Team Learning in Medical Education: Initial Experiences at Ten Institutions

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ABSTRACT

Purpose. In the midst of curricular reforms that frequently call for reducing lectures and increasing small-group teaching, there is a crisis in faculty time for teaching. This paper describes the initial experiences of ten institutions with team learning (TL), a teaching method which fosters small-group learning in a large-class setting.

Method. After initial pilot studies at one institution, nine additional institutions implemented TL in one or more courses.

Results. Within 18 months, TL has been used in 40 courses (from .5% to 100% of the time) and all ten institutions will increase its use next year.

Conclusions. We surmise that this relatively rapid spread of TL into the medical curriculum is due to the sound pedagogy and efficiency of TL as well as the modest financial resources and support we have provided to partner institutions.

Curricula in medical education utilize a variety of teaching strategies designed to promote learning that is effective, efficient, and appealing. The specific methods are often based on factors as faculty choice, institutional guidelines, and accrediting agency mandates. In the past several decades, a growing body of theoretical arguments, empirical evidence, and accrediting agency recommendations have led some curriculum leaders to increase their use of active learning strategies to introduce variety and increase the potential for a variety of positive learning outcomes.[1] Many schools, for example, have reduced the number of lectures in their preclinical curricula and have introduced methods, such as problem-based learning (PBL), that are generally believed to increase student engagement.

Nevertheless, at the start of the twenty-first century, medical education faces a troubling irony: In the midst of these curricular reforms there is a crisis in faculty time for teaching.[2] This crisis has, among other things, weakened the reforms such as PBL, which require an increased number of trained faculty simultaneously involved with a single class of students.

A few years ago, we "discovered" a well-defined instructional strategy used in business and science courses with the potential to address this dilemma.[3] Known as team learning (TL), this strategy brings together theoretically based and empirically grounded strategies for ensuring the effectiveness of small groups working independently in classes with high student-faculty ratios (e.g., up to 200:1) without losing the benefits of faculty-led small groups with lower ratios (e.g., 7:1). Team learning is a teacher-directed method of fostering effective application of course content in autonomous small groups in the lecture hall with one faculty member present.

Confident in the potential of TL in medical education, we applied for and received a one-year grant from the Fund for the Improvement of Post Secondary Education (FIPSE) to pilot and evaluate the method within our institution. In this demonstration and evaluation project, elements of TL were applied in eleven different settings, along the continuum of medical education and in different content areas.[4] Designs included relatively small pilot interventions within a course (i.e., single session of a much larger course),[5] full-course implementation,[6] and a randomized control trial.[7] Results of these studies generally revealed that TL can stimulate effective out-of-class study and advanced preparation, promote high levels of in-class engagement and "teamwork" among students, enhance students' attitudes about learning and working in teams, and facilitate content learning at least as well as is accomplished by more traditional didactic methods.

On the strength of these findings, we obtained a three-year FIPSE grant to disseminate TL to other U.S. medical schools and to conduct additional evaluation studies. This paper reports initial reactions, responses, and implementation efforts at Baylor and nine schools with which we have established a collaborative, grant-funded partnership over 18 months. We consider the results to represent a "rapid screening test" of the potential of TL and only a precursor of more substantive results to be obtained in rigorous, long-term outcome evaluations planned to be reported in a grant-funded National Consensus Conference in 2005.

Method

Definition of Team Learning

Over the past 25 years, Dr. Larry Michaelsen, a 1999 Carnegie Foundation Pew Scholar and Professor of Business at the University of Oklahoma, has designed, described, and disseminated TL into a variety of disciplines other than medicine.[3] This method focuses on the meaningful application of course content in autonomous small groups working under conditions established in the lecture hall by a single instructor. It brings together principles, guidelines, and techniques found to maximize the effectiveness of individual and group behaviors on a variety of desired outcomes, including communication and problem-solving skills.

