2. Analysis of SOTAH findings from assessment and homework common variables

Regarding assessment and homework, teachers at NYC school responded to a broad set of questions in the corresponding and respective SOTAH sections to explore their practices. The evidence from their responses generally supports the overall views of department chairs regarding the strengths and weaknesses of the school on assessment and homework but also enlightens specific areas that need to be addressed for improvement. I am going to analyze first the findings about assessment and homework practices through a set of commonly shared variables and indicators. Subsequently, I will analyze the findings about specific variables and indicators associated with the discrete functions of assessment. Finally, I will proceed with a detailed analysis of the variables and indicators associated with the discrete functions of homework practices.

Department chairs and teachers have a clear understanding that assessment involves a complex evaluation process of student learning to assign an overall grade through several weighted components as well as through different formats and tools to measure mastery of content knowledge and skills for each student. Similarly, department chairs and teachers also understand that homework supports learning but requires less evaluative or grading emphasis and can be used mainly as a formative or instructional tool. Overall, the first finding on teachers' practices at NYC school regarding the use of grading and non-grading approaches for assessment and homework is the reverse relationship between both.

Teachers use assessment at higher proportions as an evaluative or summative tool (81% of the respondents) than as a formative tool. As illustrated in SOTAH question Q3.4 the higher proportion of teachers using grading assessment makes sense since most teachers view assessment primarily as a summative evaluation of student learning and progress in mastering the subject matter knowledge and skills. By contrast, 61% of the teachers at NYC school state that they use assessments as a formative tool. This also makes sense with teachers' understanding that assessment contributes to learning, which is consistent with direct and explicit instruction and cognitive psychology insights.

When we triangulate these findings with teachers' responses to subsequent questions, the pattern is confirmed. In question Q3.14, about 67% of the teachers stated that assessments are critical for either supporting student learning and growth (35% of the respondents) or measuring student learning and progress for helping teachers to improve their instructional plans (32% of the respondents). This is further supported when we triangulate the previous percentages with teachers' responses to questions Q3.19 and Q3.20. About 82% of the teachers answering these questions state that they provide their students with formative assessments and practice tests. Similarly, about 95% of these teachers using practice assessments do so based on the same sources, structures, strategies, and motives than summative assessments. This also makes sense, since formative or practice assessments contribute to learning by providing background context, retrieval and spaced practice as well as familiarity with the assessment format and thus, reducing the subsequent student exam anxiety when confronted with high-stake exams.

The reverse relationship on grading between assessment and homework also makes sense given the primary purpose of each: homework is mainly used as a formative or instructional tool. This is illustrated by teachers' responses to question Q4.4 on using instructional or non-graded versus evaluative or graded homework. The majority of teaching faculty use homework as a formative non-graded or instructional tool (84% of the respondents) rather than a graded or evaluative tool (49% of the respondents). This makes sense from the perspectives of teaching practitioners since they use homework primarily as a low-stake instructional or learning tool.

The predominant view of the teachers at NYC school of homework as an instructional tool is supported when triangulating the above findings with their responses to the subsequent SOTAH questions. Responding to question Q4.10 about the purpose of homework, 76% of the teachers selected two main approaches for designing their assignments. First, either that they designed homework making sure it was conceptually meaningful for the materials and skills studied in class (45% of the respondents) or secondly, implicitly acknowledged the formative purpose of their assignment design as appropriately challenging (31% of the respondents). Similarly, when asked about the motivation for assigning homework in SOTAH question Q4.11, an overwhelming majority of the teachers (87% of the respondents), selected either that homework reinforces learning (45%), is a tool for pre-learning upcoming material (25%) or a way of checking for student understanding of the material (17%).

Despite most teachers using homework for formative or instructional purposes, there is always room for using homework as a low-stake evaluative tool. That is why close to half of the teachers grade at least part of the homework they assign although they typically do so as a low-stake

component of the overall student grade. This is consistent with the responses to question Q3.14 showing that as an average, teachers at NYC school weight homework and class preparation as 13% of the total grade. Grading part of the homework serves as both an evaluative tool of the level of student understanding as well as an instrument to check for effort and incentivize completion. Similarly, grading at least part of the homework is a mechanism to encourage accountability for class preparation and reinforcing learning or practice of material and skills learned in class or needed for upcoming class learning.

Image VI. 25

Findings: assessment and homework

4 • Granular level dimension

RQ #4. How do current assessment and homework practices use high-quality design consistent with evidence-based learning strategies and course standards?

Strengths

- Teachers use many formats and sources in their assessments & homework
- Teachers collaborate and share materials for assessment and homework
- Teachers also apply most of the evidence-based learning strategies on these tasks
- Teachers comply with homework time limit policies of the school



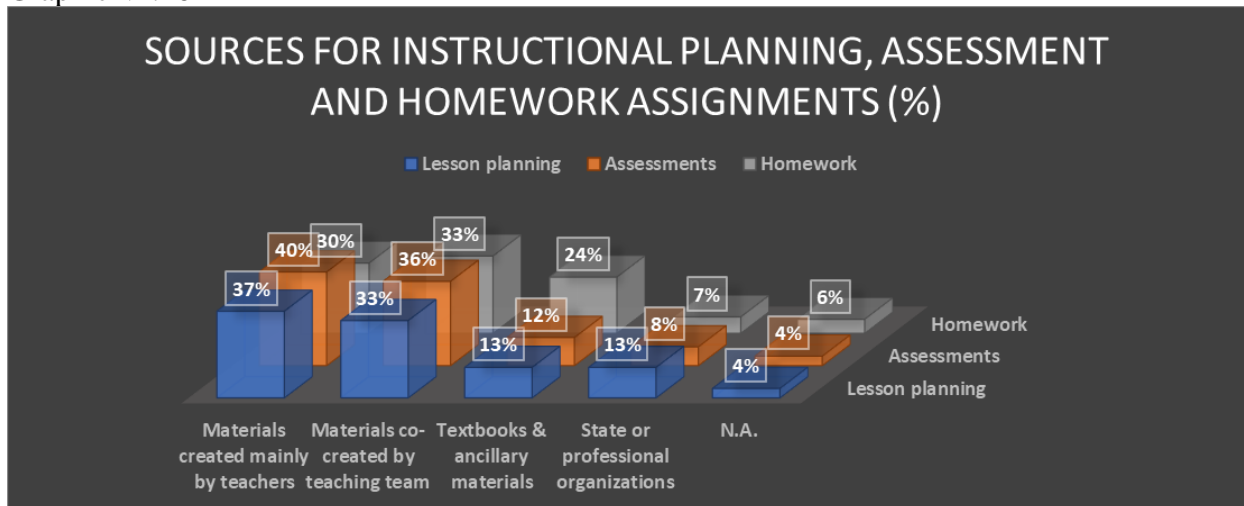
Source: own elaboration from semi-structured interviews and SOTAH findings

According to the principles of direct and explicit teaching, assessment and homework assignments will likely be correlated or derived from the instructional approaches and materials for specific courses and disciplines. This insight is consistent with teachers' responses to SOTAH questions as well as with the views expressed by department chairs during the semi-structured interviews. By the same token, how teachers decide, select and use the sources and materials for each of these components of assessment, homework and instruction is related to the degree of teachers' autonomy and self-efficacy. In that sense, we should expect a considerable degree of consistency between the sources and tools used by these three components of the teaching craft.

Questions Q2.8, Q3.5 and Q4.5 asked about the sources for the curricular and lesson planning, assessment and homework using backward design. Teachers at NYC school stated they use mainly materials created by each individual teacher: 37% of the respondents for lesson planning, 40% for assessment but there was a drop to 30% of the respondents using sources created individually by themselves for homework. When referring to the materials co-created by their

teaching team in collaboration with each other, the data is more consistent: 33% of the respondents selected this option primarily for lesson planning, 36% for assessments and 33% for homework. The materials from textbooks and ancillary materials were used as the primary source by 13% of the teachers for lesson planning, 12% for assessment but jumped to 24% for homework. Other materials such as those from professional organizations, were used as the primary source by 13% of the teachers for lesson planning but dropped to 8% as the main source for assessment and to 7% for homework. The not applicable to my courses option was 4% for lesson planning, 4% for assessment and 6% for homework, consistent with the fact that a few courses or teachers do not require homework or class preparation.

Graphic VI.26



Source: SOTAH responses Q2.8, Q3.5, Q4.5

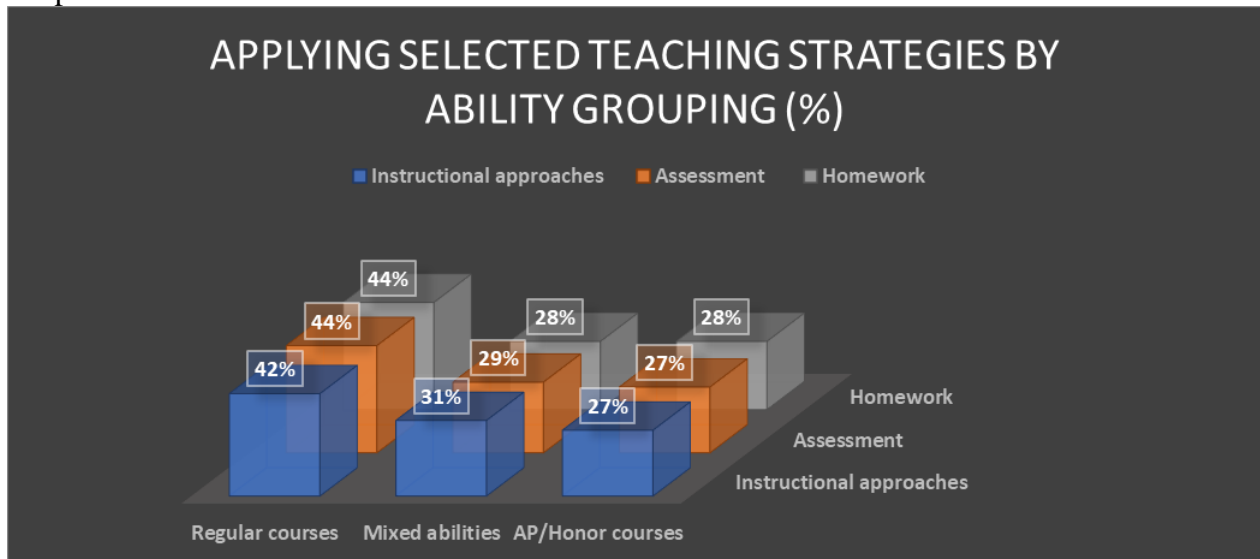
Teachers use their course textbook, workbook and ancillary materials as the primary source for homework assignments at more than double the rate than they do for lesson planning and assessment. This seems to be the counterpoint of the other difference, which is a reduction of the number of teachers using homework materials created individually by themselves. These two apparently inconsistent elements in the correlation between lesson planning, assessment and homework makes sense when considering the overwork conditions and realities of the teaching profession. Teachers have strong time constraints in their busy schedule and likely dedicate most of the constrained time available to lesson planning and assessment. Teachers likely use a combination of materials created by each teacher with those created by teaching teams, professional organizations or textbooks and their related ancillary materials for homework, since they are already created and ready to use.

The apparent reduced focus on designing homework assignments by individual teachers is likely related to the limited pay-off of homework as compared to direct instruction or assessment. This is consistent with the lower attendance rate of teachers to professional development focusing on homework (among the lowest of the various PD activities as we saw in the PD practices section). This is an implicit contextual indicator that homework is not viewed as essential for learning when compared to instruction and assessment by important segments of parents, many school administrators, students and even by some segments of researchers and scholars (as we saw in

the homework literature review). The end-result is that homework is a lower priority compared to instruction and assessment. The most effective management technique for overwhelmed, overworked and time constrained teachers is to use what textbooks, workbooks and related ancillary materials (or their teaching teams or professional organizations) provide as ready to use, maybe with some individual adjustments. This is typically accomplished through a high level of teacher collaboration and sharing of materials. This interpretation of SOTAH findings is consistent with other findings. Department chairs emphasized that teachers in their departments collaborate and share materials among themselves either at an individual level or as members of a teaching team. This is further supported by the indicator on psychological safety in Q5.19 by which 71% of the teachers stated that in NYC school people are eager to share information about what does and doesn't work.

SOTAH includes a set of similar and specific questions regarding the use of instruction (Q2.18), assessment (Q3.16) and homework (Q4.12) within various types of ability grouping. Teachers' responses at NYC school are extremely consistent about how they apply the practice of these teaching tools (instruction, assessment and homework) across different ability grouping courses. About 42% to 44% of the teachers apply the same instructional, assessment and homework approaches and practices to regular courses; 28% to 31% of the teachers apply them to their mixed abilities courses and 27% to 28% of the teachers apply their instructional, assessment and homework approaches to their AP/Honors courses. This indicates that teachers correctly perceive that regardless of their different approaches and practices, they should apply them equally to different ability grouping or courses they teach.

Graphic VI.27



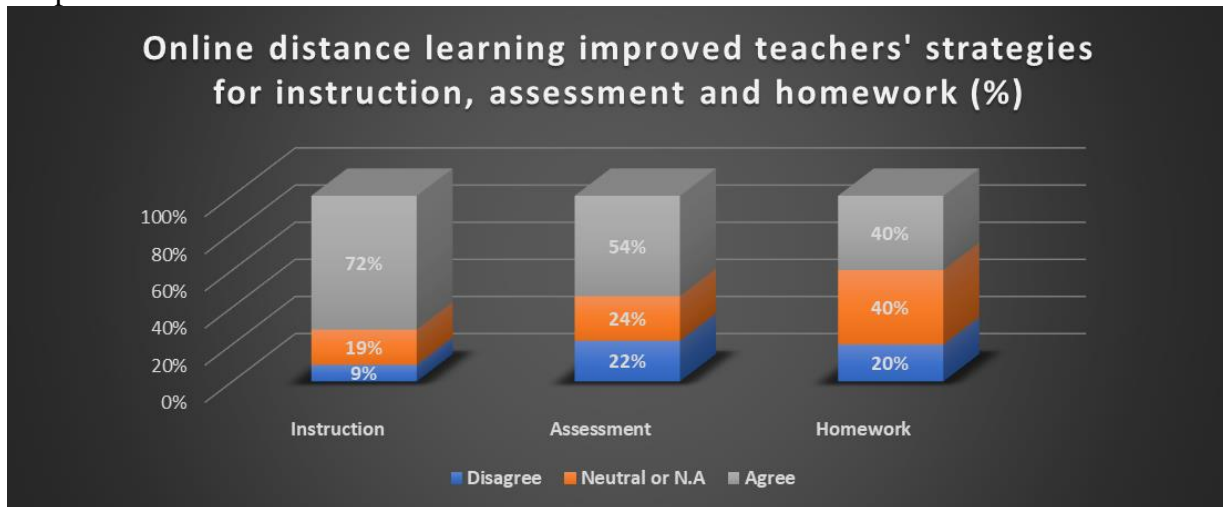
Source: SOTAH responses Q2.18, Q3.16, Q4.12

These responses tell us more about the proportion of different courses by the type of ability grouping teachers are assigned at NYC school than any difference in applying their approaches according to ability. From the SOTAH responses we can infer that most teachers teach around 2-3 regular courses, 1-2 mixed ability courses and 1 AP/Honors course. These responses seem to indicate that teachers consistently apply similar instructional approaches, assessments and

homework assignments to these courses regardless of the type of ability grouping. Some teachers might teach mainly courses within one of these three ability grouping categories. This is an indirect indicator that teachers at NYC school understand that student learning from different ability groupings is best served by applying what they believe are the best instructional, assessment or homework strategies.

The other common variable across instruction (Q2.19), assessment (Q3.17) and homework (Q4.13), explores the impact of distance teaching and student learning during the pandemic. In contrast to the variable on ability grouping, there are significant differences in teachers' perception of the impact of online distance learning regarding instruction, assessment or homework. Close to three quarters or 72% of the respondents agreed that online learning has helped them at improving or expanding their instructional practices (19% neutral, 9% disagree). The proportion of those agreeing with online learning improving or expanding their assessment practices drops to 54% (24% neutral, 22% disagree). The drop went even further, to only 40% agreeing (40% neutral, 20% disagree) about online learning improving or expanding their homework practices. The decline on how teachers at NYC school see positive impact of online learning from relatively high levels regarding instruction to lower levels for assessment and even lower for homework assignments suggest a vacuum that needs to be addressed by the school. Likely, this vacuum is related to the issue of Learning Management Systems (LMS) quality and usage for assessment and homework as well as the school support and training of teachers about the LMS as an effective instructional tool for these areas of teaching.

Graphic VI.28



Source: SOTAH responses Q2.19, Q3.17, Q4.13

So far, we have focused the analysis of the strengths and weaknesses regarding the common set of variables and indicators between assessment, homework and instructional practices. It is critical to also analyze teachers' responses to SOTAH questions focusing on different specific variables associated with the discrete functions and characteristics of assessment and homework. This will allow us to have a more detailed analysis of the overall strengths and weaknesses of assessment and homework practices at NYC school.

VI.3.3. Analysis of SOTAH findings on assessment's specific variables

One of the strengths of assessment practices at NYC school is the wide combination of different types of assessments they use regularly to evaluate student learning (Q3.6). Most teachers selected two types of assessments as the ones they most frequently use: individual labs, reports or projects (69%) and unit exams or partial section quizzes (68%). This makes sense, since these are on-going types of assessments for evaluating students as they are learning and as teachers are adjusting instruction if needed. These were followed by close to half of the teachers (49%) using three more types of assessment: group work and products, student presentations and multi-unit or trimester tests. This is also consistent with the day to day instructional practices as well as multi-unit or complex collaborative or individual performance work, which is typically done after several units to integrate various strands of content knowledge and skills into a single more complex exam or product. Final exams, tests or products are used by 38% of the teachers typically at the end of the academic year and only 17% of the teachers use other forms of alternative assessments in addition to or substitutes of the ones mentioned.

Another strength of assessment practices by teachers at NYC school is the wide combination of formats and instruments they use for designing their exams or test questions, with a clear predominant use of elaborative type of questions and answers or application of knowledge and skills (Q3.7). Indeed, the majority of teachers at NYC school or 78% use short answers to questions or problems (31% of the teachers using these most of the time or 47% regularly), 69% of the teachers use complex questions or problems requiring long elaborative answers, essays or reports (40% of the teachers using this most of the time and 29% regularly). The third item used most frequently by 66% of the teachers is demonstration of specific skills (42% of the teachers using this type of format most of the time and 24% regularly). In contrast, teachers at NYC school use other types of questions at relatively low frequency, such as multiple choice, other types of questions as well as true and false statements. About 33% of the teachers use multiple choice types of questions (8% most of the time and 25% regularly). About 39% of the teachers use "other types of questions" (10% most of the time and 19% do so regularly). The lowest frequency was the use of true or false statements: only 14% use this type of item (4% most of the time and 10% regularly).

The strength of using complex elaborative questions and answers and the application of skills for assessments can vary by department and discipline as well as among teachers. The emphasis on elaborative questions is important to develop the complex knowledge and skills as well as their application to new contexts or situations. Yet, it is also important to evaluate students on those applications through standardized multiple-choice questions, especially in the pre-AP and AP courses. The lower frequency use of multiple choice types of questions indicate slight weaknesses in the assessment strategy when considering what we know about learning and the broad and balanced format of different types of questions and evaluative assessment tasks used by the College Board on SAT and AP exams as well as in the ACT exams.

Regarding learning science, we know that assessment in general, including summative standardized assessment using multiple choice questions, have demonstrated to have positive effects on student learning and their educational outcomes. Thus, using both strategies,

elaborative short or complex long questions or problems and answers as well as using multiple choice or even true or false sentences support learning and remembering content knowledge and application of skills. The College Board's Advanced Placement (AP) courses and exams as well as the SAT and ACT standardized exams include a combination of elaborative and multiple-choice questions. Typically, elaborative questions or problems referred to as free response questions (FRQ) are weighted at about 50% of the overall performance grade. Multiple-choice type of questions (MCQ) are weighted as the other 50% of the overall cumulative grade.

I conjecture that the inconsistency in the type of questions used at NYC school for assessment (mainly elaborative) with the type of questions used by the College Board standardized AP and SAT or the ACT exams (a combo of elaborative and multiple choice questions) explain partially the outcomes and scores of NYC school students on these standardized tests. This interpretation of the data from SOTAH is supported when triangulated with the related responses to question Q3.15. Under half of the teachers or 47% of the respondents stated their students are performing to their expectations and only 24% stated that students perform at passing or exceeding expected levels on standardized testing. NYC school students' performance on the composite ACT (30-31) or SAT (1350-1370) scores are well above the national average. However to improve these already high levels of performance to even higher levels, NYC school might wish to consider a better alignment between the format and type of questions predominantly used in their classroom assessments with those used by the ACT or by the College Board's AP and SAT exams. Moreover, students at NYC school will reduce their anxiety and increase their background knowledge or familiarity with the assessment format and types of questions on these standardized tests, which will likely help students to improve their performance.

