Learning to Teach in Medical Education:

A Critical Analysis of Team-Based Learning

Jennifer Huang

Vanderbilt University

Abstract

At the start of their careers, physicians vow a commitment to teach their peers, trainees, and patients. However, the ubiquity of teaching in medical practice is not well reflected in the medical education curricular standards. Currently, medical students have few opportunities to engage with teaching experiences, and these are often limited to interested third or fourth year students. In this Capstone, I will focus on how the development of teaching can become more central to learning to be a physician for first year medical students at Vanderbilt. First year Vanderbilt students participate in many small group activities, during which they engage in multiple instances of informal peer teaching and learning. One such setting that is commonly used in medical school is team-based learning (TBL), a student-centered active group learning structure. Through a re-conception of what it means to be a teacher in medicine adapted from the teacher learning literature and redesign of TBL through approximation of practices and reflection, I suggest a new model for helping first year medical students develop their practice of teaching. In order to establish doctors as both providers and teachers of medicine, we must encourage significant modifications in medical education. We must focus on our medical student teacher development, providing guided and structured learning in a curriculum that spans all four years of medical school. Identifying opportunities for these changes within existing learning activities like TBL is the first step to building a robust and theory-driven curriculum for our budding physician-educators.

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In Latin, the word "doctor" means "teacher." Indeed, the Hippocratic Oath, which all doctors pronounce prior to receiving their degree, states that one of the duties of a doctor is "…to teach [learners] this art, if they want to learn it, without fee or indenture." However, modern medicine seems to have strayed from consideration of teaching as a central component of being a good physician. In part, this may stem from the medical field's view of teaching as a lesser activity compared to clinical practice and research, a career path lacking clear incentives or structure (Lempp & Seale, 2004). Nevertheless, all doctors, at some point in their careers, are responsible for teaching their peers, junior colleagues, and perhaps most importantly, their patients. In this Capstone, I focus on first year medical students at Vanderbilt in order to examine how the development of teaching can become more central to learning to be a physician.

While teaching is ubiquitous in medical practice, the barriers to implementing a curriculum that promotes teaching and reflection on teaching experiences are immense. In what follows, I use work from the teacher learning literature to re-conceptualize what it means to be a teacher in the field of medicine. In exploring how medical schools can begin to promote this idea, I focus on one commonly used activity structure: team-based learning (TBL). I critically analyze the unique affordances and limitations of TBL and, borrowing from techniques utilized in teacher education research, consider how TBL may be modified to better support medical students in the practice of learning how to teach. To build a robust and theory-driven curriculum for budding future physician-educators, we must first identify and develop teaching opportunities within existing learning activities like TBL.

Literature Review

The Importance of Teaching in Medicine

Teaching interactions between physicians and patients have a profound impact on patient satisfaction and quality of care (Cleary & McNeil, 1988). For example, Foo et al. (2017) demonstrated that of 518 ophthalmology patients, the highest rates of dissatisfaction were with: explanation of test results, explanation of glaucoma complications, and advice on managing glaucoma. In addition, a systematic review of patients in the emergency department showed that adequate provision of information or explanation was one of the three most commonly identified service factors that influenced patient satisfaction (Taylor & Benger, 2004). For these patients, satisfaction with their care depended on their physicians' work to educate and help them understand their medical conditions. Adding to these findings, McMullan (2006) found that cancer patients were often dissatisfied with their physician's explanations of their medical condition and turned to the Internet in search of more information. Thus, patient education is an important component of providing the best care possible for patients.

As fundamental as teaching is to patient care, however, medical education continues to lag behind in emphasizing the importance of learning how to teach. In 2017, the Liaison Committee on Medical Education (LCME)[1] published standards for all medical schools that mandates education in basic science, organ systems, cultural competence, and ethics, as well as development of research, problem-solving, communication, and interprofessional collaborative skills (LCME, 2017). Notably, the promotion of teaching is not a required component of the standardized medical student curriculum.

Conceptions of the Practice of Teaching within the Teacher Learning Literature

[1] The Liaison Committee on Medical Education (LCME) is the accrediting body for schools that grant a Doctor of Medicine (MD) degree in the United States.

The well-developed bodies of literature regarding teaching and teacher learning demonstrate that learning to teach is very complex (Cohen, 2011; Shulman & Shulman, 2004). There are many perspectives on the mentors, workshops, experiences, or qualities needed for teacher development (Evans, 2002; Lieberman, 1995; Villegas-Reimers, 2003). Shulman and Shulman (2004) provide one paradigm of teacher learning and development in their work on teacher learning communities. According to Shulman and Shulman (2004), the features of accomplished teacher development are: Vision, Motivation, Understanding, Practice, Reflection, and Community.