Michaelsen characterizes TL as a repeating series of three phases. In Phase 1, learners study independently outside of class to master assigned objectives. In Phase 2, individual learners complete an individual readiness assurance test (IRAT) to assure their readiness to apply Phase 1 knowledge. Permanently established groups of six to seven learners then retake this same test, referred to as a group readiness assurance test (GRAT), and turn in their consensus answers for immediate scoring and posting. In Phase 3, which may last several class periods, groups complete in-class assignments that promote collaboration, use Phase 1 and 2 knowledge, and identify learning deficiencies. At designated times in Phase 3 all groups simultaneously share their groups' answers to the in-class assignment with the entire class for comparison and immediate feedback. This stimulates an energetic, total class discussion with groups defending their answers and the teacher helping to consolidate learning and addressing misconceptions. In addition, Michaelsen espouses techniques that encourage desired behaviors such as having students help set course grade weights and complete peer evaluations of team members for grading purposes.

Selection and Training of Partner Institutions

Based on manifested interest in and a commitment to pilot TL within their respective institutions, we have established partner-

ships with multiple institutions and have made a commitment to provide each with modest grant funds depending upon their proposed implementation plans over a two- to three-year period. Individuals at these institutions gained interest in TL after hearing about our activities at Baylor (e.g., poster presented during the 2000 Association of American Medical Colleges (AAMC) meeting). At least one individual from nine of the partner institutions attended a two-day training work-shop we held in the spring of 2002. We designed the work-shop to introduce the method and prepare participants to design and implement pilot projects. During the following year, we provided help and advice to these partners including on-site workshops, phone conferences, and review of materials.

Collection of Activity Data and Plans

Before a second two-day work-shop in January 2003, we collected information from Baylor and our nine partner institutions about their TL activities and immediate plans for implementation. The information, some of which is reported in this paper, was organized into a structured format and presented in poster discussions to the 53 work-shop participants.

Results

As shown in Table 1, TL has been implemented in 40 courses: 33 in the preclinical and one in the clinical medical school curricula of ten institutions; two basic science and three clinical courses in physician assistant's programs at four institutions; and one course in one residency program. The amount of time devoted to TL varied widely across courses from approximately one hour of TL activities in a 200-hour course (Rochester) to complete courses (Baylor, UNC, UTMB) or a longitudinal component of preclinical medical school curricula (Oklahoma, Wright State).

We have included all reported responses (118 total responses for the 40 courses). The most common type of response (63%) was faculty and/or student perceptions of satisfaction with 30% reporting positive faculty perceptions, 19% positive student perceptions, and 14% mixed student perceptions. Other types of responses included academic performance equal to or better than when the course was taught using a method other than TL (12%), evidence from student focus groups that desired learning behaviors occurred (5%), high student engagement (9%), concern about peer evaluation in grading (8%) and students' increased positive regard for the value of teams (3%). We are unable, at this time, to detect any systematic differences in responses due to institutions, disciplines, degree of use, or years in curriculum. From the given set of responses, it appears that the most controversial aspect of TL from the students' perspective is the use of peer assessment in grading. For example, one institution reported: "student response basically positive. Peer evaluation controversial; some students uncomfortable with it; some liked the opportunity to evaluate [peers] whom they perceived as not pulling their own weight."

In general, institutions plan to continue to use and/or expand TL further in their pilot course(s). All ten institutions reported that they intend to expand TL into additional areas.

Conclusion

Team Learning as a method seems to have value to educators and is being increasingly adopted in medical schools' curricula across North America. In addition to the initiatives of the ten schools mentioned in this paper, 15 other institutions were represented at our two-day work-shop this year. Most of these schools have indicated that they plan to implement TL in the future for medical, physician assistant, nursing and/or dental students.

We recognize the need for more substantive work and consider this study a "rapid screening test" that has produced generally

encouraging results after only 18 months. This study represents an important opportunity to track the introduction and dissemination of TL. It also provides a case study of how seed money can be used to introduce a new teaching method into the tool box of medical educators.

We surmise that there are at least four reasons why TL has spread relatively rapidly in medical education over such a short time:

1. *TL history.* TL was not developed specifically for medical education and has a tried and trusted reputation in other disciplines. Many of the problems associated with a new tool have already been worked out.