Another area of strength of assessment practices at NYC school is its teachers' high intuitive understanding and application of the most effective assessment practices for developing student metacognitive, critical thinking, creativity and problem-solving skills addressed in questions Q3.8 through Q3.11. The majority of teaching faculty understand and correctly apply the learning processes involved in assessment regarding the time horizon needed for students to acquire and develop critical thinking skills (74% of the teachers). Most teachers also understand and apply the simultaneous development of content knowledge and skills (64% of the teachers) as well as the process of applying to different and diverse contexts the acquired knowledge and skills to develop creativity (63% of the teachers). Moreover, most teachers also understand far transfer to apply knowledge and critical thinking skills to a new or different context or situation (61% of the teachers). This was followed by the understanding of the application of retrieval or recalling without consulting materials as an effective strategy for learning and memory coding (59% of the teachers).

The lowest level of understanding was regarding the procedures to support the development of critical thinking skills in assessment practices (56% of the teachers). Although the majority of teaching faculty correctly assessed the development of critical thinking skills through self-directed processes following subject matter conventions and standards, still a considerable segment of about 40% of teachers emphasized following instructions and guidelines on the assessments. That means that a sizable percentage of the teachers wrongly believe that following procedure with accuracy and fidelity in the application of knowledge and skills is critical

thinking. This is the assessment area that might need further reinforcement through PD training about developing student critical thinking, problem-solving and creativity skills.

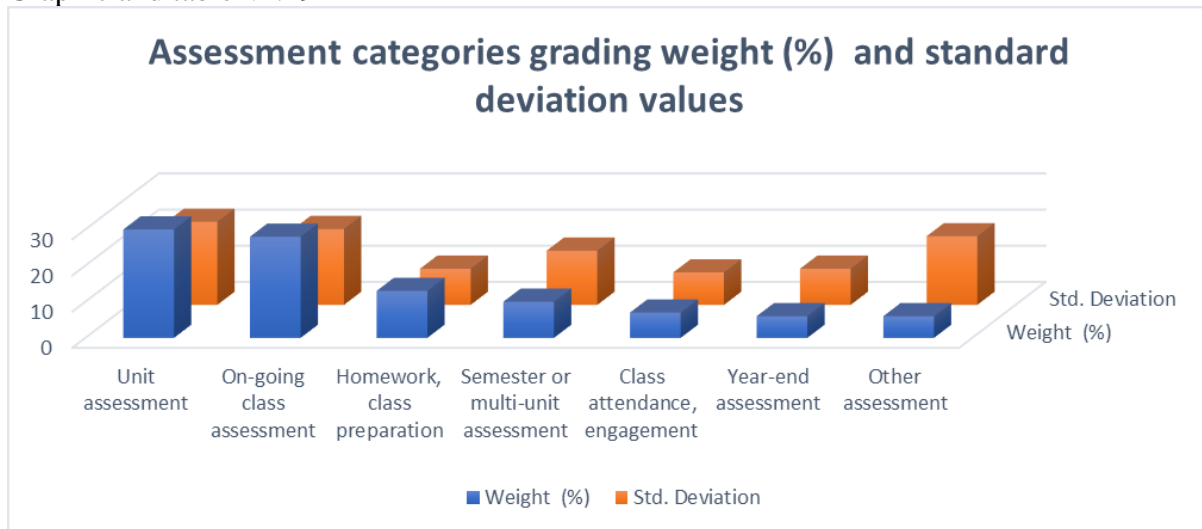
A high percentage of teachers clearly understand that focused assessment strategies are effective instruments for student learning and are powerful adaptive teaching tools. As per teachers' responses to Q3.14, indeed 67% of the teachers clearly understood these critical functions of assessment: 35% of the teachers stated that regular assessments encourage student learning; 32% stated that assessment is needed to measure students' progress acquiring knowledge and skills. This strength is confirmed by the percentages of teachers selecting the various student engagement indicators with assessment in question Q3.15. For instance, 72% of the teachers use reviewing and correcting errors on assessments, which is an effective metacognitive strategy for learning. Similarly, 82% of the teachers stated that they use practice exams and assessments in question Q3.19, which is also an effective metacognitive and retrieval practice tool.

However, there are some weaknesses in the use of assessment. As outlined in other indicators of student engagement with assessment, also in question Q3.15, the estimation by teachers about students using practice self-testing was stated by 47% of the teachers. Even a lower 10% of the teachers estimated that students engage in the specific retrieval practice of writing what they remember on a blank piece of paper. Moreover, about 17% of the teachers stated that students that need tutoring, receive school sponsored tutoring to support their assessment performance. This is a rather low percentage, which suggests that NYC school might need to increase support for either disadvantaged students or students struggling with assessment.

By the same token, there are also some additional strengths and weaknesses regarding the many components of assessment to evaluate student learning through the weighting of different categories for student overall grades as illustrated by the indicators in question Q3.18. The strength is the great degree of autonomy of teachers and departments to set the specific components and their relative grading weight to determine student overall performance evaluation through a final grade. The high level of standard deviation or variance among the relative weighting of the various grading components denotes not only a great deal of departmental and teachers' autonomy but also an overall understanding that certain categories are more summative in nature and others more formative. The most summative categories of exams, test and quizzes, essays, labs or reports, etc. are typically weighted higher than formative categories such as homework or class participation, or other types of assessment, which are weighted with lower values.

However, there are some weaknesses too, as illustrated by the high standard deviation or variance within the relative weight for each grading category entered by SOTAH respondents. This points out to a disparity among departments and teachers on how they weight each category to estimate each student's final grade. The major factors of the high levels of standard deviation or variance result from different individual teachers' assessment approaches and compounded by the departmental differences for using different grading category weights for assessing students. The major contributing factor is likely the grading categories differential between academic departments versus performing and visual arts, followed by the differences among academic departments, such as a STEM courses or Math and Science department versus the humanities departments.

Graphic and table VI.29



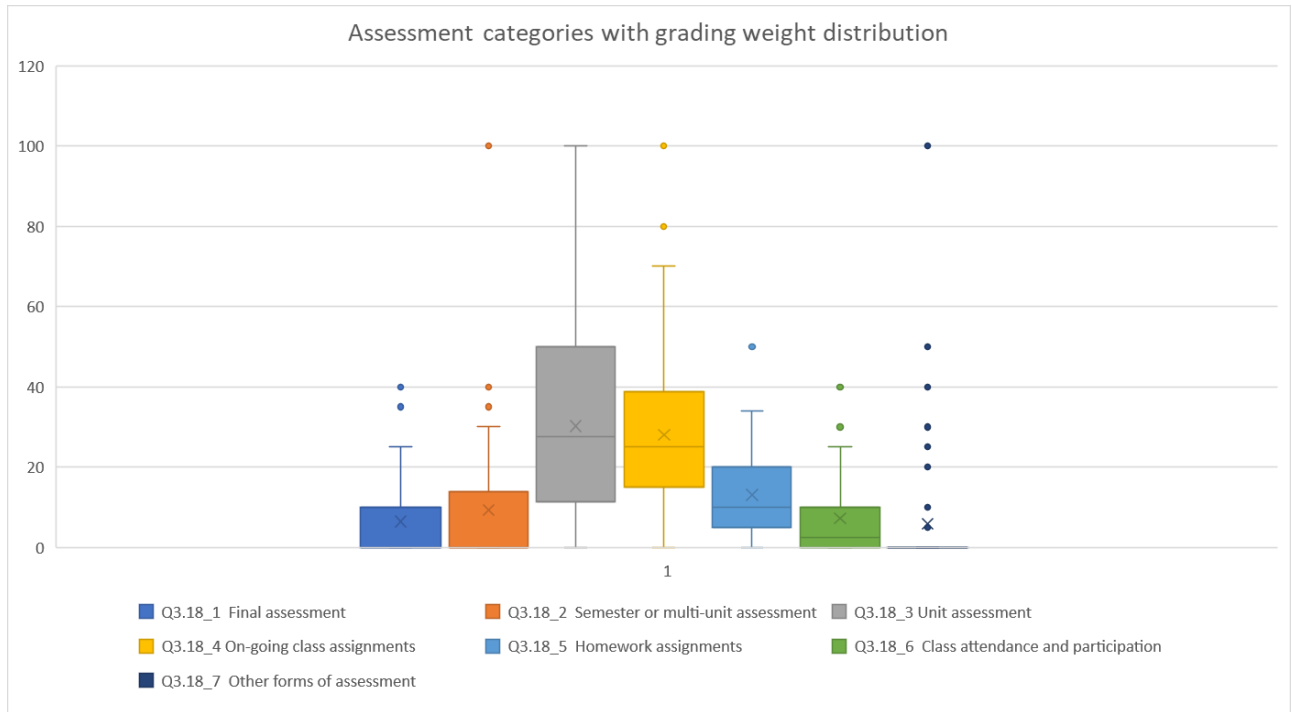
Weighted assessment categories for final grade	Weight (%)	Std. Deviation
Unit assessment	30	23
On-going class assessment	28	21
Homework, class preparation	13	10
Semester or multi-unit assessment	10	15
Class attendance, engagement	7	9
Year-end assessment	6	10
Other assessment	6	19

Source: SOTAH responses Q3.18

For instance, visual or performing arts teachers are likely to use much different categorical weights in their creative and skill-based or other types of assessments than those used in language-based courses such as English, classical and modern languages or other humanities courses such as history or social sciences. Similarly, math, science or STEM based courses are likely to have very different components and weighting for the overall assessment of their students. Those differences are captured in the categories with the highest standard deviations (Sd) and variance, which indicates an extremely wide range of grading criteria among and within departments.

This interpretation of these very high levels of standard deviation signal a wide distribution of the grading weights among different assessment categories supported by the analysis of the data through a box and whisker plot of the entries within each assessment category. What the box and whisker plot shows is that indeed, there is a wide and skewed distribution in the grading weight among various assessment categories between various departments and likely within departments (there are outliers within each category). This suggests the need to establish within each department some more consistently narrow grading ranges for each assessment category.

Graphic VI.30 Box and whisker plot



Source: SOTAH responses Q3.18

VI.3.4. Analysis of SOTAH findings on homework specific variables

The strengths of homework practices at NYC school include using homework for both retrieval and spaced practice. The responses to question Q4.6 show that about three quarters or 74% of teachers at NYC school assign homework or other class preparation assignments always or most of the time (55% of the teachers) or about half of the time (19% of the teachers). This points out to an implicit but clear understanding in the teachers' instructional approaches about homework on the importance of some form of retrieval and space practice for student learning. Spaced practice as part of homework, as illustrated in the responses to question Q4.7 includes mixing assignments of previously learned material with current material being studied in class (34% of teachers). Spaced practice also includes mixing upcoming future material to be learned with current material being discussed in class (12% of teachers). These two forms of spaced practice add up to 46% of the teachers using this learning strategy, roughly equal to 45% of teachers using homework mainly as retrieval reinforcement for current material.

The indicators from student engagement with homework in question Q4.8 add some additional insights to the patterns of strengths and weaknesses highlighted regarding the use of evidence-based strategies for homework beyond retrieval and spaced practice. About 58% of teachers stated that students use both abstract and concrete examples in their homework assignments and 43% of teachers stated that their students use interleaving at completing their homework assignments. At the end of this section, I will add and average the values of these practical and specific answers with the subsequent values of teachers understanding homework scenarios that can enhance more effectively student learning. This will allow us a deeper analysis by distinguishing between teachers actual practice versus teachers' understanding of these strategies.

Regardless of the actual practice of effective learning strategies in homework assignments, other indicators of student engagement with homework in Q4.8 bring additional insights. About 43% of the teachers at NYC school consider that students deliver high quality completed homework assignments. Similarly, a slightly lower percentage of about 39% of teachers state that students generally complete all homework assignments and tasks. These relatively low percentages of students doing high quality or even just completing all homework indicate that indeed, there is room for improvement regarding homework design and student engagement with these types of learning assignments.

One of the key variables about homework is the expected time students need to complete it. This issue is at the core of the homework debates as well as one of the critical problems of practice that NYC school wishes to address. This is especially true given the upper and middle divisions' requirements of co-curriculars and sports obligations: students do not have enough time to complete their assignments. By the same token, most teachers, as matter of practicality and time-constraints over their teaching and school related workload, tend to assign ready to use assignments, which are generally part of the textbooks' ancillary materials, such as workbooks and already printed handouts for every unit or those already created individually by previous or current teachers or their teaching teams.

Image VI.31

Findings: assessment and homework

4

• Granular level dimension

RQ #4. How do current assessment and homework practices use high-quality design consistent with evidence-based learning strategies and course standards?

Weaknesses

- Assessment categories have a wide variation in their relative grading weight among and within departments, which could be a problem
- Inconsistency between types of questions on assessment versus questions on related national standardized tests
- Homework focuses on current material but less focus on previous or upcoming material



Source: own elaboration from semi-structured interviews and SOTAH findings

NYC school already has a homework time limit policy. The upper division establishes a maximum of 45 minutes per day/subject and the middle division has a maximum of 30 minutes per day/subject. As department chairs stated during the semi-structured interviews, SOTAH question Q4.9, supports the view that teachers at NYC school are compliant with the homework time limits set by the school. Teachers estimate that they assign homework under the school time limit. In fact, about 73% of teachers stated that they assign between 31 to 45 minutes (31% of the respondents) or between 16 to 30 minutes of homework (42% of the respondents), both of which are within or under the current upper division limit of 45 minutes per class/day or the middle division limit of 30 minutes per class/day. Although the majority of teaching faculty assign homework within or slightly under the school homework time limits policy some subjects and teachers might require little homework (thus well below the official limits) or no homework at all. In fact, about 13% of teachers assign homework under 15 minutes or none. By contrast, another 13% of teachers stated that they assign between 46 to 60 minutes of homework. The courses with the highest level of homework requirements are likely the most rigorous AP or Honors courses within the school and probably a few of the higher performing arts activities demanding strong production and preparation time commitments.

The time expectations and homework load assigned by teachers is also related to the characteristics and demands of their courses as well as to the purpose of homework design. The purpose of homework can be considered through two related variables: how frequently and spaced are the homework assignments designed for and what is the main instructional approach or belief underlying the motivations for assigning homework. The majority of teachers at NYC school (83%) assign their homework and class preparation tasks with mainly two of the six approaches: as either conceptually meaningful (45% of the respondents) or as designed within

the learning proximal zone of being appropriately challenging (31% of the respondents) supplemented by 7% emphasizing the quality of the homework assignments. Similarly, the overwhelming majority of teachers (93%) assign homework motivated by their belief that reinforces student learning (43%), is needed as pre-learning for upcoming material (25%), is a formative tool for either checking for student understanding (16%) or to adapt and focus instruction in areas that need further attention (7% of the respondents). No single teacher stated that the motivation for assigning homework was because it was required by the school or department and only a very small percentage (6% of teachers) believes that schools should not assign homework at all.

Teachers at NYC school overwhelmingly understand the purpose and motivation for homework. This brings us to the last segment of this section: how the actual use of evidence-based learning strategies in NYC school homework practices compares to its teachers' understanding of these strategies. To contrast these two aspects of homework, actual practice versus understanding under hypothetical homework scenarios, SOTAH adapted the learning scenarios used in the nationwide teachers' survey by Boser (2019) as specific homework situations. This will allow me to use Boser's national sample data of teachers understanding of evidence-based learning strategies as a comparative reference. SOTAH responses to questions Q4.14 through Q4.20 provides us with the data on the relative understanding of teachers at NYC school about the learning effectiveness of these hypothetical homework scenarios. This triangulation of data and analysis of actual homework practices with the understanding of hypothetical homework situations for student learning can help us pinpoint strengths and weaknesses to target recommendations for improvement on homework practices.

Teachers at NYC school clearly understood (81% of the respondents) the effectiveness of using elaboration or elaborative questioning as a learning tool under a hypothetical homework scenario (Q4.16 or scenario 3). SOTAH did not ask direct questions about applying elaboration or elaborative questions to homework assignments but there are specific indicators of applying this learning strategy to assessment in question Q3.7. The responses showed that about 78% of teachers use short elaborative questions and answers as well as 69% use long complex questions or problems and answers as part of their assessment. This results in an average of 76% of teachers understanding and applying the elaboration strategy to homework and assessment ($81\% + 78\% + 69\% / 3 = 76\%$). This high percentage of teachers using elaboration in homework and assessment is consistent with the comparable high level of 67% of teachers using elaboration in their instruction as we saw in the previous section on instructional practices. The resulting average is 72% of teachers using elaboration in their instructional, assessment and homework practices ($76\% + 67\% / 2 = 72\%$).

Spaced practice in a hypothetical homework assignment scenario asking students to study for an exam for 10 hours was also understood by the majority or 69% of teachers (Q4.20 or scenario 7). The understanding of spaced practice in this homework scenario is higher than the actual spacing of homework assignments by teachers at NYC school. An average of 46% assign spaced homework involving current and past material (34%) or current and future upcoming material (12%) as illustrated by the responses to Q4.7. The net result is an average of 58% of teachers use the evidence-based strategies of spaced practice for their homework assignments ($69\% + 46\% / 2 = 58\%$). Teachers use spaced practice at higher rates in their assessments since 68% of teachers

do regular unit tests and quizzes (Q3.6). The average use of spaced practice in assessment and homework is 63% ($58\% + 68\% / 2 = 63\%$). When we additionally consider the use of spaced practice in instruction by 75% of teachers, the overall average is 69% of teachers using spaced practice in their instructional, assessment and homework practices ($63\% + 75\% / 2 = 69\%$).

One paradoxical finding is the relatively moderate percentage of teachers (40%) understanding the application of metacognitive strategy of students generating their own mnemonic device for remembering complex concepts with many elements in a hypothetical homework scenario (Q4.17 or scenario 4). By contrast a high percentage of teachers (72%) use the metacognitive strategy of having students correcting errors by re-doing exams (Q3.15). When we combine these indicators, the average is 56% of teachers using these metacognitive strategies in their assessment and homework assignments ($40\% + 72\% / 2 = 56\%$). Similarly, a very high percentage of teachers understand and frequently apply other forms of metacognitive strategies to their instruction (79%) as we saw in the previous section on instructional practices. When we average these percentages, the net result is that 68% of teachers use different metacognitive strategies in their instructional, assessment and homework practices ($56\% + 79\% / 2 = 68\%$).

About 37% of teachers understood the application of dual coding in a hypothetical homework situation (Q4.15 or scenario 2). I want to acknowledge that the wording of that scenario was somewhat confusing, which might explain in part the low proportion of teachers understanding this homework situation. I did not ask about applying this strategy to assessment, so I can't enter a value of dual coding in assessment. Regardless, about 53% of teachers stated using dual coding in their instructional approaches as we saw in the previous section on instructional practices. The net result is an overall average of 45% of teachers using dual coding in their instructional and homework practices ($37\% + 53\% / 2 = 45\%$).

The majority of teaching faculty at NYC school, or 63%, also understood the use of retrieval practice of students writing about what they just read (instead of re-reading) as an effective learning strategy in a homework scenario (Q4.18 or scenario 5). The use of retrieval practice is probably one of the most complex evidence-based strategies to measure homework since most teachers use this strategy sometimes alone but most of the time they use it in combination with other strategies, such as spaced practice, elaboration, concrete examples, or through metacognitive strategies such as re-doing or revising tests. I am going to narrow them down to just a few of these additional retrieval strategies typically combined with other learning strategies. For instance, Q4.7 showed that 46% of teachers use retrieval practice for their homework assignments focusing on current material but another 45% use retrieval together with spaced practice (34% combining it with previous material and 12% combining it with upcoming material). That is a total of 91% of teachers using retrieval practice in homework assignments. When we average these percentages with the 63% of teachers understanding retrieval in the context of a hypothetical homework situation, the net result is 77% of teachers understanding and applying retrieval to their homework assignments ($63\% + 91\% / 2 = 77\%$).

However, when SOTAH asked questions about using retrieval in the context of assessments, the results were from very high to extremely low. About 83% of teachers provide practice tests (Q3.19), 59% of teachers assess students unaided by their materials (Q.3.8) and according to teachers only 47% of students test themselves or even a meager 10% self-test by writing on a

blank piece of paper what they remember (Q3.15). When we average the use of retrieval in homework assignments and assessment practice or self-tests, the net result is that 59% of teachers understand and apply retrieval practice in different ways to both homework and assessment ($63\%+91\%+83\%+59\%+47\%+10\% / 6 = 59\%$). When we average 59% of teachers using retrieval practice in homework and assessment with the 21% of teachers using retrieval practice in their instruction, the net average is 40% of teachers using retrieval in their instructional, assessment and homework practices ($59\%+21\% / 2 = 40\%$).