Vision and motivation. At the foundation of professional education, students must have a vision of what it means to teach and to learn (Shulman & Shulman, 2004). Ball and Cohen (1999) support that students must have "a conception of the practice itself and what it takes to practice well" (p. 12). Application of Goodwin (1994) expands on this need, contending that professionals must develop *professional vision*, which consists of "socially organized ways of seeing and understanding events that are answerable to the distinctive interests of a particular social group" (p. 606). Thus, to develop professional vision in teaching is to discern the particular way that members within the field of education view the process of teaching and learning. Cohen (2011) clarifies this conception of teaching for educators by identifying important distinctions between the practice of teaching and informal and ordinary instruction. There are many occasions for students to learn that include no attention to how learners are taught. For example, we learn by observing others, watching television, listening to the radio, or reading books. Humans learn much through vicarious means. To distinguish teaching conceptions of practicing teachers, however, Cohen (2011) suggests that teaching practice involves attention and conscious effort in connecting teaching with learning: "This distinction

has two elements: teaching practice is relatively deliberate and attentive, while ordinary tuition is casual and inattentive; and practicing teachers seek to connect their teaching with students' learning, while inattentive instructors give learning little or no heed" (p. 26). Thus, a vision for teaching from the perspective of educators is one that emphasizes attentive teaching and connections between teaching and learning when compared to ordinary and casual tuition. Having a highly developed and well-articulated vision allows students to identify goals towards proficient teacher development. Further, students must be motivated and prepared to make changes to their own teaching practice and to challenge the status quo in order to achieve their vision. It is insufficient to develop this new vision without being motivated to make the necessary changes in that direction. Importantly, the context, peers, and culture are potentially useful supports that can significantly affect a student's vision, motivation, and willingness to change.

Understanding. In order to teach, students must understand the content of what is to be taught. However, as Shulman and Shulman (2004) highlight, the Understanding category encompasses more than content knowledge but also incorporates an understanding of how to teach, which Shulman (1986) refers to as "pedagogical content knowledge". Pedagogical content knowledge refers not to a fixed domain or set of teaching skills, but rather to the integration of content knowledge and skilled teaching of that particular subject. This includes aspects of teaching such as classroom management, organization, assessment, and personal development of learners. All of these come together in a teacher that knows and understands what must be taught and how to teach.

Practice. The next piece is the "heart of teaching, the capacity for intelligent and adaptive *action*" (Shulman & Shulman, 2004, p. 263). An accomplished educator not only

comprehends pedagogical content knowledge, but also is able to utilize and perform what they know and understand about teaching. Because there are a vast set of possibilities in bodies of knowledge and representations between teacher and learner and because there are many competing demands on the performance of teachers, teaching practice can take very different forms in various contexts. This makes the practice of teaching unique and particularly complex. All of these performance demands must be simultaneously considered and executed in an accomplished teacher with adaptability and the ability to learn from experience.

Reflection. Because teaching is unpredictable and its outcomes are uncertain, to be proficient educators, Shulman and Shulman (2004) argue that students must also learn to critically analyze their own practices in order to make changes. These moments of reflection allow for constant awareness and improvement in the learning and development as an educator. This may manifest in a myriad of ways, including through discussions of their work or teacher portfolios, with the underlying principle that critical reflection and analysis permit the capacity for purposeful change.

Community. The final piece suggests that this learning process is most effective when supported by a community of teachers as learners. Shulman and Shulman (2004) describe these communities as settings where participants work together and off of each other, distributing their expertise to become more proficient educators.

Current State of Developing Teaching Practice in Medical School

Several studies in the Canadian medical education system confirmed that while most medical students expect or plan to teach in their future careers, they lack confidence in teaching skills and access to adequate training to prepare them for the increased teaching responsibilities as residents (Matthew, Azzi, Rose, Ramnanan, & Khamisa, 2017; Nagji et al., 2017). Indeed,

two-thirds of medical students reported that residents played a crucial role in their learning, attributing one-third of their knowledge to teaching from residents (Bing-You & Sproul, 1992). In response, many medical schools have instituted student-as-teacher (SAT) courses; however, a systematic review of U.S. medical schools revealed that less than half of medical schools (44%) offered a formal SAT course (Soriano et al., 2010). The majority of these (95%) were offered to Year 4 students, 16% to Year 3, and only 12% each to Years 1 and 2 (Pasquinelli & Greenberg, 2008; Soriano et al., 2010). Only four medical schools out of 99 surveyed indicated that training was mandatory for all students in their final year (Soriano et al., 2010). Results from a survey sent to all Australian medical schools revealed similar results (Liu, Liu, Dannaway, & Schoo, 2017). The majority of schools offered student teaching programs; however, these were often limited to elective courses for a select number of third or fourth year students interested in teaching. As expected, implementing a formal teaching program for medical students can be challenging, and common barriers that were cited included: competition with other academic demands, difficulty in recruiting faculty to instruct the course, difficulty in convincing others of the value of the program, lack of commitment from medical students, and inadequacies in the evaluation process. Specific content areas that SAT programs should cover are another uncertainty that impedes widespread implementation.