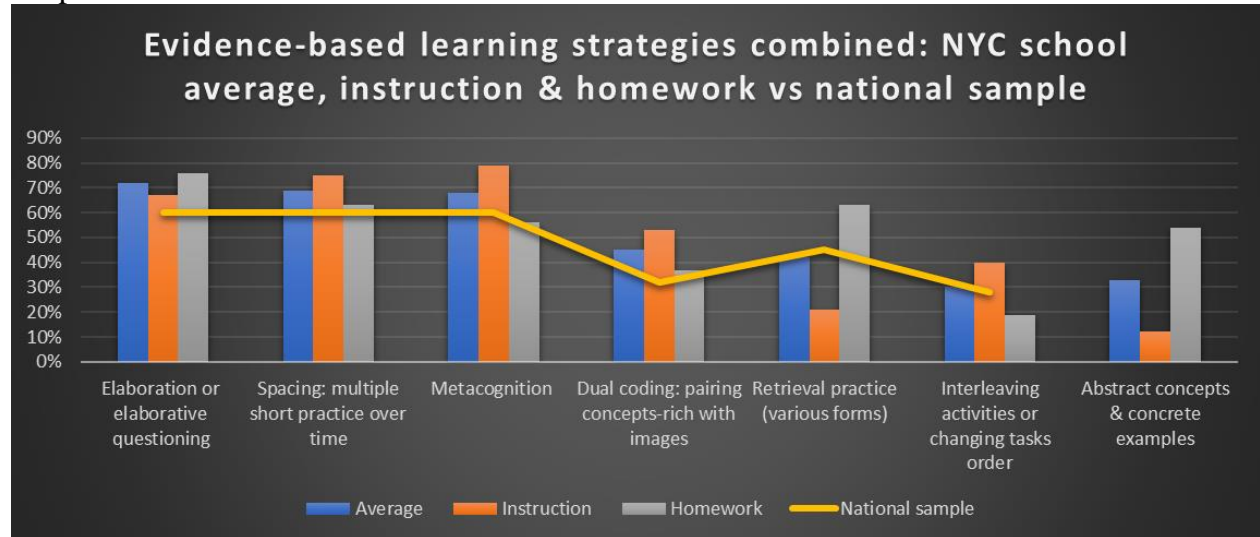
Teachers at NYC school understood overwhelmingly (87%) that using concrete examples to put in context an abstract concept, such as the meaning of a difficult word, was more effective for learning (Q4.14 or scenario 1). Paradoxically, when SOTAH asked teachers about using different concrete examples to illustrate an underlying abstract concept on students' homework assignments, the percentage was much lower (21%). I did not ask about applying this strategy to assessment, so I can't enter a value about the use of concrete examples in assessment. To balance both extreme understanding and practice of this evidence-based strategy of concrete examples, I averaged these percentages, resulting in 54% ($87\%+21\% / 2 = 54\%$) of teachers applying this strategy to homework assignments. This 54% average contrasts with the very low 12% of teachers stating in the previous section of instructional practices, that they use different concrete examples to illustrate underlying abstract concepts. When putting both averages together, the resulting use of concrete examples during instruction and homework is 33% ($54\%+12\% / 2 = 33\%$).

The lower level of understanding was regarding the use of interleaving as an effective learning strategy in a hypothetical homework situation (Q4.19 or scenario 6). Only 22% of teachers understood the application correctly. We need to consider the caveat that massing by similar examples when explaining for the first time makes sense for instruction. By contrast, interleaving makes more sense for subsequent practice and relating different and diverse concepts to each other. I did not ask about applying this strategy to assessments, so I can't enter a value on interleaving in assessments. Regardless, and to balance this value, I average it with an additional indicator of 16% students using interleaving on their homework (Q4.8). The average is that 19% of teachers use interleaving on their homework assignments ($22\%+16\% / 2 = 19\%$). When we consider that 40% of teachers use interleaving in their teaching, the net average is 30% of teachers use interleaving in their instructional and homework practices ($19\%+40\% / 2 = 30\%$).

The graphic and table below summarizes the overall percentages of teachers using evidence-based learning strategies at NYC school as an average as well as in their instruction and in their homework (and assessment) practices according to SOTAH findings. The line in the graphic compares these findings with the average use of these learning strategies among a national sample of teachers included in Boser's (2019) research. As when I discussed Boser's findings in the instructional practices section, we should use his national sample average cautiously and only as a general reference to compare with SOTAH findings. Moreover, we need to consider that Boser did not provide a disaggregation of values regarding metacognition, elaboration and spaced practice. His report simply states that roughly 60% of teachers do use these strategies but without disaggregating the values between the learning scenarios and the actual practices in their classroom. Regardless of this caveat, teachers at NYC school use metacognition, elaboration and

spaced practice at higher levels than the national sample, and we can view the use of these learning strategies as a strength of NYC school.

Graphic and table VI.32



Evidence-based learning strategies combined	Average	Instruction	Homework	National sample
Elaboration or elaborative questioning	72%	67%	76%	60%
Spacing: multiple short practice over time	69%	75%	63%	60%
Metacognition	68%	79%	56%	60%
Dual coding: pairing concepts-rich with images	45%	53%	37%	32%
Retrieval practice (various forms)	42%	21%	63%	45%
Interleaving activities or changing tasks order	30%	40%	19%	28%
Abstract concepts & concrete examples	33%	12%	54%	

Source: SOTAH responses for NYC school data and the national average from Boser (2019)

The weaknesses are more related to the other four learning strategies. Regarding the national sample, I have averaged Boser’s two values assigned to retrieval, dual coding and interleaving. One value refers to actual teacher responses to direct questions about their instructional practices versus the second value that represent teachers’ correct understanding of these learning strategies under hypothetical learning scenarios. The resulting averages are: 45% of the teachers using retrieval (averaged from 31% actual practice and 59% from the learning scenario), 32% for dual coding (averaged from 38% actual practice and 26% from the learning scenario) and 28% for interleaving (averaged from 20% actual practice and 35% from the learning scenario).

Regardless, the percentage of teachers at NYC school according to SOTAH findings using these evidence-based strategies as an average in their instruction and homework assignments are generally lower or similar than Boser’s national sample average. Boser’s report did not include references to the use of concrete examples illustrating underlying abstract concepts but SOTAH’s average about NYC school is relatively low and at a similar level than the use of interleaving. To maximize evidence-based instruction, assessment and homework, NYC school will need targeted professional development and teaching improvement teams by departments or related disciplines to design and implement strategies to strengthen these areas.

VI.4. Recommendation #4: Refine assessment and strengthen quality of homework

The teachers at NYC school have many strengths in their assessment and homework practices. Teachers use various formats and approaches in their assessments to evaluate student understanding of course contents, creativity, critical thinking and problem-solving skills and effectively use their homework assignments to reinforce student learning. Teachers have a great deal of autonomy and self-efficacy designing and using assessment and homework assignments as both formative and summative learning tools. They comply with school policies on homework limits. The majority of teaching faculty clearly understand and apply metacognition and most of the six evidence-based learning strategies, especially elaboration and application of skills to their assessment and homework assignments and do so at a higher rate than a national sample of teachers. Faculty members collaborate with each other and widely use departmental, professional organizations and textbook materials and resources relevant to their respective course practices and standards. Teachers use similar criteria for assessment and homework assignments for all their courses regardless of student ability grouping.

There is room for improvement in certain aspects of both assessment and homework to maximize instructional impact and enhance student learning. There are areas within both, assessment and homework, that could be enhanced by strengthening the application of otherwise thoughtful current practices. That is the case of assessment categories and their relative grading weight, which varies too widely among and within departments. Teachers at NYC school infrequently use multiple-choice questions together with the widely used elaborative and skill application questions. Although most teachers assign homework frequently, about half use it mainly for current materials but less frequently for spaced retrieval and application of skills of previous or upcoming materials. Similarly, teachers have a limited understanding on how to effectively use Learning Management Systems (LMS) on assessment and homework in the context of the pandemic compared to a more solid understanding of using LMS for instruction.

VI.4.1. Assessment

The strengths of teachers at NYC school on their assessment practices are numerous and wide. Yet, there are also some areas that need to be addressed to maximize student learning and standardized test outcomes at NYC school. First, NYC school must establish specific departmental ranges for different assessment categories and their relative grading weight to reduce the current wide variance and provide more predictable assessment criteria to students and teachers. It will be counterproductive to establish uniform criteria for the whole school given the wide departmental and specific discipline assessment practices. It might be more helpful to have general guidelines created from the bottom-up with input from all departments to establish at least some common categories across the school, even if not all departments must adopt or use all and the same assessment categories. However, each department could and should agree on the categories they are going to use within the various disciplines under their umbrella. The key area where some consistency of grading weights needs to take place is at a departmental level, but it must be done safeguarding teachers' autonomy and self-efficacy.

The best way to implement this recommendation is by establishing the categories used at a departmental level while respecting teachers' autonomy to assign the specific weight within an agreed-upon grading weight range for each category decided collegially within the department and/or teaching teams when applicable. This could be done as part of either the accreditation process or the elaboration of a school instructional strategic plan using the collegial distributed leadership approach and enhancing departmental and teachers' autonomy, engagement, psychological safety and trust in the decision-making process. Training from the College Board on vertical and horizontal integration and the related workshops within the context of the standards and format of the AP exams within different disciplines and departments can be a productive way of discussing assessment categories, grading weight ranges and exam format among teachers within each department and/or related disciplines.

Second, it is critical for teachers leading AP, pre-AP or similar feeding courses whose students are assessed by outside professional organizations, like the College Board, with high-stakes standardized exams to use similar formats and weighted categories in their course assessments. This will improve student learning and performance in the outcomes while increasing background knowledge of the assessment and reducing anxiety. NYC school is a member school of the College Board (CB) and uses both its Advanced Placement (AP) exams for different subjects as well as the standardized tests, such as SAT and ACT and thus, students at the school usually take these standardized tests. The College Board's Advanced Placement (AP) courses and exams as well as the SAT and ACT standardized exams include a combination of elaborative and multiple-choice questions, with a complex set of categories, each with their own relative grading weight. Although the specific evaluative categories and their relative weight of these two types of questions varies by subject matter, their relative weight ranges are usually close to the 50%/50% split between free or elaborative response questions (FRQ) and multiple-choice type of questions (MCQ) to calculate the overall cumulative grade. This format and weighting will evolve as the College Board (and the ACT organization) moves toward adaptive testing (Marcus, 2021). Yet, even adaptive testing will include a combination of formats and questions, some open and some standardized, having students practice under similar conditions will help their learning and becoming familiar with the specific composition and relative weights of various sections.

Similarly, there are other national professional organizations or even international ones, like the IBO program or the OECD's PISA tests that also measure student learning in different ways. Either way, these standardized exams and tests are in reality a composite of different tests or exams, each focusing on different and specific types of domain knowledge and skills within various disciplines (Achieve, 2018; Fernández-Castro, 2018; Lauen & Gaddis, 2016; Norcini et al., 2010; Olson, 2019). Each part of these standardized exams can be organized mainly around a narrowly type of assessment item within that specific section, and subsequently weighted together with the other sections to assign students an overall performance grade measuring their relative mastery of the specific domain knowledge and skills. Some of the most frequently used assessment items by teachers at NYC school, the College Board or other professional assessment and international organizations include open questions or problems requiring student elaboration, whether complex and long answers in the forms of essays, labs or reports or as short reasoning answers. However, most standardized exams also include multiple choice questions or other types of questions on the mastery of subject domain knowledge and skills. If teachers at NYC

school use both, elaborative questions and multiple-choice types of questions in a balanced way and with similar categories and grading weights, this can be an effective strategy for structuring assessment to prepare students to be familiar with the evaluative formats of the ACT, AP or SAT exams. Classroom assessment can become like formative or practice exams for these standardized high-stake exams. Students becoming familiar with the use of these complex assessment formats, will likely experience less anxiety and stress when they are in a formal high-stake situation taking these actual standardized exams and improve their learning outcomes and scores (Agarwal et al, 2014; Metcalfe, 2017; Weinstein & Sumeracki, 2018).

For courses that are not part of the AP sequence, it might be insightful to explore different forms of assessments. Although the use of multiple-choice type of assessments do not seem to be favored at NYC school, there are other alternative standardized assessments that balance various approaches. For instance, the current development of the DISCO TEST initiative combines standardized multiple-choice questions together with elaborative explanations and reasoning while emphasizing skills application. This initiative incorporates a new emerging assessment formative platform that might be consistent with some teachers' alternative approaches. Teachers leading courses outside the AP sequence could explore this alternative standardized approach for evaluating complex elaborative assessments: <https://lecticalive.org/about/discotest#gsc.tab=0>. (Lectica, 2021; Stein, Dawson & Fischer, 2021). However, the DISCO TEST platform should be just one more tool among others, which could include becoming part of the periodic every 4 years PISA exam (testing mainly 9th graders) to have a comparable international perspective of student educational outcomes at NYC school.

One of the most useful assessment tools is the OECD's PISA international exam since it randomly selects students, whether gifted or struggling, in advanced, regular or in remedial classes, allowing for a non-biased overall school performance analysis. That is the single most important reason why schools should sign up for this exam, regardless of their strategy for improvement. The PISA exam will help the school to be honest with itself about the quality and effectiveness of teaching and student learning, besides providing a ranking of the school within the global educational market and a plan for improvement. Similarly, exploring the possibility of becoming part of the International Baccalaureate (IB) program, which includes standardized tests but generally tilted in how different components are weighted towards assigning higher values to elaborative questions, could also be an additional alternative. In fact, some of the top magnet and international independent schools offer both programs, the AP and the IB programs as part of their curricula, providing students with alternative options. Many of these double academic program schools (AP and IB) also use the AVID program for student support and they are part of the sample schools administering the PISA exam (Fernández-Castro, 2018).

Third, teachers at NYC school have a clear, sophisticated and wide understanding about effective evidence-based assessment. Yet the focus on elaborative and application of skills at the cost of multiple choice questions indicates that teachers will benefit from further explanation and training about the positive impact on student learning of all forms of assessments and using tests as formative learning tools, including multiple choice. This can be part of the broader and focused PD on evidence-based learning strategies for instruction, which can be extended to both assessment and homework practices and/or subject matter contents and skills. Similarly, and even if the use of metacognitive strategies is one of the strengths of teachers at NYC school, it is

possible to use evidence-based focused PD on assessment to reinforce the many forms of metacognitive strategies. For instance, teachers at NYC school widely use correction of errors and formative practice exams. Small adjustments could further maximize the learning impact of these already widely used effective strategies at NYC school. Additional support and training from cognitive psychologists' expertise on the test effect and the best practices for summative and formative assessments or the timing and sequence for providing feedback and grades can enhance teaching impact on student learning. A couple of insightful sources to explore are provided by the application of the evidence-based learning strategies to assessment within medical education (see Yang, Luo, Vadillo, Yu & Shanks, 2021 for a meta-analysis of the research on assessment or Kibble, 2017 for summative and Kulasagaram & Rangachari, 2018 for formative assessments). Similarly, correcting errors and providing feedback before returning the graded exams to students (withholding temporary exam grades) has been proven to have a positive impact on subsequent academic learning within an authentic higher education setting (Kuepper-Tetzl & Gardner, 2021).

Fourth, focused professional development workshops through department or teaching teams about online assessment will enhance capacity and support teachers' concerns about using Learning Management Systems for evaluating student learning. Training on the capabilities of CANVAS or other LMS the school uses in the context of specific departments and their courses with effective examples, will provide teachers and teaching teams with additional assessment tools. To be effective, this will need not only professional development but also improvement teams within each department or related sets of courses or disciplines applying these instructional and assessment strategies through online or hybrid assignments using NYC school Learning Management System.

Finally, and fifth, NYC school needs to reinforce student support structures regarding assessment for all students, especially for those struggling academically or from underprivileged backgrounds. This will require student training about effective learning and studying strategies from the same or similar PD providers of evidence-based learning for teachers and student support professionals. One key element that is more specific to assessment will be training for all faculty on how to reduce individual and social identity stereotype threats with simple and easy to do intervention statements and contributing to enhance a climate of psychological safety (Edmonson, Higgins, Singer, & Weiner, 2016; McBride, 2015; Steele, Spencer and Aronson, 2002; Steele, 2010). The strategy of reducing stereotype threats for assessments to be more effective requires further action in the form of devising school designs, programs and support structures for disadvantaged and struggling students (America's Promise Alliance, 2019; Moore, Lantos, Schindler, Belford & Sacks, 2017; Shields, Walsh & Lee-St.John, 2016; Sibley, Theodorakakis, Walsh, Foley, Petrie & Raczek, 2017; Taggart, 2018; Wasser Gish, 2017).

Likewise, this will require enhancing school sponsored tutoring for students (maybe using trainees from establishing a teaching fellows program) using a school grown support and tutoring program or adopting well established support programs, such as Advancement Via Individual Determination (AVID: <https://www.avid.org/>) that have demonstrated a positive impact on increasing achievement of underprivileged students (Fernández-Castro, 2018, 2019; Matthews, 2015). The AVID organization provides PD training for schools and teachers that wish to engage and implement this outstanding student support program. All these interventions could help

stereotyped students to improve outcomes through the impact of positive expectations associated with the Pygmalion effect (Rosenthal & Lenore, 1992). This eventually will help students at moving horizontally to honor tracks to improve long term academic achievement. This approach can also contribute to moving students towards a positive prevalence-concept (Levari et al., 2018) to their expected higher performance. Implementing all or some of these suggestions will maximize student learning while reducing the achievement and opportunities gap between the top performing quartile of students and the lower and bottom quartiles.

VI.4.2. Homework

The strengths of teachers at NYC school on their homework practices are numerous. Yet, there are also some areas of improvement that need to be addressed to maximize student learning. First, NYC school needs to either lighten teaching loads and school commitments of its teaching faculty or provide more structured time within the school schedule for individual or teaching teams to design more focused homework assignments. This will allow for an opening in teachers' busy and overloaded schedule with instructional, assessment and other school priorities that typically force teachers to address homework design as a back-burner issue. However, if the school wishes homework to be an effective learning tool, it needs to provide teachers with the space and time to design high quality and evidence-based learning homework assignments.

A time-saving strategy of highly effective homework is using the testing effect on learning by encouraging retrieval through metacognitive strategies (a strength of NYC school) by assigning students to do self-testing and practice exams as part of homework. As a retrieval and metacognitive tool, self-tests should be low stake and designed to help students to figure out what they do and do not understand. Effective practice tests also require effortful interaction with the material including textbook multiple-choice tests and quizzes or other tools easy to review for errors. Most departments can use some questions or tasks from previous tests or some from the previous national subject tests as part of the homework assignments to retrieve concepts and materials from past units. These two principles allow students to correct their misunderstandings, develop their metacognitive skills to assess their own progress and lead to more effective study and learning strategies (Metcalf, 2017; Weinstein & Sumeracki, 2018).

Another time-saving technique for homework design is using the current textbook, workbook and ancillary materials or homework assignments previously designed by other teachers and teaching teams but making sure that it includes not only some questions about the current material but also a few questions from previous units and concepts, which brings the second recommendation. Some of the recommended websites on evidence-based learning strategies mentioned in the instructional chapter can also be used for ideas and activities using retrieval and spaced practice. Another source recommended by the Learning Scientists and other cognitive psychologists for students and teachers is <https://www.podsie.org/>.

Second, the school also needs to provide support on how to apply evidence-based learning design to homework assignments through targeted PD on homework focused on the practices and standards within various departments or disciplines. This can and must be part of the broader evidence-based learning strategies PD on instruction but including branching down to

assessment and homework. The best way to do that is through departmental or teaching teams and providing them with the scheduled time and support needed. More specifically, enhancing retrieval through spaced practice together with a few other learning strategies can be a practical way of approaching this type of improvement through individual teachers or teaching teams. Homework should include mainly retrieval of concepts, information or skills and related procedures learned in class but ideally always mixed with spacing. In that sense, it must also expand and connect the knowledge of current unit concepts explicitly taught in class with questions or items involving concepts and skills learned in previous units. It is more effective when homework is spaced through shorter but more frequent practice or studying sessions (Agarwal & Bain, 2019; Carpenter & Agarwal, 2019). A recommended strategy by some teaching practitioners and learning scientists is to simply have the students write concepts discussed on a blank piece of paper, and for homework, write as much as they remember about the concepts and how they relate to previous class materials. It could be designed just as a simple prompt or short elaborative question about a concept from the previous unit or from a few units ago besides any questions regarding the current unit.