Despite these challenges, SAT programs provide many benefits that may alleviate anxiety and concerns regarding the increased teaching responsibility of residents as teachers (Ten Cate & Durning, 2007). Student teaching programs not only enhance medical student learning and teaching effectiveness and provide experience for developing future physician-educators but also relieve the teaching burden for faculty and strengthen students' own clinical skills (Soriano et al., 2010). Another rationale that may explain the many positive outcomes of peer teaching within

these student teaching programs includes the ability for peer teachers to better approximate their peers' starting level of knowledge due to closer proximity of age and more recent similar experiences of peer teachers. This concept of "cognitive congruence", has been explored by Leeper et al. (2007) and Ten Cate and Durning (2007), who showed that this can promote a more relaxed, comfortable, and safe environment for learning. This intellectual alignment is further supported by the similar social roles, or "social congruence", that peer teachers and student learners share (Schmidt & Moust, 1995).

SAT courses serve as one formal experience for students to become involved with teaching. While there are few other formal teaching opportunities in the current medical curriculum, there is much potential for student education of teaching practice within existing learning structures. One such learning activity that is commonly used in medical education is team-based learning.

Team-based learning. Originally developed by Larry Michaelsen in the 1970s for business school, team-based learning (TBL) has since become a popular active learning structure for health science professional schools (Michaelsen, Knight, & Fink, 2002). TBL is an "instructional strategy that is designed to (a) support the development of high performance learning teams and (b) provide opportunities for these teams to engage in significant learning tasks" (Fink, 2004, p. 9). The successful use of TBL relies on four essential principles: properly formed and managed groups; student accountability for individual and group work; assignments that promote both learning and group development; and frequent and timely feedback on student performance (Michaelsen & Sweet, 2008).

TBL sessions consist of three distinct phases: (1) at-home student preparation, (2) in-class readiness assurance testing, and (3) group application activity (Reimschisel, Herring,

Huang, & Minor, 2017). Prior to the in-person TBL session, students are expected to peruse preparatory materials that have been provided by the facilitator, which may take a variety of forms, such as readings, video presentations, audio lectures, or presentation slides. In class, students complete individual readiness assurance tests (iRAT) that consist of multiple-choice questions aligning with content provided in the preparation material. After completion of the iRAT, students retake the same test, but this time as a team of students in the group readiness assurance test (gRAT). Teams engage in group discussions in order to come to an agreement on the answer to each question. Using the Immediate Feedback Assessment Technique (IF-AT), a self-scoring answer sheet, teams receive immediate feedback on the correctness of their decision. With the IF-AT scoring card, students scratch the covering off one of four or five boxes in search of a star indicating the correct answer. If the star is revealed on the first attempt, students receive full credit and move on to the next question. If the students do not find the star, they continue scratching off until they identify the correct answer, and their score is reduced with each unsuccessful scratch. After all teams have completed the gRAT, the facilitator brings the teams together to engage in a class wide discussion regarding the content material. Finally, students participate in a group activity with their respective teams that involves the practical application of content to a "real world" scenario. The centrality of group interactions in TBL generates many opportunities for peer teaching and learning, which I will explore in greater depth later in my Capstone.

Conceptualization of Learning to Teach in Medical Education

In order to reestablish teaching as a central component of being a good physician, we must first conceptualize what it means to be a practicing teacher of medicine. Shulman and Shulman's (2004) six features of accomplished teacher development provide a starting point for

this framework, and for my purposes, I am combining the features of Vision and Motivation from their work.

Vision & Motivation

Adapting Shulman and Shulman's (2004) work on teacher learning to the field of medical education, in order to build future physician-educators, we must first encourage physicians to begin developing a professional vision of teaching. Most medical doctors have minimal formal training in education. As such, we can turn to teacher education literature to help formulate a vision of teaching for medical professionals. This starts most fundamentally as a re-conception of the identity of physicians not only as providers of health care, but also as teachers of medicine. Several studies note that medical teachers often primarily identify with being a doctor or researcher rather than with being a teacher (Bartle & Thistlethwaite, 2014; O'Sullivan, 2012). Further, a systematic review surveying students, doctors, patients, and nurses regarding the traits of a "good doctor" demonstrated that teaching, research, and continuous education was mentioned least often out of six categories, highlighting the lack of emphasis that the medical field currently places on the teaching role of physicians (Steiner-Hofbauer, Schrank, & Holzinger, 2017). If we are to make progress on developing teaching practices in medical students, the medical community must first begin to view teaching as an essential element of being a good doctor. As medical students are able to identify and observe physician-educators in action as members of the medical community, they can begin their development of becoming full and legitimate participants in the practice of teaching in medicine. All physicians are teachers in some respect, and acknowledging this idea requires a significant revolution in the current identities of our medical providers.

Another fundamental change that must precede the successful implementation of a teaching curriculum in medical school is building a student's identity as both learner and teacher. According to Beauchamp and Thomas (2009), identity involves an "understanding of oneself in relation to others and one's place in the world." First year medical students often currently find themselves at the bottom of the metaphorical medical totem pole, with the least experience and the most to learn. The hierarchical organization of power and knowledge in medicine frequently leaves students feeling overwhelmed and unable to meaningfully contribute to the group (Friedman et al., 2015; Smith & Lipoff, 2016). Instead, we must cultivate an environment in which students are able to participate and, even with more limited medical experience, act and be seen as teachers. The legitimatization of this peripheral participation as learner and teacher helps students begin to cultivate their professional identities and place in the medical profession.

Understanding

Shulman and Shulman (2004) argue that accomplished teachers must have an understanding of content knowledge and how to teach. Similarly, it is not just understanding of medical knowledge that first year medical students have the potential to develop, but also pedagogical content knowledge. Medical students have much to learn from a constantly expanding base of medical knowledge and spend most of the first year attempting to absorb and retain as much knowledge as possible. However, even with a relatively limited foundation of medical knowledge, it is conceivable for students to begin practicing the art of teaching in their first year. Students may become mini-experts in specific topics, sharing information with peers, patients, and even attendings. The process of consolidating knowledge and preparing content for learners through these teaching opportunities can also help students gain a deeper understanding of the material (Bulte, Betts, Garner, & Durning, 2007; Rodrigues et al., 2009).

Practice

Finding opportunities for students to focus on "capacity for intelligent and adaptive *action"* (Shulman & Shulman, 2004, p. 263) in teaching is one of the keys to building effective physician educators. Teaching is a complex practice that requires time and experience. Thus, finding time to practice one's teaching practice in an already busy first year curriculum is certainly a difficult feat. However, through multiple small-scale teaching opportunities in medical school, students can begin to slowly integrate the nuances and understanding of pedagogy into their daily teaching practice and clinical work. The cross-professional research done by Grossman et al. (2009) provides some guidance on how practitioners learn their practice, suggesting three examples of constructs that help teachers understand the pedagogies of practice in professional education: representations, decomposition, and approximations of practice. According to Grossman et al.,

> Representations of practice comprise the different ways that practice is represented in professional education and what these various representations make visible to novices. Decomposition of practice involves breaking down practice into its constituent parts for the purposes of teaching and learning. Approximations of practice refer to opportunities for novices to engage in practices that are more or less proximal to the practices of a profession (Grossman et al., 2009, p. 2058).

Applying this framework to the medical student learning how to teach, students must have opportunities to observe representations of teaching in use by medical professionals, to distinguish and then practice decompositions of teaching, and to experiment with a variety of approximations of teaching. With these three principles, students can develop and hone their teaching practice during various activities throughout their medical training. Team-based

learning (TBL) is a potentially useful approximation of teaching practice that medical students already utilize, serving as a low-stakes opportunity for students to practice teaching. Students become mini-experts after studying the preparatory material and have the chance to approximate teaching practice during the group discussions. Approximations such as these allow students to first focus on key aspects of teaching "that may be difficult for novices but almost second nature to more experienced practitioners" (Grossman et al., 2009, p. 2078). Over time, with multiple opportunities for smaller-scale teaching approximations, students continue building their knowledge and teaching practice for more and more complex conditions and settings.

Reflection

The importance of reflection in health professions education is relatively new but may be useful as a learning strategy (Mann, Gordon, & MacLeod, 2007). Reflection can help learners integrate new knowledge and experiences, and reflecting on teaching experiences specifically is crucial to continually adjusting and improving one's own teaching practice. By introducing a curriculum that highlights the importance of reflection, medical students can begin to practice and improve reflective teaching at the start of their medical training.