The evidence-based strategies that need most clarification and training besides retrieval practice, for homework design, are interleaving and using different concrete examples to illustrate an underlying abstract concept as was the case with instruction (Hausman & Kornell, 2014; Kornell & Bjork, 2007; McNeil, Uttal, Jarvin & Sternberg, 2009; Rawson, Thomas & Jacoby, 2014). These last two learning strategies need more expert explanation and further training since the evidence points to deeply rooted misunderstandings that can be elucidated in the context of actual teaching by more targeted experimentation and testing. From direct and explicit teaching and my own experience as a classroom teacher, I have found out through trial and error that teaching for the first time an abstract or a difficult concept might require massed practice (instead of interleaving) and similar examples illustrating the abstract concept (instead of different examples). However, after students have learned the material and practiced it in class, that is when assigning homework tasks and practice problems using interleaving or very different examples or within different contexts, enhance student learning and understanding of the material. Although this assertion needs further research and experimentation, there are clues from actual teaching practice and recent experimental research, like the study on interleaving and massed practice by Carvalho & Goldstone (2021), that indeed make these hypotheses worthy to explore and test in real teaching and student learning situations.

Third, the most demanding and rigorous courses, especially a few AP and Honors courses, requires some flexibility regarding school homework time limits. Similarly, the arts need a flexible schedule for their students dedicating time to production preparation or practicing artistic skills. In general, all courses will benefit if teachers are supported with more time and targeted PD focused on homework as part of broader evidence-based professional development. This can support teachers designing more high quality effective and meaningful homework that might require less time to complete by students (Dettmers et al., 2010). Yet, highly demanding and rigorous courses, in academics or the arts, require more asynchronous work, whether homework or class preparation. A way of addressing this issue by the school is setting homework time limits in a more flexible manner. The school might wish to keep its general overall policy but understanding that highly rigorous courses will likely exceed the homework time limit. A possible way to balance this is through flexibility by making sure that all students, including

those with the most demanding course-loads, also have at least a couple of courses typically assigning or requiring less time or no homework at all. This could be accomplished through advising, course-load requirements, scheduling or a combination of all these strategies. This will allow students that thrive and can handle more to do so and yet have some respite while those students that wish to focus on less demanding curricula and more co-curricular activities can also limit over-commitment of heavy homework course-load.

Fourth, focused professional development workshops through department or teaching teams about online assessment will enhance capacity and support teachers' concerns about using Learning Management Systems for designing and developing effective homework assignments. A key element for homework as an effective retrieval and spaced practice is designing high quality assignments while reducing the quantity (Agarwal & Bain, 2019; Carpenter & Agarwal, 2019; Challenge Success, 2012). Training on the capabilities of CANVAS or other LMS the school uses in the context of specific departments and their courses with effective examples, will provide teachers and teaching teams with additional homework tools. To be effective, this will need not only professional development but also improvement teams within each department or related sets of courses or disciplines applying these homework strategies through online or hybrid assignments using NYC school's Learning Management System.

Finally, and fifth, NYC school needs to reinforce student support structures regarding homework completion for all students, especially for those struggling academically or from underprivileged backgrounds. The lack of resources of the families of these students contribute to the negative impact on student learning due to their overall disadvantage growing up in the context of a family with low levels of education and the financial impossibility of providing extra-support, tutoring, home space and a quiet environment for their children to study. Lack of financial resources also limit transportation means and the related mobility to join after school academic and curricular support or enrichment through co-curricular activities. In fact, family background or family environment is one of the primary predictors of student relative success or unsuccess in school (Carnevale, Fasules, Quinn, Campbell, 2019; Egalite, 2016; Lareau, 2011; Pal, 2020). Counteracting these disadvantages will require the school to provide student training about effective learning and studying strategies from the same or similar PD providers of evidence-based learning for teachers and student support professionals. Likewise, this will require the incorporation in the student schedule of a study period and the space within school where to do homework, after school support and summer catch up or enrichment opportunities, increasing school sponsored tutoring, support programming and enhancing the transportation means and hours for students. This will facilitate and support students' needs while providing a structure for all students to engage more productively with high quality homework completion and improving overall academic achievement. This is consistent with the literature on student support structures for academic achievement (America's Promise Alliance, 2019; Moore, Lantos, Schindler, Belford & Sacks, 2017; Shields, Walsh & Lee-St.John, 2016; Sibley, Theodorakakis, Walsh, Foley, Petrie & Raczek, 2017; Taggart, 2018; Wasser Gish, 2017). Similarly, proven programs like AVID can also support at creating these needed structures, schedule the time and train teachers and tutors to support struggling and under-privileged students.

CHAPTER VII

Conclusion and recommendations

Chapter contents

- VII.1. Summary of key findings
- VII.2. Summary of recommendations
- VII.3. Limitations and strengths of the capstone project
- VII.4. Implications for future research directions
- VII.5. Theory of change, logic model and action plan

Chapter VII. Conclusion and recommendations

This capstone is an improvement project and case study addressing the problems of practice of how NYC school can maximize evidence-based teaching and learning strategies, assessment, homework practices for improving student learning and outcomes while also improving teachers' professional development and school climate. The school aims at improving student learning and mastery of their broad curricular and co-curricular programs while increasing the proportion of its graduates' acceptance into the most competitive colleges in the nation. NYC school also wishes to create a climate of trust with its faculty and a more effective professional development program to improve the effectiveness of its teaching practices.

Maximizing evidence-based teaching and learning, assessment and homework will increase student learning and their educational outcomes while reducing the time students need to dedicate to academic schoolwork and increase the accessibility and time students can also dedicate to the various co-curricular programs. This in turn will contribute to enhancing students learning outcomes and achieving greater performance in other educational areas such as arts, athletics, character and service and overall social and emotional learning. NYC school believes that achieving this balance in student outcomes and engagement with curricular and co-curricular programs is needed for its graduates increased whole person learning and their chances of acceptance into the most competitive colleges of their choice.

I am going to summarize the detailed analysis and findings of this capstone project by synthesizing them in a few simple sentences answering the four research questions guiding the underlying research design of this case study. I will synthesize the insights from the findings into a few recommendations for an action plan involving several components for each dimension of the model. I will follow with a section on the limitations and strengths of this research project and outline a future research agenda grounded on the questions uncovered during the research on this case study. Afterwards, I will make explicit the implicit theory of change and logic model derived from the four-dimensional school learning conceptual framework used. Should the school leadership choose to implement these recommendations, this final chapter also outlines an action plan and timetable to do so.

VII.1. Summary of major findings

The macro-level dimension, RQ1: To what extent do NYC school's leaders reinforce a climate of learning, faculty support, psychological safety and trust?

The leadership at NYC school reinforces a positive professional school climate with distributed leadership, autonomy and self-efficacy for teachers. There is a strong professional development and teacher growth support program. Similarly, there is among its teaching faculty an environment of psychological safety and experimentation for teaching and student learning.

There are also some areas that need further improvement. The school climate of trust, respect and identification with the mission is slowly being established. The school leadership is perceived by teaching faculty as having limited impact on instructional guidance, having limited knowledge about the strengths of individual teachers or providing helpful feedback for instructional improvement. There is high teacher turnover in a few departments.

The meso-level dimension, RQ2: How does NYC school implement effective professional development and how do teachers perceive its relative effectiveness and relevance for improving their teaching craft?

NYC school has a robust supportive teacher professional development program with many components and high to moderate levels of participation. PD activities are generally helpful and aligned with faculty teaching and subject contents. Teachers do rely on and support each other for practical instructional guidance outside the professional development program which points out some areas needing improvement.

Teachers and department chairs perceive the school's robust PD program as more informational than practical for their instructional strategies. The mandated nature of some components of the professional development program might be counterproductive with very little instructional impact for improving the teaching craft. There seems to be limited evidence-based learning PD training resources for support specialists. School student accessibility and support structures to the most rigorous courses seem limited to maximize student outcomes.

The micro-level dimension, RQ3: To what extent do teachers at NYC school utilize evidence-based teaching and learning strategies in their pedagogical approach?

NYC school teaching faculty use a varied and wide combination of instructional approaches. Teachers collaborate extensively, formally and informally, for instructional planning. Teachers are cognizant and use high levels of metacognitive strategies as well as most evidence-based teaching and learning strategies as compared to the levels used by teachers in a national sample. Teachers at NYC school have an ample variety of professional backgrounds, instructional skills and experience and apply their instructional approaches equally to all ability grouping classes.

There are some areas needing further improvements. Teachers at NYC school could maximize their instructional practices through a deeper training on all evidence-based teaching and learning strategies, specifically, retrieval practice. Two additional evidence-based strategies misunderstood on their application are interleaving and use of different concrete examples to illustrate an underlying abstract concept. Students need further academic support and training on effective learning and studying strategies to improve educational outcomes and performance.

The granular-level dimension, RQ4: How do current assessment and homework practices at NYC school utilize high-quality design and strategies consistent with evidence-based learning and course standards?

Teachers at NYC school use various formats and approaches in their assessments to evaluate student understanding of course contents, creativity, critical thinking and problem-solving skills and effectively use their homework assignments to reinforce student learning. Teachers have a great deal of autonomy and self-efficacy designing and using assessments and homework assignments as both formative and summative learning tools. They comply with school policies on homework time limits. The majority of teaching faculty clearly understand and apply metacognition and most of the six evidence-based learning strategies, especially elaboration and application of skills, to their assessment and homework assignments and do so at a higher rate than a national sample of teachers. Faculty members collaborate with each other and widely use departmental, professional organizations and textbook materials and resources relevant to their respective course practices and standards. Teachers use similar criteria for assessments and homework assignments for all their courses regardless of student ability grouping.

There are areas within both, assessment and homework, that could be enhanced by strengthening the application of otherwise thoughtful current practices. That is the case of assessment categories and their relative grading weight, which varies too widely among and within departments. Teachers at NYC school infrequently use multiple-choice questions together with the widely used elaborative and skill application questions. Although most teachers assign homework frequently, about half use it mainly for current materials but less frequently for spaced retrieval and application of skills of previous or upcoming materials. Similarly, teachers have a limited understanding on how to effectively use Learning Management Systems (LMS) on assessment and homework than they do with instruction in the context of the pandemic.

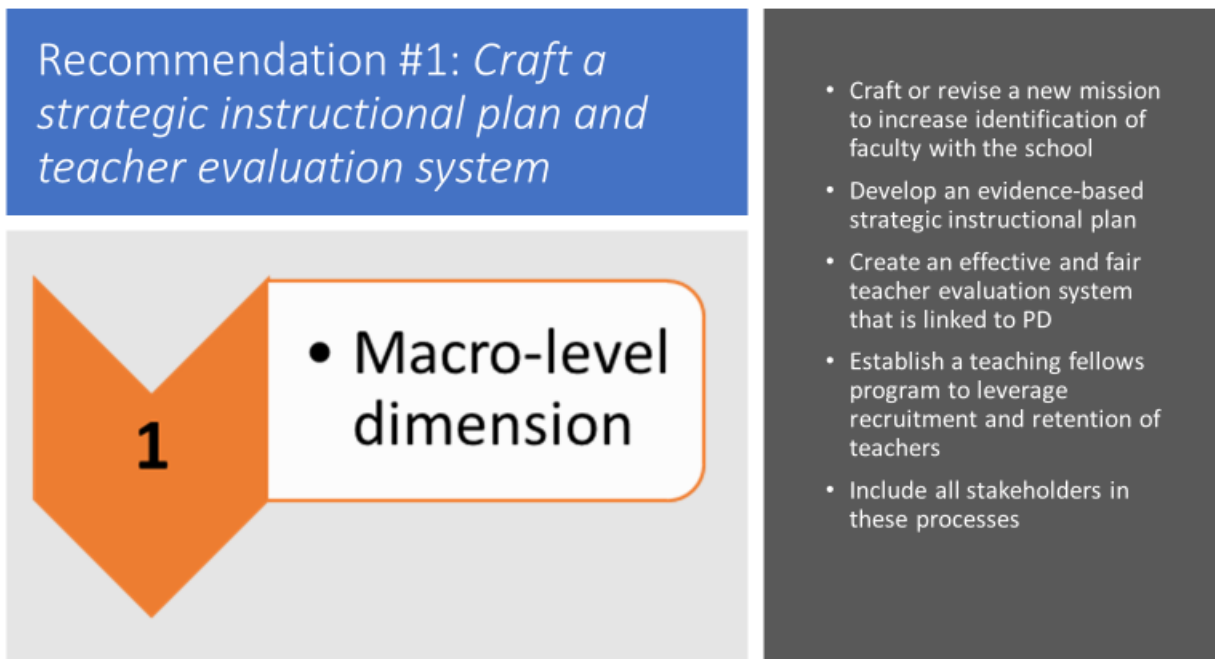
VII.2. Summary of recommendations

This capstone project outlines four broad recommendations to address the areas that need improvement within each dimension of the school learning model developed through this case study. First, leverage the school commitment to its collegial and distributed leadership style to craft a strategic instructional plan and teacher evaluation system. Second, focus on broad, practical, self-directed professional development and faculty non-evaluative coaching and peer-mentoring. Third, maximize evidence-based learning strategies through teaching teams and provide student training also and academic support. Finally, and fourth, refine assessment and strengthen quality of homework practices through evidence-based learning strategies while providing student support resources and structures. Each of these broad recommendations can be disaggregated into more specific action-plans.

Recommendation #1: Focus collegial leadership on strategic instructional planning

The analysis of the evidence of the macro-level dimension on school leadership and climate indicates that NYC school has created a relatively positive psychological safety and experimentation climate with a robust support for faculty professional development. Yet, the school collegial distributed approach seems to have limited success at increasing trust. This can be improved by outlining a clear mission and vision for the school, crafting a strategic instructional plan and a teacher evaluation system providing fair and helpful feedback.

Image VII.1



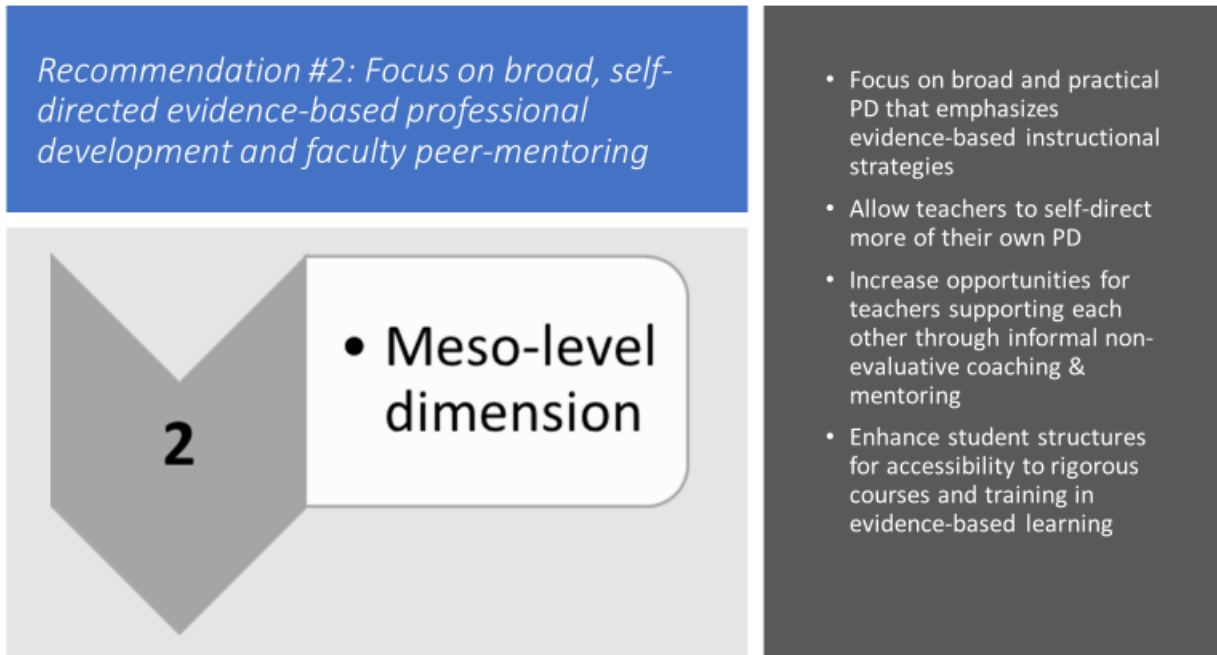
Source: summarizing capstone leadership recommendations

Craft a strategic instructional plan and teacher evaluation system including all stakeholders in the design and implementation process. This can be done in the context of crafting or revising a new mission or school strategic plan. A component of that strategic plan will be an instructional plan with an emphasis on evidence-based learning strategies for the next accreditation cycle. Another critical element will be the development of an effective and fair teacher evaluation system as well as establishing a teaching fellows program to leverage recruitment and retention.

Recommendation #2: Focus on broad, self-directed evidence-based professional development and faculty peer-mentoring.

The evidence and findings from SOTAH responses and qualitative semi-structured interviews during this research suggest that NYC school should enhance and refine its robust and strong PD program support to make it more effective, impactful, practical and meaningful by taking advantage of current patterns of practice.

Image VII.2



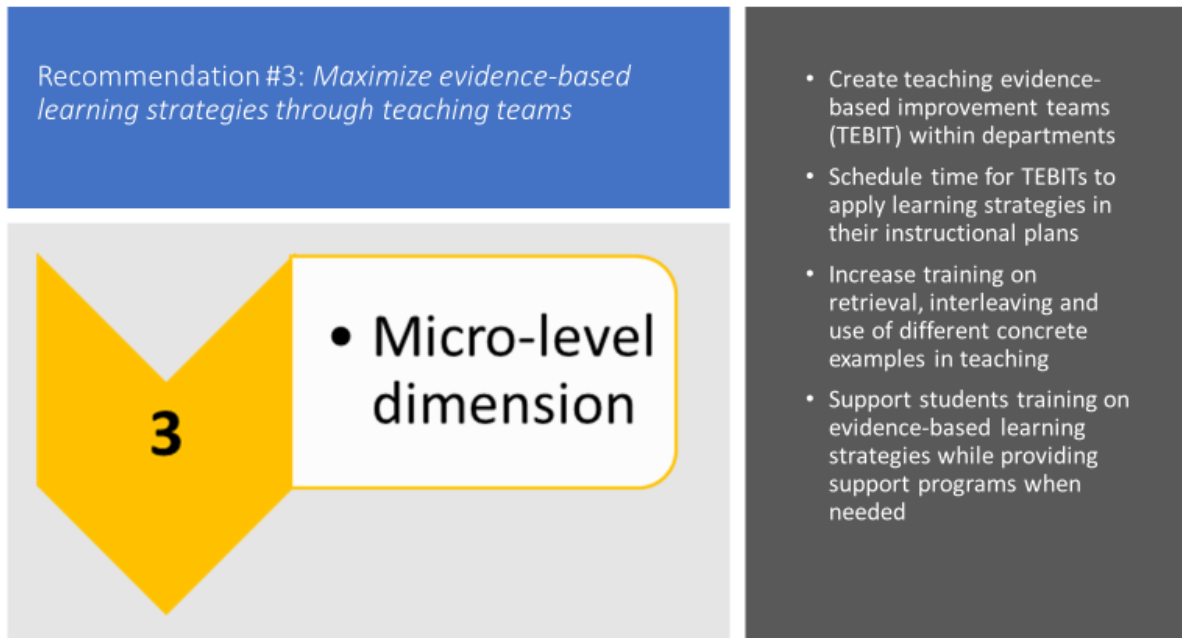
Source: summarizing capstone professional development recommendations

Focus on broad instructional self-directed professional development. This requires several steps. First, distinguish between school legally required training and teacher PD. Focus practical PD components on evidence-based instructional strategies but provide structured time for teachers and teaching teams to apply those strategies to their specific courses over the yearly curricular and instructional planning. Allow teachers to self-direct their own PD and increase the available options especially long-term programs. Enhance the opportunities for teachers supporting each other through informal and non-evaluative coaching and mentoring. Provide student support specialists and fellow teaching trainees with PD support for students improving their learning strategies and studying skills.

Recommendation #3: Maximize evidence-based teaching and learning strategies through instructional teams within each department.

NYC school can maximize the strengths of its instructional practices and improve the weaknesses through a set of five interrelated actions. The key is to encourage improvement teams to adopt and adapt evidence-learning strategies while respecting departments and teachers' autonomy and self-efficacy. Similarly, students must also learn these evidence-based learning strategies and receive support when needed.