Community

All of the aforementioned features must occur in a community that supports the underlying goal of developing teaching practice. For the medical community, this begins with a change in the professional identity of physicians as educators of medicine in addition to health care providers. Within a community of learners, medical trainees and professionals can collaborate, distributing their expertise to create more proficient educators.

Current Opportunities for Teaching within Vanderbilt School of Medicine

In 2013, Vanderbilt University School of Medicine adopted a new medical school curriculum, entitled Curriculum 2.0. The new curriculum consists of one academically rigorous year for the acquisition of basic science knowledge and early clinical skills through a multitude of learning contexts and environments. During their second year, students gain comfort interacting with patients and health care professionals while on the clinical wards, an intense and immersive experience that was traditionally completed in the third year. In the third and fourth years, the curriculum provides substantially more flexibility for students to explore their own personal interests through several required and elective month-long rotations.

Throughout the four years, there are a limited number of teaching opportunities for students. An elective year-long course entitled Students as Teachers is available to 30 out of 200 third and fourth year students who are interested in teaching. Once a year, three to four upper-level students enroll in Medical School 101, a three-week course during which students develop curriculum for and teach select topics in medicine to a group of gifted high school students. No other formal training in teaching is provided throughout the four years of medical school at Vanderbilt. Extracurricular teaching opportunities include participating in Curriculum Committee, a small group of elected students who meet periodically with medical school administrators, and volunteering at Shade Tree Clinic, a free clinic for uninsured Nashville patients in which upper-level students often serve as clinical tutors for first year trainees.

The First Year Experience

First year medical students at Vanderbilt complete five systems-based blocks in thirteen months: Human Blueprint & Architecture; Microbes & Immunity; Homeostasis; Endocrine, Digestion & Reproduction; and Brain, Behavior & Movement. Within each block, students participate in multiple small group activities, including case-based learning (CBL), anatomy

dissection labs, physical diagnosis sessions, and team-based learning (TBL). Within these sessions, students frequently engage in peer-assisted learning and informal peer teaching; however, there are no formal guidelines or assessment methods for these experiences.

First year medical students are often unfamiliar with the new trials of learning medicine. Many medical students come from top undergraduate institutions and have succeeded in most, if not all, of the subject matter previously presented. However, to learn to practice medicine is to learn to be a part of a profession, and this makes the challenge of learning medicine particularly unique. This participation develops by more than simple observation and imitation, as the traditional apprenticeship model would suggest (Lave & Wenger, 1991). Instead, situated learning goes further by encouraging students to be active participants: to participate in the talk of the community; to acquire the necessary practical skills and techniques; to know the values and norms of the culture; and to understand the ways in which the community frames and solves problems (Mann, 2011; Shulman, 1998). Rather than acting as passive absorbers of knowledge, students must learn to become legitimate peripheral participants, involving themselves actively in the practices that physicians perform daily. This requires multiple iterations of opportunities for practice within authentic but low-risk environments.

Medical school, particularly the first year, is a trying time for many students, a time where new knowledge and practices must be rapidly accumulated. As the Liaison Committee on Medical Education (LCME) recognizes, there are many components to becoming a good physician and students have several experiences to engage with these competencies. First year students spend time learning in anatomy lab, histology and pathology sessions, lectures, small group case-based activities, physical exam simulations, and clinics or hospital wards. Students learn medical and procedural knowledge in the hospital and during simulation labs. Through

speaking to patients and presenting to attendings, students practice effective communication. Through mandatory courses and clinical projects, students are exposed to research and ethics. These activities provide authentic, low-risk environments for student learning and cover most of the daily practices of a "good doctor". What Vanderbilt's medical curriculum currently lacks, however, are formal and authentic opportunities for students to engage meaningfully in the teaching practice of clinician educators. One such learning environment where these opportunities may exist is team-based learning (TBL).

Team-Based Learning at Vanderbilt

At Vanderbilt, first year students participate in several TBL sessions throughout each systems-based block, and the sessions largely adhere to the general guiding structure originally conceived by Michaelsen. All of the students in the class are randomly divided into teams of seven to eight members, which remain the same throughout each block. Students prepare prior to class by watching several pre-recorded videos of the content. In one large laboratory room, students take the 10-question multiple-choice individual readiness assurance test (iRAT) individually online and then the group readiness assurance test (gRAT) on paper, consisting of the same ten questions, with their respective teams. Teams utilize the Immediate Feedback Assessment Technique (IF-AT) as a self-scoring answer sheet. Points are deducted for each incorrect answer. After all teams complete the gRAT, the facilitator brings the class together to review difficult concepts and to answer any questions. Finally, students participate in a group activity with their respective teams that applies the content to a "real world" scenario.

Affordances of TBL. TBL is lauded as a student-centered learning experience that encourages participants to better understand the learning content, value of teams, and effective team interactions. Many studies support that learners feel more engaged and gain a deeper

understanding of the material by having the chance to discuss and apply content (Reimschisel et al., 2017). Further, a number of studies have found that TBL helps students earn higher grades in class overall and possibly helps academically weaker students more than stronger ones (Huang et al., 2016; Kang, Kim, Oh, Kim, & Lee, 2016; Koles, Nelson, Stolfi, Parmelee, & Destephen, 2005). This may be due, in part, to the increased social support or peer tutoring that the group can quickly provide (Michaelsen & Sweet, 2008).

In TBL sessions, the instructor takes on a facilitator role, allowing students to learn content and effective group interactions through the successes and failures of the team. Almost without exception, each group ultimately develops into effective self-managed learning teams; however, this process is not well-structured or defined amongst groups. Parmelee, Michaelsen, Cook, and Hudes (2012) support that "students do not need any specific instruction in teamwork since they learn how to be collaborative and productive in the process" (p. 275). One group's conversation and experience may completely differ from those of another, but this variability allows for acknowledgement of the diversity and individuality of the different members that comprise each team. Each group can work through the learning experience at its own rate given the understanding of its team members.

In addition, the unique immediate feedback system not only assists in content learning and retention, as is well documented in educational research literature (Hattie & Timperley, 2007; Kulik & Kulik, 1988), but also because the group receives feedback together, it has an important impact on group development.

Limitations of TBL. The TBL facilitator guides and encourages student learning by moving away from lecturing and instead promoting student-led discussions. Thus, the quality of the facilitator's instruction is an important factor that may impact students' perceptions of TBL.

Parmelee et al. (2012) suggest that, "the instructor must be a content-expert, but need not have any experience or expertise in group process to conduct a successful TBL session" (p. 275). To argue that any specialty physician can facilitate TBL, however, is to completely disregard any intention to connect teaching with learning. Students learn, but there is no effort by the "teacher" to understand the progression of learners' thinking. While it is true that the distinct role that TBL instructors take on is drastically different from the traditional didactic lecture to which physician educators are accustomed, in both roles, the conception of teaching should be similar. TBL instructors must focus on creating or selecting home preparation materials and quiz questions that are just challenging enough to push group collaboration and critical thinking. They must consider the material in question as the first year learner would, forging connections between ideas and topics that may not yet exist. To be intentional in teaching TBL and promoting student learning during these sessions requires preparation and time. Indeed, two studies (Brandler, Laser, Williamson, Louie, & Esposito, 2014; Touchet & Coon, 2005) specifically mention the additional workload on faculty, especially in the beginning when the TBL curriculum is developed. Further, Della Ratta (2015) and Roh, Lee, and Choi (2015) report that students disliked TBL when it was first introduced and only began to accept it after several iterations of the novel technique. This finding suggests that faculty conducting TBL for the first time may not be fully prepared for the unique challenges that TBL presents and may need guidance on how to facilitate a TBL session.

The lack of structure that makes TBL so unique and valuable as a teaching method may also be a potential limitation. Students are instructed to answer questions to pass a test as a group with no real guidance on what is to be experienced in this process. The "conscious competence" learning model describing the process of progressing from incompetent to competent suggests

that individuals initially begin unaware of their incompetence (Howell, 1982). As they learn to become aware of their incompetence, they are able to consciously acquire that skill and ultimately use the skill without consciously thinking about it. Because first year medical students are often unaware of their incompetence, in order to help develop their awareness, the particular facets of medical practice must be made visible to learners. Grossman et al. contends that to help learners begin to participate in a professional practice, "instructors must first possess a set of categories for describing practice and then, during instruction, focus students' attention on these components of practice" (Grossman et al., 2009, p. 2069). Thus, more guidance and structure to TBL sessions may be a useful construct to focus students more intentionally on what to learn.

Curricular Design: A New Vision for Team-Based Learning

Encouraging first years to begin focusing on Shulman and Shulman's (2004) six characteristics of expert teacher development has significant implications for the structural supports needed for a student participating in TBL.

TBL is a unique learning structure that affords group interaction and critical thinking. This plethora of group interactions and discussion creates space for instances of peer teaching that students can learn and practice. In the sections that follow, I draw on Shulman and Shulman (2004) and Grossman et al. (2009) in order to identify how approximations of teaching practice and reflection can deepen first year medical students' attention to and development of teaching.