Image VII.3



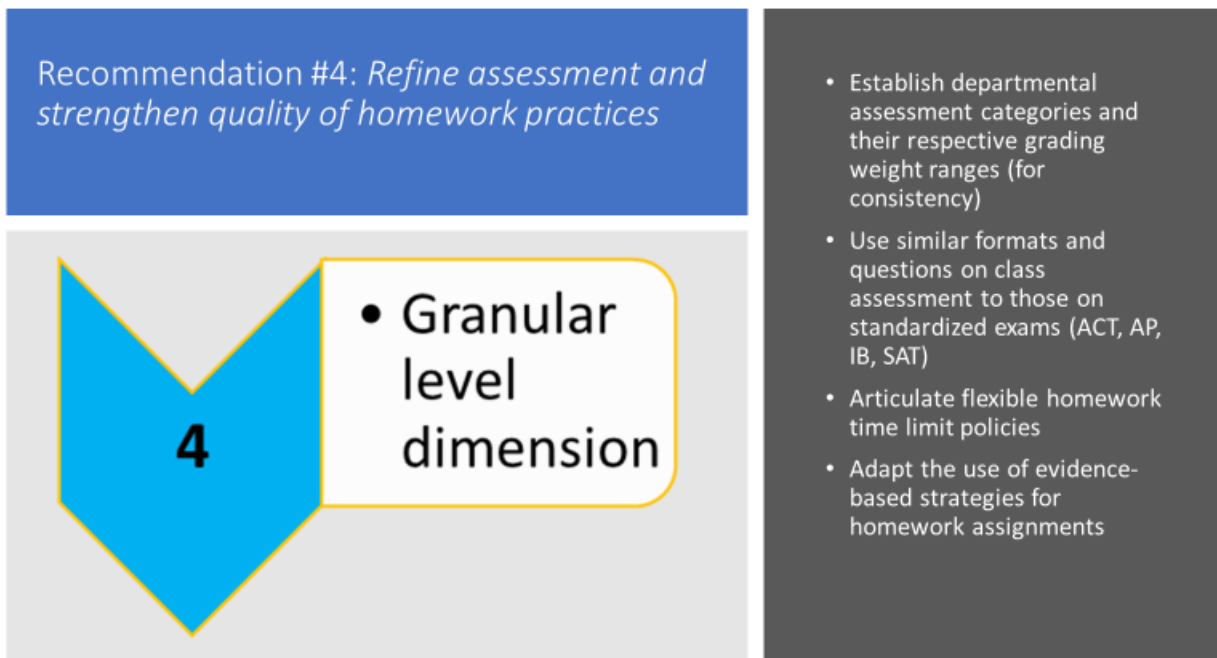
Source: summarizing capstone instructional recommendations

Maximize instruction by creating teaching evidence-based improvement teams (TEBITs) within each department. Schedule time for TEBITs to apply these learning strategies in their curricular and instructional plans and execute them in the classroom. Support TEBITs with focused PD for those teams as they request it. Provide evidence-based learning strategies training for all students and provide enhanced school support structures in the form of space, schedule, sponsored mentoring or tutoring for underprivileged and struggling students, including the possible resource of a newly created teaching fellow trainees program.

Recommendation #4: Refine assessment and strengthen quality of homework practices using evidence-based learning strategies.

NYC school has many strengths of its assessment and homework practices for enhancing student learning. The numerous and wide strengths of teachers at NYC school on their assessment practices can be used to maximize areas that need further improvement by refining assessment and strengthen quality of homework practices.

Image VII.4



Source: summarizing capstone assessment and homework recommendations

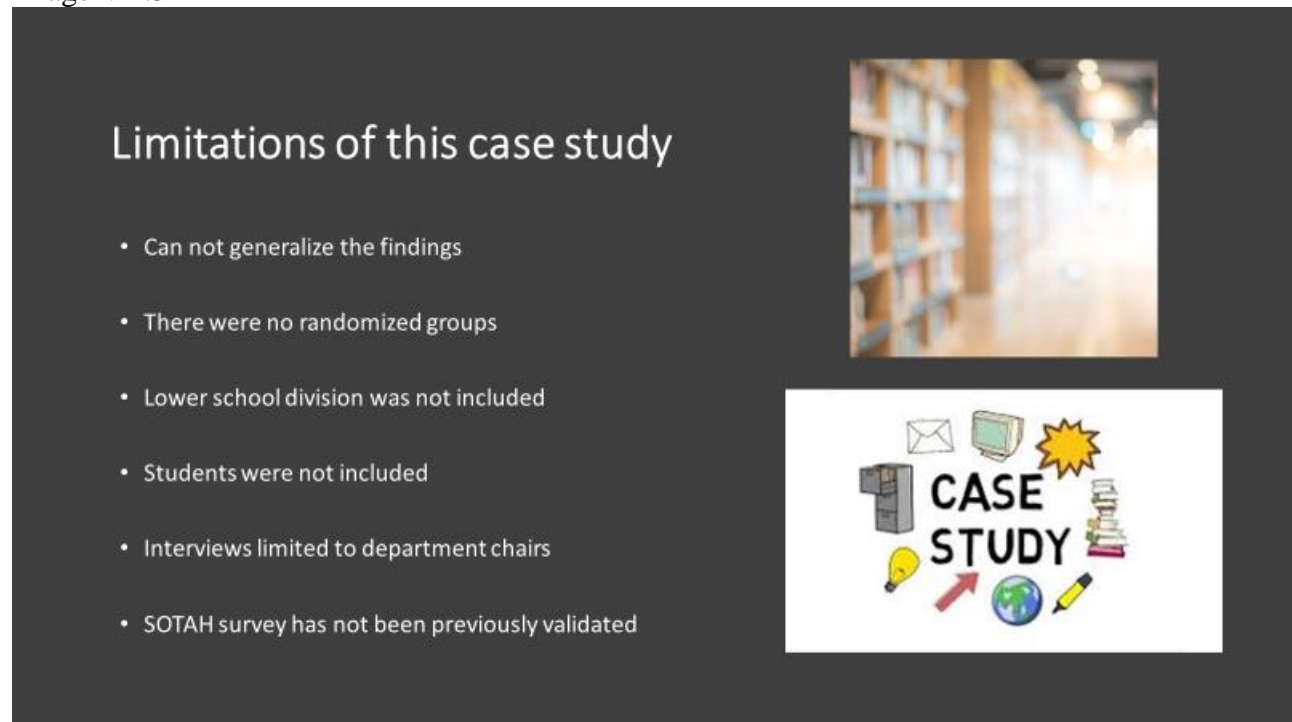
Refining assessment and strengthen homework will require a set of steps. Establish departmental assessment categories and guidance ranges for their relative grading weight. Increase the use of similar formats and questions in class assessments to those in standardized outside exams. Provide a flexible schedule for departmental teams and the needed targeted PD they request to refine assessment criteria and adapt homework assignments to increase quality and impact on learning. Articulate a flexible homework policy limit and/or establish a tier for highly rigorous courses requiring extra-time and those regular courses requiring a standard amount of homework time. Include PD on the use of school LMS for assessment and homework as part of the overall school targeted professional development focused on evidence-based learning strategies and provide support for teaching teams applying it to their courses.

VII.3. Limitations and strengths of the project

Limitations

Like any research design, this capstone project has some limitations and strengths. The main limitation of a case study is that the findings and insights are not generalizable to the broader universe of reference. In this case study, the detailed findings and insights are not generalizable to the broader universe of schools and teachers in the US. Additionally, this case study did not use randomized groups or comparative groups. Therefore, I cannot claim causal inferences from the findings but only correlational insights or whether those findings are consistent or inconsistent with the broader insights from the research literature. Moreover, at the request of NYC school, the focus was in its upper and middle divisions, and thus, this study did not include the lower division. Similarly, this research project focus was on the perceptions and perspective of teaching faculty and some teaching administrators, and thus, it does not include student and non-teaching staff perceptions and perspectives. Finally, the survey instrument, SOTAH has not been previously validated.

Image VII.5



Limitations of this case study

- Can not generalize the findings
- There were no randomized groups
- Lower school division was not included
- Students were not included
- Interviews limited to department chairs
- SOTAH survey has not been previously validated

Source: own elaboration from research literature insights

Methodologically, there are also some limitations. First, the semi-structured interviews focused on a narrow sample: department chairs and two senior leaders. The semi-structured interviews with department chairs was determined by NYC school as a necessary step to create trust and rapport for the survey. Since department chairs are directly appointed by school senior leadership, I avoided addressing directly issues of trust with senior leadership and focused on professional development, teaching, assessment and homework practices. These semi-structured

interviews were voluntary but with school time incentive (the interview counted as one meeting time with their respective supervisor). I interviewed 7 department chairs, but I was unable to interview the science department chair, since it has none. As I learned later, the science department has three senior teachers sharing the leadership role. Yet none of the three teachers sharing the responsibilities volunteered for these interviews.

Second, there is also some potential bias in the survey responses. I created this survey from scratch and combined the questions I created with additional questions from several previous surveys. Yet, SOTAH as a complete survey has not been validated. Similarly, SOTAH also was very long with a total of 80 questions and took about 30 minutes to complete. Of the 103 potential teachers at NYC school, 65 completed the whole survey, resulting in a return rate of 63%. This means that 37% of the teaching faculty did not participate at all or only partially in the survey. Of 78 teachers that initially began the survey, 13 of them withdrew at a certain point and did not complete it. There were different withdrawal points at various partial sections of the survey: 78 faculty members that began SOTAH completed block 2 of the survey: the section on teaching practices. Of those, 72 completed the subsequent blocks of the survey: the respective sections on assessment (block 3) and homework (block 4). Of these remaining 72 faculty members, 67 completed the subsequent block 5: the section dealing with professional development and school climate. The last and final block 6 (the demographic section) was completed by 65 teachers, resulting in a 63% return rate of completed surveys from the potential universe of teachers at NYC school's middle and upper divisions.

Finally, the fourth limitation was the unavoidable situation of the COVID-19 pandemic. The restrictions on traveling as well as the closures of on-campus and in-person visits did not allow me to carry out a third part of the research method. Although I compensated for this with two follow up interviews with senior leaders and accessed open source online data and documents about NYC school, I was unable to use a third method, which would have been a visit to campus and observational study for further triangulation and interpretation of data and findings.

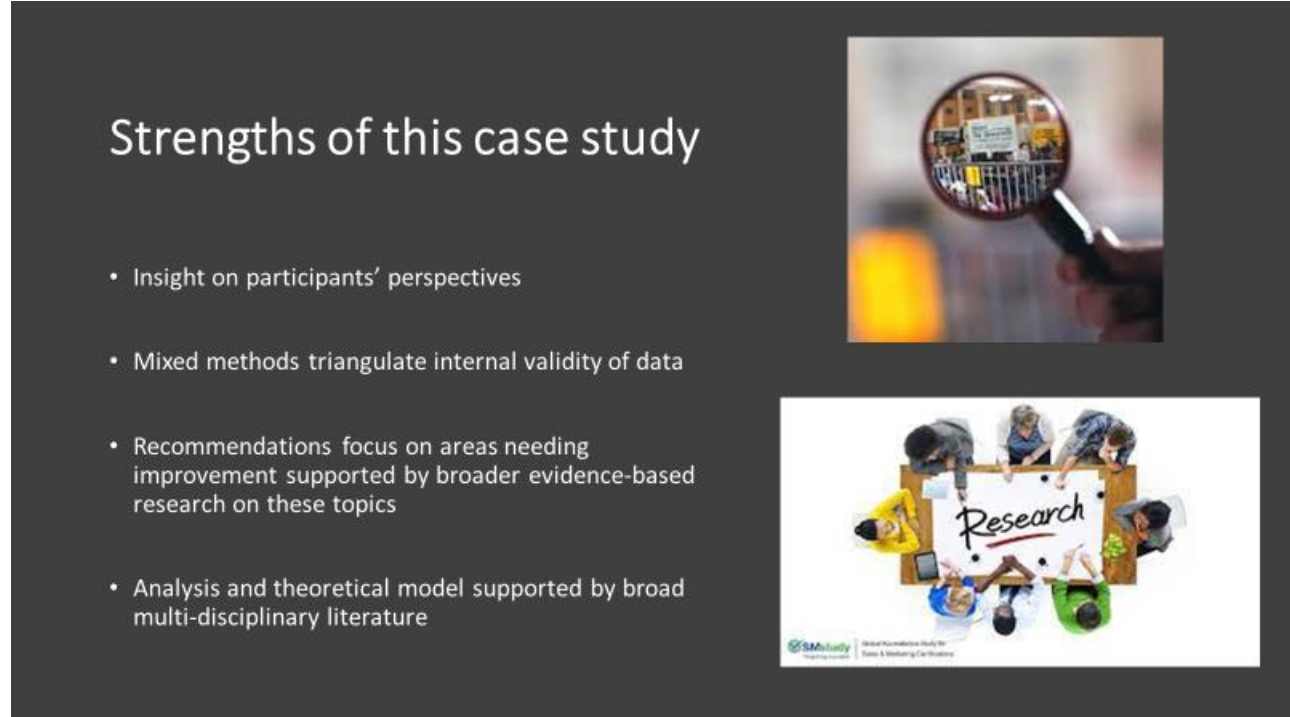
Strengths

This case study also has some strengths. First, the ideographic approach of a single case study involves a detailed description, analysis and insights into the meaning, perception and perspectives of the agents of that organization even if these perspectives cannot be generalized. This allows us to understand how teachers and administrators at NYC school make-sense of their own experiences and practices. I counter-balanced and partially strengthened the inherent weakness of a single case study with two intentional strategies in the research design. I bolstered the ideographic properties of this case study with broader comparative testable insights into the problems of practice addressed in this capstone project through a large body of experimental research literature addressing these issues.

Second, I purposefully used sequential mixed methods of semi-structured interviews and survey research complemented with available open-source data and follow up interviews with the school leadership to triangulate and verify trends and inferences, thus incorporating various sources of data and perspectives. These two intentional research design strategies, a single case study using sequential mixed methods, allowed this capstone project to deepen the understanding of the

dynamics, meaning and motivations of the teaching faculty at NYC school. With this approach, I was able to puzzle together the various perceptions of teachers about school leadership and climate, professional development practices and their own instructional, assessment and homework practices.

Image VII.6



Strengths of this case study

- Insight on participants' perspectives
- Mixed methods triangulate internal validity of data
- Recommendations focus on areas needing improvement supported by broader evidence-based research on these topics
- Analysis and theoretical model supported by broad multi-disciplinary literature

Source: own elaboration from research literature insights

Third, the research findings of this case study allow me to craft and design specific recommendations targeting the areas that need improvement within each dimension of the school learning model. These recommendations are based on the data and findings about NYC school practice and they were bolstered with the insights of broader findings from experimental and quasi-experimental research literature on these issues.

Fourth, I developed a well-structured four-dimensional school learning conceptual framework, synthesizing the ecological model and the social science three level analysis approach of complex systems. I adapted this four-dimensional school learning model into a single case study incorporating evidence-based concepts and hypotheses from the broader multi-disciplinary literature. This strategy allows this capstone project research to be a crucial case study to falsify or provisionally validate well-established theoretical insights and their related hypotheses.

VII.4. Implications for a future research agenda

The finding from this case study suggest several areas of future research for practitioners and researchers. First, further investigation on schools must include inquiry into instructional leadership and exploring the distributed versus managerial leadership style to understand the

climate of psychological safety and innovation for teachers. Improvement and education reform can be designed and implemented effectively through instructional distributed leadership that encourages collegiality, genuine inclusion and trust as well as leadership by example, psychological safety and innovation to openly address and solve the challenges and problems of learning and educating students.

Second, there is a need to further investigate how schools, districts, professional development servicers and higher education institutions can curate, reform and structure the contents and delivery of their teacher and teaching support staff preparation and induction programs. Researcher and teaching practitioner partnerships are critical for designing curricula and instructional practices to incorporate efficiently evidence-based teaching and learning strategies. It is critical to also include student support staff in this process as well as to adapt it to students, who also need to be trained themselves on effective evidence-based learning strategies.

Third, there is a very limited number of studies on the extent of which teachers or students use effective teaching and learning strategies. Future studies through practitioner-researcher partnerships need to explore through experimental, observational, qualitative and quantitative survey methods the extent to which teachers and students receive professional support about evidence-based teaching and learning strategies and to what extent they use them in their instructional or studying practices.

Fourth, there is need of further experimental, observational and survey research on interleaving versus blocked explanation and practice as well as regarding the use of similar versus different concrete examples to illustrate an underlying abstract concept. The evidence from SOTAH responses by teachers at NYC school, indeed point out to the need for real classroom observational research on all evidence-based learning strategies used by teachers, especially interleaving and concrete examples. The wording of survey research on these strategies needs further disaggregation to capture when these strategies are typically used within the many steps involved in teaching. For instance, explaining for the first time a concept or practicing a skill in real class situations involves blocked explanation and practice as well as illustrating them with similar examples and situations (near transfer). However, this needs to be distinguished from when subsequently, teachers explain and practice at posteriori related concepts or skills. It is typically thereafter, that teachers try to relate current concepts or skills to previous ones, when using strategies such as interleaving or completely unrelated different concrete examples would make sense (far transfer). Most teaching practitioners through trial and error experiences, typically follow that sequence regarding these learning strategies.

For the purpose of explaining a new concept for the first time, most teachers know that the most effective strategy seems to be some form of a blocked explanation and practice as well as illustrating that concept with similar concrete examples to facilitate near or short transfer of knowledge and skills. Once this is understood, the subsequent step to acquire and expand further knowledge, skills and understanding would be to mix concepts and practice (interleaving) and promote the understanding and grasping of the underlying abstract concept with very different and apparently unrelated concrete examples. This process of far transfer requires providing clues and scaffolding to students to successfully assimilate and understand the underlying abstract concept. More disaggregated and focused research on these sequential steps about teaching and

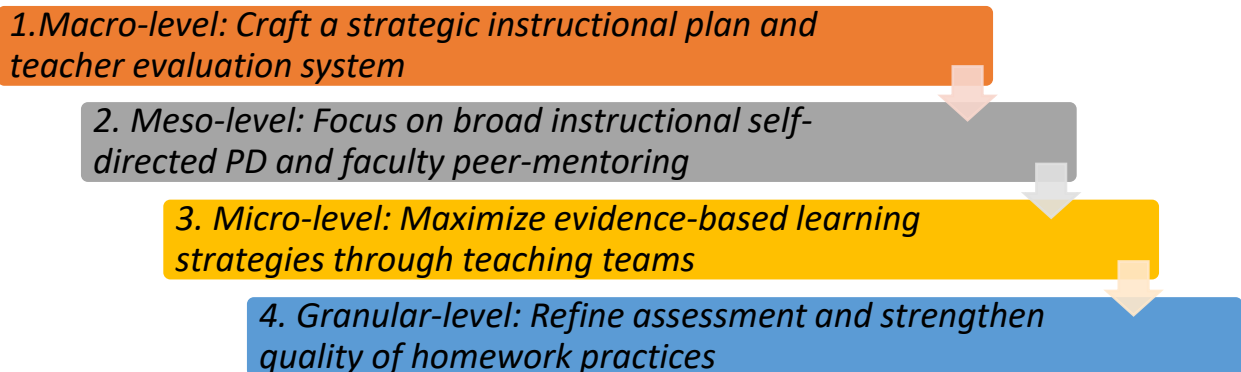
learning will enlighten the conditions under which the steps and strategies for interleaving and using completely different examples to illustrate an underlying abstract concept in a real classroom situation can be more effective. Regarding NYC school, the keen teachers and teaching teams at the school can experiment with small and incremental adjustments to their instructional practices to ascertain and test what steps and modification to evidence-based learning strategies are practical, and result in improved student learning outcomes.

VII.5. Theory of change, logic model and action plan

The research carried out throughout this capstone project suggests four broad areas for maximizing instructional improvements at NYC school. These four areas correspond to the four-dimensions of the school learning conceptual framework and the related insights from the broader literature. The macro-level is useful to explore the problem of practice around leadership, learning environment and school climate. The meso-level is the appropriate level to analyze the problem of practice around professional development and school structures. The micro-level of classroom interaction is best to examine the problem of practice around teaching and learning and the granular level is related to the most specific problem of practice of assessment and homework assignments design and quality.

In this capstone project I developed the four-dimensional school learning model to explore the interaction between curriculum, students and teachers within the context of a single case study. The key question is how NYC school could initiate an improvement proposal to maximize its teaching and learning, assessment and homework practices in the context of its current leadership approach and professional development program. This capstone project outlines four broad recommendations to do so. First, craft a strategic instructional plan and teacher evaluation system. Second, focus on broad instructional self-directed professional development and faculty non-evaluative peer-mentoring and coaching. Third, maximize evidence-based learning strategies through teaching teams and extend it by also training students in using evidence-based learning in their studying approaches. Finally, refine assessment and strengthen quality of homework practices using evidence-based learning strategies.

Image VII.7



Source: own elaboration from capstone findings and conceptual framework and research literature insights

Theory of change

This four-dimensional school learning model, together with the four guiding research questions and the inputs and insights provided by the findings of this research, underpin the development of the theory of change and the logic model of NYC school. This implicit theory of change incorporates insights from the previous literature. The four propositions of this theory of change corresponds with the four-dimensional model. The overall distal environment of this model is defined by leadership and school climate. School leadership has a significant impact on the learning environment of an educational institution through its mission and vision. Leaders can also enhance or diminish the psychological safety and trust climate of the school. These overall macro-aspects also have an indirect impact on the relative quality and support of the faculty's evaluation dynamics and professional development opportunities as well as educational accessibility and support structures for student learning.