TBL as an Approximation of Teaching Practice

First year medical students often have many years of experience of learning from teachers, but limited experience teaching others. As such, students may not know what to attend to, or how to interpret what is observed in teaching practice. McDonald, Kazemi, and Kavanagh (2013) describe "core practices", or fundamental elements of a practice that students can learn to

recognize and later employ. As Grossman, Hammerness, and McDonald (2009) clarify, the core practices are not meant to be a list of best practices that the most skilled teachers utilize; instead, it is the concept of core practices that is intended for use in developing and implementing teacher education initiatives. They are common practices that teachers may use or adjust as needed in a particular context. Inexperienced first year students may benefit from an introduction to some of these practices in order to begin observing and developing them for their future teaching careers.

Currently, at the beginning of TBL, students are only introduced to the logistics of the session, such as how to access the iRAT online and how to use the self-scoring card during the gRAT. There is no description of the benefits that Michaelsen intended, including improved group collaboration and critical thinking, and no emphasis on teaching opportunities. This lack of structure in sessions precludes deliberate and intentional focus on teaching practices. Instead, students may be better supported with explicit instructions on the experience and potential benefits that are to follow.

For example, instructors might explicitly describe the multiple teaching moments that may occur within each group. In pointing these out, students become aware of these valuable moments and can be encouraged to view and use the group conversations as an opportunity to practice teaching. To further support student teaching practices, at the start of each session, instructors might introduce particular small-scale teaching practices that educators commonly use, such as eliciting and responding to learners' prior knowledge, revising learner misconceptions, or making extensions and connections with other knowledge. Throughout the session, learners would then be able to identify and focus on these core concepts, creating a more deliberate practice environment. After this short introduction, students would then continue the gRAT portion of the TBL as usual. However, with particular teaching practices in mind, such as

eliciting learner thinking, students can use various parts of the group discussions as opportunities for "rehearsals" or "approximations" of teaching practice (Grossman et al., 2009; Lampert et al., 2013). These approximations serve as lower-stakes opportunities for students to practice teaching before jumping into clinical teaching situations or presentations. Although these approximations can never fully eliminate the anxiety and uncertainty surrounding more realistic conditions, it is a useful construct for students to begin learning from experience. For first year students, trying to remember content material while seeking opportunities to practice teaching may be a very difficult task. However, the first step to building this ability is to start recognizing opportunities for its use, and with subsequent sessions, or even in other small-group learning activities, students may continue to practice and to gain confidence in their teaching practice.

Reflection

In recent years, reflective teaching has been widely discussed in teacher development (Bain, Ballantyne, Packer, & Mills, 1999; Calderhead, 1989; Harford & MacRuairc, 2008; Loughran, 2002). Reflection is an important tool for professional development. It encourages learners to take responsibility for what they learn and to make decisions in relation to their future development and shaping as a teacher. Reflective learners continuously reconstruct their professional knowledge in response to changing contexts and expectations. While there is much variation in how the concepts of reflective teaching are justified and connected to professional education, for this Capstone, I focus on Schon's (1984; 1987) conception of the iterative process of reflection: (a) knowing-in-action, (b) surprise, (c) reflection-in-action, (d) experimentation, (e) reflection-on-action. Schon (1984) contends that in a new situation, individuals attempt to use practical intuitive knowledge gained from other similar experiences that are not appropriate for the current situation, leading to surprise. To overcome this, the person must reflect and improvise

in the situation, experimenting with alternative approaches in response to feedback they are receiving. While reflection-in-action describes the changes that are made during the event, reflection-on-action occurs after the event and considers potential changes for future situations. I focus here on Schon's (1984) concept of reflection-on-action. There are many methods to engage in reflective practice, including teacher portfolios, journal writing, and video reflection. I will focus on the opportunities for journal writing and peer-videoing as instances for medical students to engage in reflective teaching in TBL.

Journal writing. One method for reflection that can be incorporated into TBL in the first year of medical school is journal writing. After completing a TBL session, students will be encouraged to describe and write about their experiences as part of the group, both in the context of being a learner and a teacher. Taken together with the more formalized approximations of teaching practice described above, students can reflect on ineffective or missed opportunities for teaching. Through these accumulated journal entries, students gain a metacognitive perspective of the development of their own teaching practice. Areas for improvement may be identified and recorded. These past personal experiences can be used to continually inform and adjust their future teaching practice.