Faculty professional development together with student accessibility and school support structures constitute the meso-level intervening factors mediating the relative impact of the macro-level school leadership on the micro-level of school teaching and learning practices. The micro-level of actual teaching and learning through the daily classroom instructional activities and tasks is the key for engaging students with curriculum and teachers during class time. The daily teaching and learning practices also shape the granular level of assessment and homework through asynchronous assignments or tasks engaging students and materials during and beyond class time. This implicit theory of change can be made explicit through four interrelated propositions to articulate and guide the implementation of the recommendations outlined in the findings of this capstone project.

The first proposition hypothesizes that if the NYC school leadership fully commits to incorporating evidence-based teaching and learning in its mission, vision, strategic goals using its distributed approach, the school will maximize student outcomes, its learning environment and its faculty professionalism and trust. The expected outcomes are the crafting of collegial and inclusive processes for developing or redefining its mission, vision and evidence-based strategic academic or instructional plan. This must occur simultaneously or in parallel to the crafting of an effective and fair faculty evaluation system linked to professional development. An additional teaching fellows program to recruit and retain new teachers will contribute to the overall positive impact at the macro-level dimension.

The second proposition hypothesizes that if NYC school supports broad evidence-based focused faculty professional development and non-evaluative peer-mentoring and coaching practices, the school will maximize faculty teaching effectiveness. Similarly, enhancing opportunities and support for training students on evidence-based learning and more accessible structures will increase student learning skills. The expected outcomes are increasing the knowledge, skills and behaviors of teachers and learning specialists at implementing evidence-based teaching and learning strategies in their courses' curriculum, lesson planning and tasks. Additionally, enhancing accessibility structures to rigorous courses for students and a program for training students on evidence-based learning strategies will increase their learning capacity, skills and engagement with higher level courses.

Image VII.8

Theory of change for NYC school's improvement proposal

1. Macro: If NYC school fully commits to reinforcing evidence-based teaching and learning strategies (T&L) through its collegial distributed leadership and inclusive approach, the school will maximize its learning environment, faculty professionalism and trust.

2. Meso: If NYC school supports broad evidence-based and self-directed faculty professional development and non-evaluative peer mentoring for teachers and learning training for students, the school will maximize faculty teaching effectiveness and student learning skills.

3. Micro: If teachers implement evidence-based teaching strategies, and students integrate learning strategies in their studying approaches (T&L), NYC school's teachers will maximize their teaching craft impact and students will improve their learning outcomes and mastery of the course study content and skills.

4. Granular: If assessments and homework assignments are designed with evidence-based teaching and learning strategies and enhance student support, NYC school students will become more engaged and proficient at successfully completing assigned tasks and demonstrate improved learning outcomes.

Source: own elaboration from capstone four-dimensional conceptual framework and research literature insights

The third proposition hypothesizes that if teachers implement evidence-based teaching strategies, NYC school teaching faculty will maximize their teaching craft impact on student learning. Similarly, if students integrate evidence-based learning in their studying approaches, they will improve their learning outcomes and mastery of the subject matter content and skills. These evidence-based strategies include retrieval and spaced practice, elaborative questioning and interleaving, and dual coding and using differentiated concrete examples to illustrate underlying abstract concepts in the classroom. The expected outcomes will be the development, implementation and improvement of evidence-based teaching and learning (T&L) strategies. This will result in a more effective pedagogical approach and improved student support and learning outcomes for all students.

Finally, the fourth proposition hypothesizes that if assessments and homework assignments are designed with high quality and evidence-based teaching and learning strategies, NYC school students will become more engaged and proficient at successfully completing assigned tasks and

demonstrate improved learning outcomes in a more balanced way and with less time, energy or stress levels. The expected outcomes are that teachers will develop, implement and improve over time more effective and high-quality assessments and homework practices that will result in the following outcomes:

- Higher baseline and subsequent increased and improved student engagement in academic learning and co-curriculars
- Higher baseline and subsequent increased and improved student homework completion while reducing assignments' time
- Higher baseline and subsequent increased and improved student grades and academic skills while narrowing the performing gap
- Higher baseline and subsequent increased and improved faculty effectiveness and quality in teaching tasks, assessment and homework assignments

Logic model

The NYC school logic model reframes the four propositions outlined above, one per each of the four dimensions of the school learning model, grouping the various processes, activities and outcomes. Crafting the NYC school logic model is a summarizing schema of the inputs, processes, output and outcomes expected if the school chooses to implement the outlined recommendations. Thus, before discussing various aspects of the logic model, it is important to consider the school's initial resources or inputs. The inputs include personnel (administrators, faculty and staff), families and students and members of the school board and volunteers. These personnel resources, together with financial and facilities or space resources, transportation assets are part of and linked to the school's mission and strategic goals. The outputs in the logic model capture the findings and insights from this research as well as those from previous research literature. This capstone project articulates those insights around a four-dimensional school learning conceptual framework to understand the processes for maximizing effective instructional, assessment and homework practices in the context of the professional development practices and learning environment at NYC school.

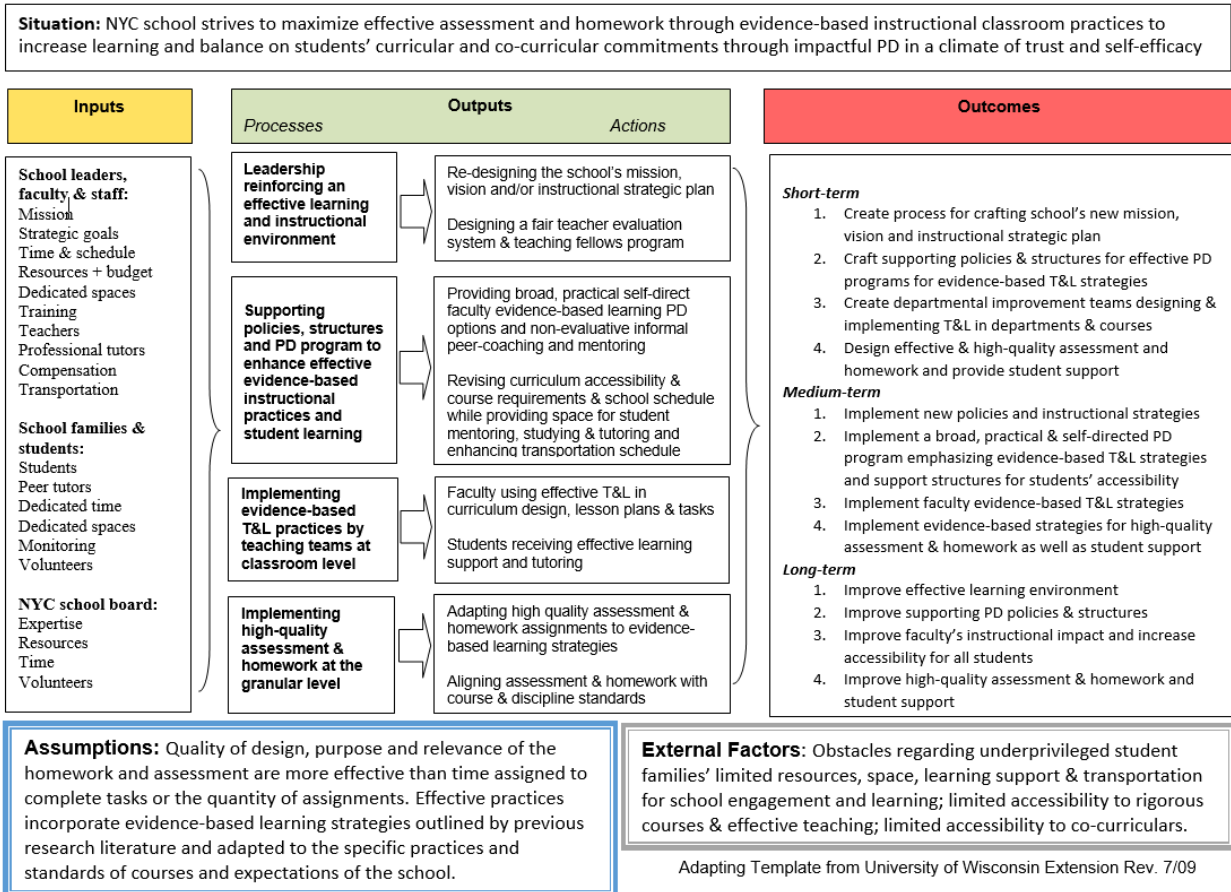
The first dimension encompasses the processes and outputs needed to shape the overall school mission, vision & strategic goals for the school leadership reinforcing an effective learning environment. The two critical processes and activities within this dimension includes, firstly, designing an instructional strategic plan consistent with mission, values and vision of the school. Secondly, crafting a fair teacher evaluation system linked to professional development and a teaching fellows program to recruit and retain new teachers.

The second dimension emphasizes the meso-level processes and outputs required to maximize teaching and learning (T&L). This involves an impactful and practical professional development program for faculty and policies for student support reinforcing accessibility to high quality learning opportunities for all students. The two key processes and activities include first, providing a broad evidence-based, self-directed professional development, including informal non-evaluative peer-coaching and mentoring for faculty and separately for students. Second, the other key is revising curriculum accessibility and course requirements while providing space and time for student mentoring, doing homework and studying as well as tutoring support. This will

also likely involve enhancing the school’s transportation means and schedule, so under-privileged students can use the schools’ support.

Graphic VII.9`

NYC school logic model



Source: own elaboration from research review, capstone conceptual framework and NYC school faculty feedback

The third dimension outlines the processes and outputs that will improve student learning by implementing evidence-based teaching and learning (T&L) strategies and practices at the classroom level. The two peremptory processes and activities involve firstly, faculty using evidence-based instructional strategies in curriculum design, lesson plans and classroom tasks. Secondly, the school must facilitate processes and activities for underprivileged students or those struggling to receive effective learning support, mentoring and tutoring with a feed-back loop to classroom teachers’ assessment and recommendations for students needing support.

Finally, the fourth dimension relates to the processes and outputs that will contribute to improving effective assessment and homework practices. This is achieved by implementing high-quality assessment and homework at the granular classroom practice level. The two crucial processes and activities are firstly, applying evidence-based teaching and learning (T&L) to high quality assessment and homework assignments. Secondly, this involves aligning assessment and homework assignments and practices with course or subject matter discipline standards.

Action plan

The logic model and theory of change outlined are based on the explicit recommendations articulated through the evidence provided by the semi-structured interviews and SOTAH responses within each of the four dimensions of the school learning conceptual framework and related insights from the research literature. The recommendations and theory of change can be articulated into an action plan of learning cycles for designing and maximizing further improvements. If these processes and outputs are implemented, we should expect positive outcomes within each of these four dimensions.

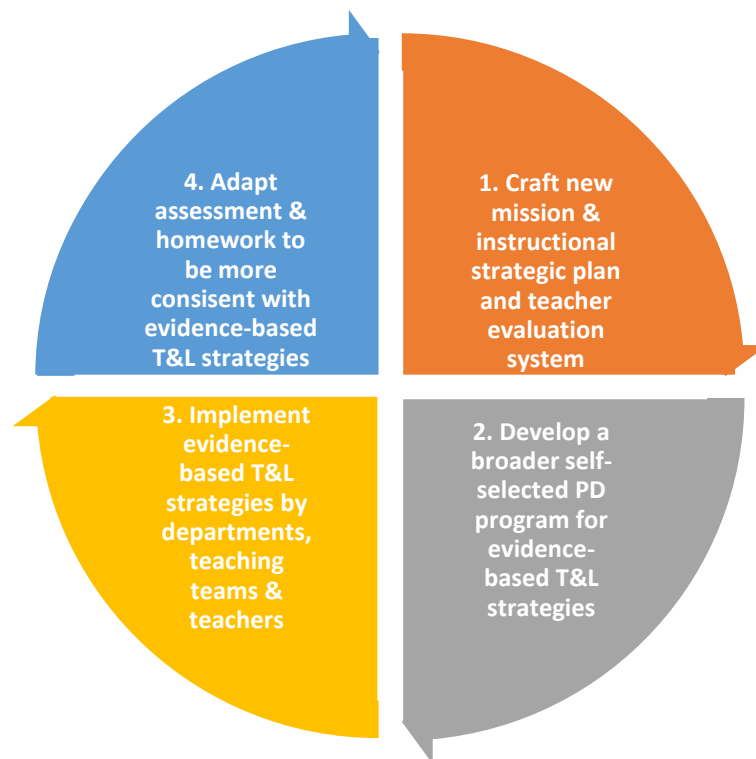
A school improvement culture starts by affirming its commitment to continuous improvement. This affirmation includes providing the resources to address that process by listening, empathizing and understanding all stakeholders involved within a specific area. These stakeholders are the ones diagnosing the challenges or problems to be addressed within their domain and setting goal(s) for improvement, called an “aim statement.” The improvement process within education should be led by teaching professionals. This is followed by diagnosing all possible causes of the identified problem (typically through a fish bone diagram) and exploring possible interventions for improvement (through a driver diagram with cause and effect behavioral interventions). A driver diagram is basically a theory or set of hypotheses about what components or changes might likely help at addressing and improving the problems. Each component can develop a set of indicators to measure our progress towards the goal established in our aim statement and the drivers or change ideas. The most fruitful strategy is by experimenting and testing the initial plausible hypotheses derived from teaching practices’ bright spots that are consistent with evidence-based research findings. These change ideas are then implemented through a set of rapid cycles of Plan, Do, Study, Act (PDSA) cycles of testing the changes inspired in the bright spots and evidence about effective teaching and learning while studying the outcomes for further action (whether elimination, modification or scaling up) for further improvement.

Image VII.10



These outcomes can be grouped in short-term, medium-term and long-term expected results. Within each time horizon, it is critical to explore the specific outcomes for each of the four dimensions and sets of recommendations of the proposed improvement intervention. First, school leadership commitment to an evidence-based teaching and learning (T&L) mission, vision and instructional strategic plan (macro-level). Second, broad and self-directed professional development options also focusing on evidence-based teaching and learning (T&L) strategies as well as policies and structures for student accessibility and support (meso-level). Third, implementing in a continuous cycle of improvement at the classroom level involving evidence-based teaching and learning (T&L) curricular design, lesson planning and class tasks (micro-level). Fourth, implement high-quality and evidence-based teaching and learning (T&L) forms of assessment and homework practices (granular level). We outlined the specifics of these processes and outcomes in the previous section articulating the four areas of recommended interventions.

Graphic VII.11



Source: own elaboration from capstone conceptual framework and research findings

Timeframe for action plan

NYC school senior administrators will be the primary stakeholders and disseminators of the recommendations outlined and improvement cycles processes. Improving student learning and outcomes at NYC school must include the incorporation of the six effective learning strategies uncovered by cognitive psychology experimental research into their actual daily teaching

practices. These strategies, together with the existing bright spots that have demonstrated their effectiveness in various school settings or through teachers’ pedagogical practices should be the starting point for testing and scaling up improvement projects. Designing and implementing the necessary changes based on these insights are the keys to unlocking the true potential and existing resources within NYC school’s current educational assets. Below, I have outlined a brief time frame for implementing the action plan and improvement cycles should the school leadership choose to implement the recommendations outlined.

Table VII.12

Timeframe implementation

Timeframe	Action-plan
Spring 2021	<ul style="list-style-type: none"> • Revise capstone project and make actionable recommendations with feedback and suggestions from NYC school stakeholders • Submit final version of capstone and recommendations, including a future evaluation sequence of outcomes progress to NYC school
Summer 2021	<ul style="list-style-type: none"> • If requested by NYC school, present capstone findings and final report to senior leadership
Fall 2021	<ul style="list-style-type: none"> • Start evaluation and improvement process with revised Logic Model and its short-term outcomes during the first year
Spring 2022	<ul style="list-style-type: none"> • Evaluate Logic Model medium-term outcomes while continuing to evaluate and implement improvement cycle for short-term outcomes • Start complete evaluation of Logic Model long-term outcomes while continuing evaluation and improvement cycle implementation of short and medium-term outcomes
Summer 2022	<ul style="list-style-type: none"> • Finish complete evaluation cycle of Logic Model long-term outcomes while continuing evaluation and implementation of improvement cycles of short and medium-term outcomes • Re-start evaluation and improvement cycle analyzing and modifying the Logic Model as needed for its short, medium and long-term outcomes

Source: own elaboration from capstone research design and execution

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Appendix A: Semi-structured interview questions for department chairs.

Adapted from VU Peabody College of Education EdD LLO: Program Evaluation course.

My name is Joaquín Fernández-Castro and I am studying teaching and learning, assessments and homework practices and professional development support at a NYC school. This is a confidential interview, it is voluntary, and you can stop participating at any point of our conversation. Reporting results and analysis will avoid any possible connection or identification of the participants and if the report quotes any statement of any participants, their identity will be disguised and masked. I would like to ask you for your consent for recording this conversation. If you do not agree to have this conversation recorded, I will take some notes after the interview to remember your answers as best as I can without identifying your name or you as a particular individual holding a specific formal role within the school. Only myself and my supervisor at Vanderbilt University will have access to these recordings or notes and they will be destroyed after the study is completed.

1. **What are the strengths and weaknesses in your department regarding teaching and learning?**
2. **What would you like to see changed in your department or overall in the school?**
 - 2.1. **If assessment was not mentioned:**
Is assessment an issue and how important is it compared to the issue(s) you mentioned?
 - 2.2. **If homework was not mentioned:**
Is homework an issue and how important is it compared issue(s) you mentioned? Why?
 - 2.3. **If teaching practices were not mentioned:**
Are teaching practices an issue and how important is it compared to the issue(s) you mentioned? Why?
3. **What type of professional development or mentoring support does the school, division, department provide to address the issues you mentioned?**
 - 3.1. **If PD on assessment was not mentioned:**
Did any of the PD cover assessment practices?
 - 3.2. **If PD on homework was not mentioned:**
Did any of the PD cover homework practices?
 - 3.3. **If PD on teaching practices was not mentioned:**
Did any of the PD cover effective teaching practices?
4. **Is there a question that should have been asked and would you like to express your point of view regarding that missing question?**

Appendix B: Thematic summary of semi-structured interviews content analysis

Thematic coding	Strengths	Weaknesses
<p><u>Macro-level: school leadership & climate.</u></p> <p>1.School leadership style and perceived trust 2.Departmental and faculty autonomy 3.School and department climate and faculty psychological safety</p>	<ul style="list-style-type: none"> • Implicit: Collegial and distributive leadership with departmental autonomy • Explicit: Faculty autonomy and professionalism with wealth of content and pedagogical knowledge and skills 	<ul style="list-style-type: none"> • Implicit: Issues of trust with department chairs and faculty • Explicit: High turnover of two departments plus not having a chair in the science department as indicators of issues of school climate
<p><u>Meso-level: professional development practices.</u></p> <p>1.School support for PD 2.Effectiveness of PD at improving instruction 3.Faculty autonomy at selecting PD programs (self-directed PD)</p>	<ul style="list-style-type: none"> • Leadership supports PD at all school-levels and is robust and wide • The PD program is regularly executed and embedded in the school’s schedule • PD at department and individual levels is more focused, specific and practical 	<ul style="list-style-type: none"> • Schoolwide PD is more informational than practical • It is uneven in its instructional focus and impact among and within departments • High faculty turnover in some departments limit PD effectiveness
<p><u>Micro-level: instructional practices.</u></p> <p>1.Departments & teachers use of different combination of instructional approaches 2.Sources for curriculum planning and teaching teams 3.Using evidence-based learning strategies in classroom tasks</p>	<ul style="list-style-type: none"> • Wealth of experience and diversity of teachers’ professional backgrounds • Wide use of different combinations of instructional approaches around the predominant core of classical direct instruction • Collaboration among teachers around instructional planning either in formal teaching teams or informally through individual connections 	<ul style="list-style-type: none"> • School teaching load, limited opportunities and lack of scheduled time for individual teachers or team collaboration • Student varied ability levels and weak academic preparation limiting impact on learning outcomes • A couple of departments viewed some courses as relying too heavily on more traditional methods

<p><u>Granular level: assessment and homework practices.</u></p> <p>1. Use of graded & non-graded assessment & homework assignments</p> <p>2. Sources and types of departments & teachers' assessment & homework assignments and design</p> <p>3. Effectiveness & use of evidence-based strategies in assessment & homework assignments & design</p>	<p><u>Assessments: strengths</u></p> <p>All academic departments and teachers use multiple forms of assessments as well as different formats and types of questions</p> <p>Teachers are collaborative and share with colleagues the assessment materials they develop individually or as part of teaching teams or from other sources</p> <p>Performing and visual arts primarily use on-going progress-rubrics assessing artistic or performing skills and creativity</p> <p><u>Homework: strengths</u></p> <p>Teachers cooperate, share ideas and materials for homework assignments</p> <p>Various academic departments and courses focus differently on homework: some focus on current materials while others use it as pre-learning for upcoming materials</p> <p>Performing and visual arts do not assign homework, but some events require a similar amount of production time and practice compared to academic homework</p> <p>Most academic departments and teachers comply with school policy and assign homework below the time limits established for the upper and middle divisions</p>	<p><u>Assessments: weaknesses</u></p> <p>The unequal and varied background knowledge and skills among students results in a wide range of student outcomes in the assessment process</p> <p>Difficulty capturing and measuring authentic learning (academic departments) or artistic craftsmanship, skills and creativity (arts departments)</p> <p><u>Homework: weaknesses</u></p> <p>There is little time in a teacher's schedule for designing homework assignments</p> <p>Some students from affluent backgrounds receive tutoring support on homework</p> <p>The purpose of homework seems unclear for various departments or teachers</p>
<p>Thematic coding</p>	<p>Strengths</p>	<p>Weaknesses</p>

Source: elaboration research questions and responses to semi-structured interviews with department chairs

Appendix C: Survey on Teaching, Assessment and Homework practices (SOTAH)

NYC School capstone project: Survey Flow

Standard: Block 1: Consent (1 Question)

Standard: Block 2: Instructional practices. (19 Questions)

Standard: Block 3: Assessment practices (20 Questions)

Standard: Block 4: Homework practices. (20 Questions)

Standard: Block 5: School climate and professional development practices. (20 Questions)

Standard: Block 6: Demographics (7 Questions)

Page Break

Start of Block: Block 1: Consent

Q1.1

Welcome to the research survey study on teaching, assessment and homework practices!

I am interested in understanding teaching practices at your school as part of my doctoral research project at Vanderbilt University's Peabody College of Education. My capstone project will analyze current practices based on your responses in this survey and recommend possible improvements to the school. The results of this survey will be presented as aggregated data in my doctoral project and shared with your school.

You will be presented with questions and statements about your instruction, assessment, homework and professional development practices as well as a few questions on school climate. Please choose the answers that best reflect your practices within each of these areas. Please be assured that your responses will be completely anonymous and the name of the school will be confidential, disguised as "NYC school."

The survey should take around 30 to 35 minutes to complete during your scheduled department or faculty meeting, thanks to your school's permission for you to use that time for this task. Your participation in this research is voluntary. If you would like to contact the Principal Investigator in the study to discuss this research, please e-mail jfernandezcastro@vanderbilt.edu.

By clicking the button below, you acknowledge that your participation in this study is voluntary, you are 18 years of age or older, and that you are aware that you may choose to terminate your participation in the study at any time and for any reason.

Please note that this survey will be best displayed on a laptop or desktop computer. Some features may be less compatible for use on a mobile device.

I consent, begin the study (1)

I do not consent, or I do not wish to participate (2)

End of Block: Block 1: Consent

Start of Block: Block 2: Instructional practices.

Q2.1 INSTRUCTIONAL PRACTICES. *This section includes questions about your instructional approach and curriculum planning in your classroom. Please choose the answers that best reflect your teaching practices.*

Q2.2 I use direct instruction followed by individual or group practice, problem-solving or rehearsals with teacher led questions and then direct teaching as my instructional approach (Teaching-Practice-Teaching, TPT).

- Always or most of the time (1)
- About half of the time (2)
- Sometimes (3)
- I don't use this instructional method or does not apply to my courses (4)

Q2.3 As my instructional approach, I often begin with individual or group practice, problem-solving or rehearsals, followed by direct instruction or reflection, then more practice (Practice-Teaching-Practice, PTP).

- Always or most of the time (1)
- About half of the time (2)
- Sometimes (3)
- I don't use this instructional method or does not apply to my courses (4)

Q2.4 My instructional approach is to use experiential or project-based learning with student led initiatives and practices and teacher led questioning to guide students' projects and learning.

- Always or most of the time (1)
- About half of the time (2)
- Sometimes (3)
- I don't use this instructional method or does not apply to my courses (4)

Q2.5 I use student collaborative learning and student led discussions: Harkness, student Socratic circles or similar student collaborative instructional approaches.

- Always or most of the time (1)
- About half of the time (2)
- Sometimes (3)
- I don't use this instructional method or does not apply to my courses (4)

Q2.6 Students receive first, direct instruction online via lectures, assigned readings or videos, then they discuss, practice, problem-solve, rehearse or collaborate in class (flipping the class).

- Always or most of the time (1)
- About half of the time (2)
- Sometimes (3)
- I don't use this instructional method or does not apply to my courses (4)

Q2.7 In my courses, I use another instructional approach not included in the previous statements.

- Always or most of the time (Please briefly describe) (1)

 - About half of the time (Please briefly describe) (2)

 - Sometimes (Please briefly describe) (3)

 - I don't use another instructional approach or does not apply to my courses (4)
-

Q2.8 I use backward design or similar approaches as the main guide when creating curriculum content, skills or unit sequencing and the related lesson plans for students to demonstrate the expected proficiency grade-level content knowledge and skill standards, mainly based on: (Choose the source you use most frequently)

- The textbook, workbook and ancillary materials of my subject matter (1)
 - The materials and practices recommended by the State or professional organizations, such as Common Core, AP, IB or other formalized academic or artistic curriculum (2)
 - The materials and practices created collaboratively by my teaching team or colleagues in my department (3)
 - The materials and practices created by me based on my own professional expertise and skills (4)
 - Not applicable to my courses or teaching approach (5)
-

Q2.9 When I teach each unit in academic disciplines or artistic artifacts or performances:

	Never or rarely (1)	About half of the time (2)	Always or most of the time (3)
I present a brief summary at the beginning of every lesson of the new concepts, materials or skills (1)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I connect and integrate previous concepts, materials or skills with current ones (2)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I ask students for explanations of why they think their answers are correct or incorrect (3)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I ask students to elaborate on why their skill levels meet or do not meet expectations (4)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I ask students to apply concepts, methods or skills learned in a specific context to very different contexts while I scaffold the task with cues (5)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q2.10 When introducing or reviewing materials or skills in my classes, I often pair concept-rich graphics and images with text, lecturing or audio:

- Simultaneously (1)
- One after the other or one before the other (2)
- I don't use this type of teaching strategy or it is not applicable to my courses (3)

Q2.11 When trying to improve students' retention and understanding of new material, I often provide students with exposure to new concepts, topics or skills:

- Multiple times for short periods within the unit and subsequent units (1)
- Once or twice within a given unit for longer periods to go deeper into the material and before that unit assessment or progress evaluation (2)
- I don't use this type of teaching strategy or it is not applicable to my courses (3)

Q2.12 When introducing or reviewing abstract concepts or a difficult skill in my classes, I often ask students to discuss examples or draw concrete representations that are:

- Similar or closely related (1)
- Very different and apparently unrelated (2)
- I don't use this type of teaching strategy or it is not applicable to my courses (3)

Q2.13 When connecting information and deepening students' understanding on a topic or skill, I often ask questions or do activities that require students to:

- Synthesize information and extract key concepts elaborating details after acquiring the basic knowledge (1)
- Express their feelings and opinions (2)
- I don't use this type of teaching strategy or it is not applicable to my courses (3)

Q2.14 When connecting information and deepening students' understanding on a topic and before asking students to infer or produce related models, skills or solve problems on their own, I often give students:

- Consecutive sets of very similar models, skills or solved problems before moving to different ones (1)
- Different sequences mixing various types of models, skills or solved problems (2)
- I don't use this type of teaching strategy or it is not applicable to my courses (3)

Q2.15 When trying to improve students' retention and understanding of new material, I often provide short activities or tasks to assess if students can recall concepts and information on their own:

- By consulting or re-copying their notes, re-reading the text chapters or materials or re-watching the video(s) (1)
- Writing what they remember in a blank piece of paper without consulting their textbooks, materials or notes (2)
- I don't use this type of teaching strategy or it is not applicable to my courses (3)

Q2.16 Students in my classes:
(Choose all the items that apply)

- Practice concepts or skills we previously studied in subsequent units (9)
- Draw diagrams or pictures or see related graphics or images of the materials we are studying (11)
- Feel comfortable discussing mistakes or asking questions about the materials (1)
- Stay engaged and focused during class even when making some errors during class tasks (6)
- Receive school sponsored learning support by specialists or subject professionals if they need it (7)
- Are learning at similar levels with online remote learning as they did in person (8)
- None of the above (5)

Q2.17 My courses cover the following number of units:

- From 2 to 4 units (artifacts or performances in arts) (1)
- From 5 to 7 units (artifacts or performances in arts) (2)
- From 8 to 10 units (artifacts or performances in arts) (3)
- From 11 to 13 units (artifacts or performances in arts) (4)
- 14 units or above (artifacts or performances in arts) (5)

Q2.18 I apply my instructional approaches and strategies to:
(Choose all the items that apply to you)

- Advanced and Honors courses (1)
- Regular courses (2)
- Mixed abilities courses (3)

Q2.19 Online distance teaching and learning or hybrid classes has allowed me to improve and expand my approaches and strategies for instruction and curriculum development.

- Agree (1)
- Neutral or does not apply (2)
- Disagree (3)

End of Block: Block 2: Instructional practices.

Start of Block: Block 3: Assessment practices

Q3.1 ASSESSMENT. *This section includes questions about the assessments or progress evaluation rubrics you use in your classroom. Please choose the answers that best reflect your assessment practices.*

Q3.2 Have you participated in professional development focusing on student assessment and progress evaluation within your teaching area of expertise in the last 2 years?

- Yes (1)
- No (2) Skip To: Q3.4 If Q3.2 = No

Q3.3 The assessment focused professional development experiences:
(Choose all the statements that apply to you)

- Were very professional, specific and helpful for my assessment needs (1)
- Were closely aligned with my instructional and assessment materials (2)
- Had a large impact at maximizing my courses' assessments and progress evaluation effectiveness (3)
- Included 2 or more sets of events, sessions or days each year (4)
- I selected this PD about assessment on my own initiative (5)
- None of the above (6)

Q3.4 I use the following type of assessments:
(Choose all the statements that apply to you)

- Graded academic assessments or graded artistic or creative progress evaluation rubrics (1)
- Non-graded academic assessments or non-graded artistic or creative progress evaluation rubrics (2)
- Not applicable to my courses (3)

Q3.5 I create or use graded assessments or graded progress evaluations mainly based on:
(Choose the source you use most frequently)

- The textbook, workbook and ancillary materials of my subject matter (1)
- The materials and practices of the State or professional organizations, such as Common Core, AP, IB or other formalized academic or artistic curriculum (2)
- The materials and practices created collaboratively by my teaching team or colleagues in my department (3)
- The materials and practices created by me based on my own professional expertise and skills (4)
- Not applicable to my courses (5)

Q3.6 When I assess my students for a letter grade or pass/fail, I use the following type of assessments: (Choose all the items that best reflect your assessment practice)

- Final academic exam (1)
 - Semester, trimester or multi-unit academic exams (2)
 - Academic unit tests or partial section quizzes (3)
 - Individual research, lab activities or reports, projects or artistic artifacts, performances or skills (4)
 - Group or team research, lab activities or reports, projects or artistic artifacts, performances or skills (5)
 - Student formal and/or visual-aided presentations (6)
 - Other types of graded assessments (Please briefly describe) (7)
-

Q3.7 In most of my graded assessments I use the following items:

	Never or rarely (1)	Regularly or half of the time (2)	Always or most of the time (3)
Multiple choice answers (1)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
True or false statements (2)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Short answers to short questions or problems (3)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Essays, reports or long answers to complex questions or problems (4)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Demonstrating specific or overall linguistic, artistic, performing or technological artifacts or skills (6)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other types of assessing items (Please briefly describe) (7)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q3.8 When I assess students through exams, quizzes, tests, performances or creating artifacts, students must do them:

- Aided by their own notes, textbook or materials (open book exams) (2)
- Unaided and without consulting notes, textbook or other materials (1)
- Not applicable to my courses (3)

Q3.9 I assess creativity in the knowledge contents and skills students are acquiring by providing tasks in which they can:

- Apply what they learned to similar contexts in a high stakes situation (1)
- Apply what they learned in novel ways or to very different contexts in a low stakes situation (2)
- Not applicable to my courses (3)

Q3.10 I assess critical thinking skills as students develop their learning and understanding within specific areas:

- Over the short-term as students develop a new competency (2)
- Over the long-term, progressively and slowly as students gradually develop their competencies (1)
- Not applicable to my courses (3)

Q3.11 I assess critical thinking skills by evaluating the processes by which students draw conclusions to a problem, question or task:

- Through self-directed thought processes following subject matter conventions or standards such as considering both sides of the issue or purposefully attempting to falsify a hypothesis, offering evidence for claims or demonstrating artistic proficiency without letting emotion interfere with reason or the cannon (1)
- Following instructions and guidelines completing every step with accuracy and fidelity or expressing their opinions and feelings (6)
- Not applicable to my courses (5)

Q3.12 I assess student learning by evaluating:

- The accuracy and growth of knowledge (advanced vocabulary, rich contents) (1)
- The growth of skill competencies and high-level thinking (2)
- The growth and progressive build-up of both, knowledge contents and skill competencies (3)
- Not applicable to my courses (4)

Q3.13 I assess the capacity of transferring knowledge and skills learned within a specific context to another context by:

- Making sure that the new context is similar and comparable to the original context for students to apply what they learned in the original context (2)
- Making sure that the new context is completely different and dissimilar to the original context but providing scaffolding or guiding cues to apply the previous knowledge and skills (1)
- Not applicable to my courses (3)

Q3.14 I use graded assessments of students' content knowledge and skills because: (Choose the statement that is the most important to you)

- Teachers can measure if students are making progress and determine how they can improve their teaching (3)
 - My department, school or the State require to measure and grade student progress (5)
 - Students learn and remember contents and skills when they are assessed regularly and find out if they are making progress or need to study more to improve (1)
 - Parents can find out if their children are making progress and help their children to improve (6)
 - Other reasons (Please briefly describe) (7)
-

Q3.15 Students in my classes:
(Choose all items that apply)

- Self-test themselves through practice quizzes (asking each other, using Quizlet or in-class practice tests) (1)
- Self-test themselves by writing in a blank piece of paper all they can remember on a topic (6)
- Receive school sponsored assessment preparation tutoring if they need it (7)
- Have opportunities to review and re-do partial or whole assessments if don't meet standards (8)
- Perform to my expectations on class academic assessments or progress evaluation of artistic artifacts or performances (9)
- Achieve or exceed passing outcomes on standardized tests: ACT, AP, IB, PSAT, SAT or discipline specific tests (10)
- None of the above (2)

Q3.16 I use my assessment strategies in:
(Choose all the items that apply to you)

- Advanced and Honors courses (1)
- Regular courses (2)
- Mixed abilities courses (3)

Q3.17

Online distance teaching and learning or hybrid classes has allowed me to improve and expand my assessment sources and strategies.

- Agree (1)
- Neutral or does not apply (2)
- Disagree (3)



Q3.18 Please write down the approximate percentage (%) that different types of assessments, assignments, engagement and tasks count towards students' overall final grade. (Must total 100%)

Final assessments: exams or projects, artistic performances or artifacts: _____ (1)

Semester or multi-unit assessments: exams, projects, artistic performances or artifacts: _____ (2)

Unit assessments: tests, quizzes or progress in artistic performances or artifacts: _____ (3)

On-going class assignments: essays, labs, projects, performances or artifacts: _____ (4)

Homework assignments or preparation of artistic artifacts, performances or skills: _____ (5)

Class attendance, engagement and participation: _____ (6)

Other forms of assessments and assignments (Please briefly describe): _____ (7)

Total: _____

Q3.19 Do you provide your students with non-graded practice assessments or non-graded progress evaluations?

Yes (1) Skip To: Q3.20 If Q3.19 = Yes

No (2)

Q3.20 My non-graded practice assessments or non-graded progress evaluations:

Are based on the same sources and criteria as my graded assessments (1)

Are similar in format and structure to my graded assessments (2)

Use similar strategies and techniques as my graded assessments (6)

Are motivated by very similar reasons as my graded assessments (3)

Other criteria (Please briefly describe) (4)

End of Block: Block 3: Assessment practices

Start of Block: Block 4: Homework practices.

Q4.1 HOMEWORK. This section includes questions about your homework or class preparation assignments. Please choose the answers that best reflect your homework practices.

Q4.2 Have you participated in professional development focusing on homework and student preparation within your area of teaching in the last 2 years?

- Yes (1)
- No (2) Skip To: Q4.4 If Q4.2 = No

Q4.3 These professional development experiences:
(Choose all the statements that apply to you)

- Were very professional, specific and helpful for designing homework assignments (1)
- Were closely aligned with my instructional and homework materials (2)
- Had a large impact at maximizing my courses' homework effectiveness (3)
- Included 2 or more sets of events, sessions or days each year (4)
- I selected this PD on my own initiative (5)
- None of the above (6)

Q4.4 I use various types of: (Choose all the items that apply to you)

- Graded homework or graded preparation work for class, artistic artifacts, skills or performances (1)
- Non-graded homework or non-graded preparation work for class, artistic artifacts, skills or performances (2)
- Not applicable to my courses (3)

Q4.5 I create or use homework or class preparation assignments mainly based on: (Choose the source you use most frequently)

- The textbook, workbook and ancillary materials of my subject matter (1)
- The materials and practices recommended by the State or professional organizations, such as Common Core, AP, IB or other formalized academic or artistic curriculum (2)
- The materials and practices created collaboratively by my teaching team or colleagues in my department (3)
- The materials and practices created by me based on my own professional expertise and skills (4)
- Not applicable to my courses (5)

Q4.6 How frequently do you require students to do homework or class preparation during each unit or project?

- Always or most of the time (1)
- About half of the time (2)
- A few times regularly for every unit (3)
- Rarely or never (4)

Q4.7 I design graded or non-graded homework or preparation for academic or artistic assignments according to:

- The current section/unit or artistic artifact/event (1)
- Current and past sections/units or artistic artifacts/events (2)
- Current and future upcoming sections/units or artistic artifacts/events (3)
- Not applicable to my courses (4)

Q4.8 Students in my classes:
(Choose all items that apply)

- Do homework that mixes the order in which they review various topics or practice skills (1)
- Have to illustrate or practice with concrete examples the concepts and skills we studied in class for homework (2)
- Have to complete their homework during mandatory scheduled study time on school facilities during normal school or at home during distance learning (3)
- May complete homework on their own initiative during their free periods or free time (4)
- Complete all the homework assignments or class preparation tasks (5)
- Do high quality work on homework assignments and preparation tasks (6)
- None of the above (7)

Q4.9 How long do you expect your students to take to complete the homework assigned or do the class preparation per day for academics or artistic artifacts, skills or performances as an average?

- More than 61 minutes (1)
- About 46-60 minutes (2)
- About 31-45 minutes (3)
- About 16-30 minutes (4)
- About 6-15 minutes (5)
- No time or less than 5 minutes (6)

Q4.10 I design and use my homework or preparation assignments with the following approach:
(Choose the approach that is most important to you)

- At an appropriately challenging level: not too easy or too difficult (1)
 - As conceptually meaningful and engaging for students (2)
 - As a moderately time-consuming task for completion: not too long or too short (3)
 - As high-quality assignments more than high quantity (4)
 - As a strategy for flipping my classes: students do homework assignments and tasks during class (5)
 - As for other reason (Please briefly describe) (6)
-

Q4.11 The most important reason for asking students to complete homework or preparation assignments is because: (Choose the reason most important to you)

- The school or my department or State require these assignments (1)
 - It is critical for reinforcing student learning of the material or skills (2)
 - It helps with checking for understanding (3)
 - It provides teachers with formative information to guide further instruction (8)
 - It contributes to student pre-learning and processing of upcoming new material or skills (9)
 - It is conducive to instill student hard-work ethic habits and self-discipline (5)
 - We should not assign homework at all (Please briefly describe why) (7)
-

Q4.12 I use the homework and preparation assignments and strategies in my:
(Choose all items that apply to you)

- Advanced and Honors courses (1)
- Regular courses (2)
- Mixed abilities courses (3)

Q4.13 Online distance teaching or hybrid classes has allowed me to improve and expand on student homework or class preparation assignments.