Peer-video. Another opportunity for reflective teaching in TBL is through peer-videoing. Observing one's own teaching practice may be useful for identifying areas for improvement (Santagata & Guarino, 2011; Snyder, 2011). However, for first year students, difficulty may arise in not having had enough experiences to be able to truly critically analyze one's own work. Introducing a peer to assist in collaborative reflection may overcome this and promotes a culture of observation, critical dialogue, and shared learning (Tripp & Rich, 2012).

In TBL, this might manifest as periodic meetings of a pair of students watching a video

clip of their group's discussion and interaction after the session. While watching these videos, students might be encouraged to identify coding schemes of particular teaching practices. Cicourel (1964, 1968) describes coding schemes as "one systematic practice used to transform the world into the categories and events that are relevant to the work of the profession" (as cited in Goodwin, 1994, p. 608) and, according to Goodwin (1994), are central to the development of professional vision. This activity serves two purposes. The first is to provide a representation of teaching practice that gives first year students an opportunity to begin developing ways to see and understand professional practice. In watching these videos, the interactive components of teaching practice are made visible, and the use of coding schemes helps students establish an orientation for examining these teaching practices that is reflective of the perspective of teaching professionals. The videos are limited in that the particular reasoning behind each action may be invisible, so by working in pairs, students are then able to talk through some of these thought processes and thus broaden their horizons of observation. The second purpose is to serve as an opportunity for joint reflection. Reflection is an important component in teacher preparation programs and "helps practitioners better understand what they know and do through a consideration of what they learn in practice" (Loughran, 2002, p. 34). While individual reflection is helpful in processing and understanding the experience, collaborative reflection through discussion and comparison of experiences may promote deeper learning that might be impossible to obtain otherwise (Epler, Drape, Broyles, & Rudd, 2013). This collective experience encourages greater cognitive and metacognitive processing (Ericsson & Simon, 1998; Yukawa, 2006) and is a potentially useful tool for supporting first year medical students in learning how to teach. Alternatively, students may watch a video clip of the session with a fourth year student, creating an opportunity for reflection in a tutor-student dyad. In this case, the more experienced

fourth year student provides useful insights into specific instances of decompositions of practice and their context (Parsons & Stephenson, 2005).

Limitations

This Capstone is written from my perspective, as a Vanderbilt medical student who has been through the curriculum. As such, the proposed modifications are applicable only to TBL at Vanderbilt School of Medicine. Each medical school may run their TBL sessions with slight variations in a different curriculum, and this paper does not consider those contexts. Further, I cannot comment from a medical school administrative perspective on the interplay between other components of the curriculum or the fulfillment of medical school requirements. I also do not examine the appropriate use of assessment measures in such a curriculum. Even so, I believe the changes I propose are valuable as a starting point for filling this gap that exists in medical education. Through in-depth analyses and critiques of various aspects of the medical curriculum, we can identify areas for improvement and change, areas where education research can provide guidance.

In addition, introducing any new requirement into an already full medical curriculum runs the risk of being seen as meaningless or "just another task" by students. To counter this, we must focus on the culture and values of medical education. Students do not view learning about patient care or medical knowledge as trivial because these are aspects of becoming a physician that they identify as indispensable. In the same respect, developing one's teaching practice must be seen in this way. It is only then that students will not consider these opportunities for video reflection, journal writing, and practicing teaching as busy work but will focus on them as indispensable aspects of becoming a physician.

Implications & Future Considerations

As with other components of the medical curriculum such as scholarly research and patient care, teaching is a universal practice that should be supported and upheld with the same standards expected of other domains of medicine. To provide the best patient care, we must provide guidance and structure to all of our students to become future physician-educators. However, inciting change in a system of education that has remained largely constant for more than a hundred years is difficult. In recent years, many medical schools across the country have begun to make adjustments to the curricular foci and pedagogical methods in use. To continue pushing these changes, we must carefully consider the fundamentals of what makes a good physician and how we train our students to get there. Much of the work in teacher education literature can be borrowed and adapted to help accomplish this goal.

This paper provides just one example of how we can use educational tools to modify learning activities in medical school to better promote development of teaching practice. We can do this for any number of activities, including case-based learning, anatomy lab, and physical diagnosis sessions. Throughout the remainder of a student's medical school training, these teaching practices may be put to use in various other approximations of teaching, including resident conference talks, elective-long courses, or one-on-one tutoring sessions. With a curriculum for developing teaching practice that expands all four years of medical school, students gain early exposure to teaching experiences and have the opportunity to begin practicing from day one of their medical career. Introducing the development of teaching practice into medical school curricula thus marks the first step towards changing the culture of medicine to one where being an educator is important and valued.

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