- Agree (1)
- Neutral or does not apply (2)
- Disagree (3)

Q4.14 *Homework scenario 1: Two students are trying to remember the new vocabulary word “gloaming,” which means “twilight” or “dusk” as part of their homework assignment. The assignment for student A asks her to spend a minute repeating the sentence, “gloaming means twilight.” The assignment for student B asks her to spend a minute creating a sentence that illustrates the meaning of gloaming.*

- Student A’s assignment will be more effective than Student B’s assignment (1)
- Student B’s assignment will be more effective than Student A’s assignment (2)
- Student A’s assignment will be as effective as Student B (3)

Q4.15 *Homework scenario 2: Students are learning about how a heart pumps blood. For homework, teacher A asks students to watch a 5 minutes video lecture that displays on a split screen a slide with a diagram of how the heart works while simultaneously listening to the explanation on the video. For homework, teacher B also ask her students to watch an online video with a slide with the same diagram, followed with a subsequent lecture and related text slides explaining how the heart works for 5 minutes.*

- Teacher A’s class will learn more about how the heart pumps blood than students in Teacher B’s class (1)
- Teacher B’s class will learn more about how the heart pumps blood than students in Teacher A’s class (2)
- Students with both teachers and in both classes will learn about the same (3)

Q4.16 *Homework scenario 3: It is mid-way through the semester. The students are learning a new technique to solve a problem. For homework, student A spends ten minutes trying to memorize the steps in order. Student B spends ten minutes doing his homework by asking himself*

questions about the reasoning for each step. If later both students face a problem that asks them to apply the technique in an unusual way a few days later:

- Student A will be more likely to solve the problem than student B (1)
- Student B will be more likely to solve the problem than student A (2)
- Both students will likely solve the problem at a similar rate of success (3)

Q4.17 Homework scenario 4: Two homework assignments ask students to learn the list of cranial nerves using a mnemonic device. Assignment A asks students to create their own mnemonic device to assist their learning. Assignment B includes a commonly used mnemonic device provided by the instructor to assist students in their learning. After two weeks, all students are asked to list the cranial nerves in order.

- Students completing Assignment A will remember more nerves than students completing Assignment B (1)
- Students completing Assignment B will remember more nerves than students completing Assignment A (2)
- Both sets of students completing either Assignment A or B will likely remember similar number of nerves (3)

Q4.18 Homework scenario 5: In two different classes, a 275-word prose passage about a specific topic is assigned for homework after an initial basic presentation in class. The homework assignment in Class A asks students first study the passage for seven minutes, and then are asked to study the passage again for another seven minutes. The homework assignment in Class B asks students first study the passage for seven minutes, and then are asked to write down from memory as much of the material from the passage as they can for seven more minutes. After one week, all students are asked to recall as much of the passage as they can remember.

- Students in class A will recall more contents from the passage than students in class B (1)
- Students in class B will recall more contents from the passage than students in class A (2)
- Both sets of students in class A and B will likely recall about the same level of content (3)

Q4.19 Homework scenario 6: Two art history professors want their students to recognize paintings by famous artists. They both assign for homework to watch videos presenting 6 paintings by each of 12 artists (72 paintings total). Professor A's homework video assignment presents the various artists' paintings in an intermingled fashion (i.e., mixed), such that a single painting by a particular artist would be followed by a different artist. Professor B's homework

video assignment presents all six paintings by a single artist consecutively (i.e., grouped), and then moves onto the next artist's six paintings, and so on, until all paintings have been presented.

- Students in Professor A's class will recognize more paintings than students in Professor B's class (1)
- Students in Professor B's class will recognize more paintings than students in Professor A's class (2)
- Both sets of students in Professor A and B classes will recognize about the same amount of paintings (3)

Q4.20 Homework scenario 7: Students are told to study for 10 hours as preparation for a test. Student A studies for a total of 10 hours on the two days leading up to the test. Student B studies for a total of 10 hours, and begins studying two weeks before the test, studying a little bit every day, including the day before the test.

- Student A will do better than student B on the test (1)
- Student B will do better than student A on the test (2)
- Both students, A and B will perform about the same level on the test (3)

End of Block: Block 4: Homework practices.

Start of Block: Block 5: School climate and professional development practices.

Q5.1 SCHOOL CLIMATE AND PROFESSIONAL DEVELOPMENT. This section includes questions about the school's climate and your professional development experiences. Please choose the answers that best reflect your perceptions and practices.

Q5.2 The senior leaders and administrators at my school:

(Choose all the statements that you agree with)

- Communicate a clear mission and vision for the school (1)
- Articulate a well thought out strategic plan for maximizing instruction, assessment and homework (7)
- Foster a school climate of fairness, respect and trust (9)
- Support faculty professional development and growth (10)
- Know my strengths and provide fair and helpful feedback for instructional improvement (11)
- None of the above (12)

Q5.3 Senior leaders in this school:

	Disagree (1)	Neutral or does not apply (2)	Agree (3)
Invite input from others in discussions (1)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Acknowledge their own limitations with respect to their knowledge or expertise (4)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ask probing questions (5)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Listen attentively (6)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Encourage multiple points of view. (7)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q5.4 In the last 2 years, have you participated in one to one peer coaching or mentoring as part of a required or formal arrangement by your school or department?

- Yes (1)
- No (2) Skip To: Q5.6 If Q5.4 = No

Q5.5 The one to one peer coaching and mentoring professional development experiences:
(Choose all the statements that apply)

- Were very professional, specific and helpful for my teaching strategies (1)
- Were closely aligned with my instructional and curricular materials (2)
- Had a large impact at maximizing my teaching effectiveness (3)
- Included 4 or more sets of events, sessions or days each year (4)
- I selected the coaches and mentors on my own initiative (5)
- None of the above (6)

Q5.6 In the last 2 years, have you participated in professional collaboration time with your colleagues or in professional development workshops **within** your department or school?

- Yes (1)
- No (2) Skip To: Q5.8 If Q5.6 = No

Q5.7 The collaboration time or professional development workshop experiences:
(Choose all the statements that apply)

- Were very professional, specific and helpful for my teaching strategies (1)
- Were closely aligned with my instructional and curricular materials (2)
- Had a large impact at maximizing my teaching effectiveness (3)
- Included 4 or more sets of events, sessions or days each year (4)
- I selected this collaboration or PD workshops on my own initiative (5)
- None of the above (6)

Q5.8 Have you participated in collaboration time or workshops on the subject matter or methods related to your discipline with **outside** professional organizations or institutions during the last 2 years?

- Yes (1)
- No (2) Skip To: Q5.10 If Q5.8 = No

Q5.9 The outside professional development experiences:
(Choose all the statements that apply)

- Were very professional, specific and helpful for my teaching strategies (1)
- Were closely aligned with my instructional and curricular materials (2)
- Had a large impact at maximizing my teaching effectiveness (3)
- Included 2 or more sets of events, sessions or days each year (4)
- I selected these outside PD experiences on my own initiative (5)
- None of the above (6)

Q5.10 Have you participated in education conferences or seminars where teachers and/or researchers present their findings and discuss education problems or strategies to improve teaching effectiveness during the last 2 years?

- Yes (1)
- No (2) Skip To: Q5.12 If Q5.10 = No

Q5.11 The education conferences or PD seminar experiences:
(Choose all the statements that apply)

- Were very professional, specific and helpful for my teaching strategies (1)
- Were closely aligned with my instructional and curricular materials (2)
- Had a large impact at maximizing my teaching effectiveness (3)
- Included 2 or more sets of events, sessions or days each year (4)
- I selected the PD conferences and seminars on my own initiative (5)
- None of the above (6)

Q5.12 Have you participated in certificate or degree qualification programs to learn more about your subject matter and methods of teaching beyond your initial subject or teaching degree during the last 2 years?

- Yes (1)
- No (2) Skip To: Q5.14 If Q5.12 = No

Q5.13 The certificate or degree program experiences:
(Choose all the statements that apply)

- Were very professional, specific and helpful for my teaching strategies (1)
- Were closely aligned with my instructional and curricular materials (2)
- Had a large impact at maximizing my teaching effectiveness (3)
- Included 10 or more sets of events, sessions or days each year (4)
- I selected these programs on my own initiative (5)
- None of the above (6)

Q5.14 In the last 2 years, have you participated in classroom observations by or of your colleagues' teaching **within or outside** your school?

- Yes (1)
- No (2) Skip To: Q5.16 If Q5.14 = No

Q5.15 These classroom observation experiences:
(Choose all the statements that apply)

- Were very professional, specific and helpful for my teaching strategies (1)
- Were closely aligned with my instructional and curricular materials (2)
- Had a large impact at maximizing my teaching effectiveness (3)
- Included 4 or more sets of events, sessions or days each year (4)
- I selected these observations on my own initiative (5)
- None of the above (6)

Q5.16 When I struggle with teaching a specific skill or concept or about designing assessments or homework assignments, I mainly use the support from: (Please choose the professional person(s) you rely on most frequently)

- School leaders such as division head, director of faculty or director of teaching and learning (2)
- Department chairs or teaching team leaders within my department (4)
- Peers and colleagues within the department, division and school (5)
- Deans, instructional coaches or learning support specialists within my school (7)
- Other professionals (Please briefly describe) (10)

Q5.17 When I struggle with teaching a specific skill or concept or about designing assessments or homework assignments, I mainly use the information from: (Please choose the source you use most frequently)

- Professional development workshops from my department, school or outside professional associations (1)
- Professional newsletters or magazines such as Educational Leadership, Education Week, or similar (3)
- Teaching and learning blogs and websites such as the Cult of Pedagogy, Edutopia, Learning Agency, Learning Scientists, Mindshift, or similar (6)
- Virtual professional networks in social media (8)
- Education research journals (9)

Other sources (Please briefly describe) (10)

Q5.18 When do you typically make decisions about your overall teaching approach and strategies?

(Choose the statement that best apply)

- During the summer or other school break times (1)
- During prep time at the start of the school year (2)
- During teaching team meetings throughout the academic year (3)
- During weekends throughout the academic year (4)
- When school leaders, the State, College Board or IBO make changes to curriculum and assessments (6)
- During professional development conferences, seminars and workshops (8)

Q5.19 People in this school:

	Disagree (1)	Neutral or does not apply (2)	Agree (3)
Speak up about what is on their minds (1)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Are usually comfortable talking about problems and disagreements (4)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Are eager to share information about what does and doesn't work (5)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q5.20 People in this school experiment frequently with new:
(Choose all that you agree with)

- Ways of working differently (1)
- Instructional practices or strategies (4)
- Assessment and progress rubrics practices (5)
- Homework assignments (6)
- Processes for evaluating and applying different ideas (7)
- None of the above (3)

End of Block: Block 5: School climate and professional development practices.

Start of Block: Block 6: Demographics

Q6.1 DEMOGRAPHICS. This section includes questions about your demographic characteristics. Please choose the most relevant answer describing you.

Q6.2 What is your gender or gender identity?

- Female (1)
- Male (2)
- Other alternative non-binary or non-conforming gender identity (3)

Q6.3 What is your age?

- Under 30 years (1)
- Between 30 to 39 years (2)
- Between 40 to 49 years (3)
- Between 50 to 59 years (4)
- 60 years or more (5)

Q6.4 How many years of combined teaching experience do you have in this school and previous schools?

- 5 years or less (1)
- Between 6 to 10 years (2)
- Between 11 to 20 years (3)
- Over 21 years (4)

Q6.5 How do you identify yourself regarding your race or ethnic background?

- African American or Black (1)
 - Asian (2)
 - Caucasian or white (3)
 - Hispanic or Latinx (4)
 - Native American, Alaskan, Hawaiian or Pacific Islander (5)
 - Middle Eastern (6)
 - Mixed races (7)
 - Other (Please briefly describe) (8)
-

Q6.6 Which one of the following best describes your primary role at the school?

- Upper school teaching faculty, department chair, learning specialist (1)
- Middle school teaching faculty, department chair, learning specialist (2)
- All school or division dean, assistant/associate head or division head (3)

Q6.7 Under which department do you teach your courses?

- Performing or Visual Arts (1)
- English (2)
- History (3)
- Classical or Modern World Languages (4)
- Mathematics (5)
- Science (6)
- Student support or school administration (7)

End of Block: Block 6: Demographics

Appendix D: Homework scenarios summary

SOTAH's questions Q4.15 to Q4.20 with homework scenarios

- A learns more than B
- B learns more than A
- C: Both, A and B will learn about the same

Concrete example of underlying abstract concept vs abstract concept definition

Q4.14. *Homework scenario 1: Two students are trying to remember the new vocabulary word “gloaming,” which means “twilight” or “dusk” as part of their homework assignment. The assignment for student A asks her to spend a minute repeating the sentence, “gloaming means twilight.” The assignment for student B asks her to spend a minute creating a sentence that illustrates the meaning of gloaming.*

- Student A’s assignment will be more effective than Student B’s assignment
- Student B’s assignment will be more effective than Student A’s assignment
- Student A’s assignment will be as effective as Student B

Simultaneous dual coding versus sequential

Q4.15. *Homework scenario 2. Students are learning about how a heart pumps blood. For homework, teacher A asks students to watch a 5 minute video lecture that displays on a split screen a slide with a diagram of how the heart works while simultaneously listening to the explanation on the video. For homework, teacher B also ask her students to watch an online video with a slide with the same diagram, followed with a subsequent lecture and related text slides explaining how the heart works for 5 minutes.*

- Teacher A’s class will learn more about how the heart pumps blood than students in Teacher B’s class
- Teacher B’s class will learn more about how the heart pumps blood than students in Teacher A’s class
- Students with both teachers and in both classes will learn about the same

Elaboration or elaborative questioning versus memorizing steps

Q4.16. *Homework scenario 3: It is mid-way through the semester. The students are learning a new technique to solve a problem. For homework, student A spends ten minutes trying to memorize the steps in order. Student B spends ten minutes doing his homework by asking himself questions about the reasoning for each step. If later both students face a problem that asks them to apply the technique in an unusual way a few days later.*

- Student A will be more likely to solve the problem than student B
- Student B will be more likely to solve the problem than student A
- Both students will likely solve the problem at a similar rate of success

Metacognition: generation versus provided mnemonic device

Q4.17. *Homework scenario 4: Two homework assignments ask students to learn the list of cranial nerves using a mnemonic device. Assignment A asks students to create their own mnemonic device to assist their learning. Assignment B includes a commonly used mnemonic device provided by the instructor to assist students in their learning. After two weeks, all students are asked to list the cranial nerves in order.*

- Students completing Assignment A will remember more nerves than students completing Assignment B
- Students completing Assignment B will remember more nerves than students completing Assignment A
- Both sets of students completing either Assignment A or B will likely remember similar number of nerves

Retrieval practice: re-reading versus writing in blank page

Q4.18. *Homework scenario 5: In two different classes, a 275-word prose passage about a specific topic is assigned for homework after an initial basic presentation in class. The homework assignment in Class A asks students first study the passage for seven minutes, and then are asked to study the passage again for another seven minutes. The homework assignment in Class B asks students first study the passage for seven minutes, and then are asked to write down from memory as much of the material from the passage as they can for seven more minutes. After one week, all students are asked to recall as much of the passage as they can remember.*

- Students in class A will recall more contents from the passage than students in class B
- Students in class B will recall more contents from the passage than students in class A
- Both sets of students in class A and B will likely recall about the same level of content

Interleaving versus blocked learning

Q4.19. *Homework scenario 6: Two art history professors want their students to recognize paintings by famous artists. They both assign for homework to watch videos presenting 6 paintings by each of 12 artists (72 paintings total). Professor A's homework video assignment presents the various artists' paintings in an intermingled fashion (i.e., mixed), such that a single painting by a particular artist would be followed by a different artist. Professor B's homework video assignment presents all six paintings by a single artist consecutively (i.e., grouped), and then moves onto the next artist's six paintings, and so on, until all paintings have been presented.*

- Students in Professor A's class will recognize more paintings than students in Professor B's class
- Students in Professor B's class will recognize more paintings than students in Professor A's class
- Both sets of students in Professor A and B classes will recognize about the same amount of paintings

Spaced versus massed practice

Q4.20. *Homework scenario 7: Students are told to study for 10 hours as preparation for a test. Student A studies for a total of 10 hours on the two days leading up to the test. Student B studies for a total of 10 hours, and begins studying two weeks before the test, studying a little bit every day, including the day before the test.*

- Student A will do better than student B on the test
- Student B will do better than student A on the test
- Both students, A and B will perform about the same level on the test

Source: adapting learning scenarios originally created by McCabe (2011), modified by Morehead et al. (2016) and as used by Boser (2019) to homework assignment scenarios (see SOTAH questions Q4.14 through Q4.20)

Appendix E: Summary strengths and weaknesses from SOTAH responses and analysis

Thematic coding through the four-dimensional learning model	Strengths	Weaknesses
<p><u>Macro-level: school leadership & climate.</u></p> <p>1.School leadership style and perceived trust</p> <p>2.Departmental and faculty autonomy</p> <p>3.School and department climate and faculty psychological safety</p>	<p>Very high professional growth support (75%+)</p> <p>High levels of psychological safety & school levels of experimentation (45%-70%)</p>	<p>Moderate trust, school mission identification and learning environment (35%-45%)</p> <p>Low instructional strategy plan & feedback (14%-22%)</p>
<p><u>Meso-level: professional development practices.</u></p> <p>1.School support for PD</p> <p>2.Effectiveness of PD at improving instruction</p> <p>3.Faculty autonomy at selecting PD programs (self-directed PD)</p>	<p>High engagement in 4 types of PD (86%-68%)</p> <p>Most PD activities are helpful (26%) and aligned (23%) and very few (4%) find these activities ineffective</p> <p>Colleagues & peers (61%) and department chairs & team leaders (22%) are valued as the professionals for instructional support</p> <p>Departmental and outside of the school PD workshops (34%) and a combination of virtual professional networks and resources (47%) are the trusted sources for instructional support</p>	<p>Schoolwide PD workshops that are mainly informational instead of practical</p> <p>Mandated and required PD has the lower instructional impact (11%-15%) and is counterproductive (7%-13% see no benefit)</p> <p>Very limited combined influence of senior leaders (6%) or outside professionals (11%) as trusted sources for instructional support</p>

<p><u><i>Micro-level: instructional practices.</i></u></p> <p>1. Departments & teachers use of different combination of instructional approaches</p> <p>2. Sources for curriculum planning and teaching teams</p> <p>3. Using evidence-based learning strategies in classroom tasks</p>	<p>All teachers use different combinations of instructional approaches complementing classical and inquiry-based direct instruction</p> <p>Wide individual collaboration and teaching-teams lead curriculum development and lesson planning for instructional design</p> <p>High level instructional application of learning processes: background knowledge, memory coding, near & far-transfer & metacognition</p> <p>Strong use of elaboration/elaborative questioning, spaced practice and dual coding strategies as well as above national sample average</p>	<p>Limited use and low understanding of some evidence-based learning strategies: interleaving, retrieval and use of concrete examples illustrating abstract concepts</p> <p>Self-aware metacognitive strategies for student learning could be further improved</p> <p>Limited effectiveness of student support, mixed ability grouping and online learning</p>
<p><u><i>Granular level: assessment and homework practices.</i></u></p> <p>1. Use of graded & non-graded assessment & homework assignments</p> <p>2. Sources and types of departments & teachers' assessment & homework assignments and design</p> <p>3. Effectiveness & use of evidence-based strategies in</p>	<p>Assessment</p> <p>Teachers have a clear understanding of assessment as a complex evaluation process of student learning through various weighted components to assign an overall grade</p> <p>Teachers use multiple forms and formats in their assessments: multi-unit and on-going unit tests, essays, labs, projects, presentations and alternative approaches and apply them to all students regardless of ability grouping</p>	<p>Assessment</p> <p>There is an inconsistency between the predominant grading categories, format and types of questions in assessments at NYC school with the College Board's AP, PSAT and SAT standardized tests</p> <p>Wide variance on categories used for assessment and their relative grading weight among teachers and the overall school</p> <p>Some evidence-based instructional learning strategies are only partially</p>

<p>assessment & homework assignments & design</p>	<p>Teachers uses many types of test or assessment questions but predominates foci on elaboration (complex & short questions) and demonstration of mastery of skills to assess authentic learning, critical thinking and problem-solving skills</p> <p>Performing and visual arts assess artistic skills and creativity through performance or artifact creation progress rubrics</p> <p>Teachers have great levels of autonomy and self-efficacy designing their assessment categories to evaluate student learning and relative grading weight of each category</p> <p>Homework</p> <p>Teachers understand homework as a low-stake instructional and learning tool, cooperate, share and use different sources for homework and assign it to all students regardless of their ability grouping</p> <p>About three quarters of the teachers assign homework regularly for current, past or upcoming course contents and skills, enhancing retrieval and spaced practice, with slightly different foci depending on departments or courses</p> <p>Performing and visual arts do not assign homework except</p>	<p>understood, such as interleaving, using concrete examples, dual coding and retrieval</p> <p>The potential use of online assessment through the school LMS is partially understood and used</p> <p>Wide differential of student academic and skill backgrounds and capacity negatively affects their learning outcomes</p> <p>Homework</p> <p>Teaching loads together with instructional and assessment priorities limit time for designing high quality homework assignments</p> <p>Homework assignments do not fully take advantages of evidence-based learning strategies</p> <p>Most demanding and rigorous courses and some performing art productions exceed homework or class preparation time limits</p> <p>Limited understanding of and use of the full capability of</p>
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	<p>for AP art courses but require a comparable amount of production time and practice effort</p> <p>Teachers comply with school policy and assign homework at or below the time limits established for the upper and middle divisions</p>	<p>online homework assignments using the school LMS</p> <p>Students from underprivileged backgrounds or struggling academically do not receive enough school sponsored support and opportunities</p>
Thematic coding	Strengths	Weaknesses

Source: Summarizing SOTAH responses and analysis