2. *TL effect on teachers.* TL is teacher centered, can accommodate multiple teaching styles, and allows the teacher to be an expert in the subject (as in traditional didactic lecturing), and a facilitator of discussion (as in other small-group style teaching). Because the method utilizes one teacher before a large class of students in a lecture hall, an environment many lecturers are familiar with, it requires less faculty time than most small-group methods currently used in medical education. TL can easily fit into a small part of a course and gradually expand. In addition, it tends to have a positive impact on the perceptions of faculty on learning. For example, faculty perceive that TL facilitates the understanding of concepts, therefore helping students see the forest for the trees. One faculty member commented, "I believe the students thought more deeply about the important concepts within the topic. They got it!" Other teachers understand and value active learning: "I am convinced that Team Learning is a good method of active learning. It allows for good integration of materials (both horizontal and vertical integration). It helps the learner go from a passive-student role to a more involved-learner role. Still others have said that their teaching has improved because they cannot become "stale" as they "hear" their students actually learning. "What sells my faculty on this method is overhearing the student dialogue during the sessions," one instructor said.

3. *TL emphasis.* One prominent aspect of TL is that the responsibility for learning facts is placed squarely on the shoulders of the students. Class time is not used to impart basic knowledge. Because of the emphasis on independent learning out of class to master assigned objectives, Phase 1 of TL encourages the skills necessary for students to become life-long learners. Phase 3 (group activities) addresses the pinnacle of learning, that is, can the student "use" what he or she has learned? Can he or she make connections between "facts" and how they relate and interact with one another? These group activities also promote collaboration and help identify learning deficiencies. This type of active learning should endow students with life-long learning skills that many curriculum committees now demand.

4. *Dissemination process.* We have provided our partners and others with financial support from FIPSE grant funds. Although these funds have been quite meager ($2,000 to $5,000), our partners have been able to make significant beginnings into the difficult task of pedagogical change. We have also provided resources and support in the form of workshops and consultations. This has allowed each partner institution to adapt TL to their individual institution's needs. The experiences of the ten schools in this study demonstrate that TL is achievable without a large expenditure of monetary resources.

The following are possible limitations of the present study to gather and report initial responses to TL:

1. *Introduction into only a few hours of an established course.* Most applications of TL thus far have involved a relatively small number of hours in established courses. This limited "dose" of the method may have resulted in a positive or negative bias. A positive bias might result when the exposure is so small that important negative "side effects" may not have surfaced. For example, many students tend to skip class and may balk at large doses of TL which require

TABLE 1. Initial Initiatives in Team Learning at Ten Institutions

School/Description of Activities	Hours TL/Total	Some Responses to Date*†	Plans†
Arizona			
1. Anatomy Lab (MS1)	8/90	Positive faculty response (1,2)	May continue use (new dean) (1,2)
2. Immuno-micro (MS2)	25/51	Positive student response (1,2)	Will introduce TL into the nursing curriculum next year
		Academic performance, good (1,2)	
Baylor‡			
3. Physical Diagnosis (PA1)	50/150	Positive faculty response (3,5)	Continue use (4,5,6)
4. Evid Based Medicine (MS2)	14/14	Positive student response (3,5)	Introduce into new course (PA1)
5. Medical Physiology (MS1)	10/64	Academic performance, good (3,4,5)	Introduce into OBGYN clerkship lecture series (MS2-3)
		Students report in focus groups that desired group behavior occurs (3,4)	
		High student engagement (3,4,5)	
		Peer evaluation controversial (4)	
Oklahoma			
6. Medical Physiology (MS1)	2/120	Positive faculty response (6-13)	Continue use (6-13)
7. Neuroscience (MS2)	4/145	Positive student response (6,7,8,11,12,13)	Initiate of a new, mandatory MS1 and MS2 Team Learning course called "Integrated Medical Problem Solving"
8. Human Physiology (PA1)	10/92	Mixed student response (9,10)	
9. Epidemiology (MS1)	6/16		
10. Gross Anatomy (MS1)	2/130		
11. Human Behavior II (MS2)	2/128		
12. Biochemistry (MS1)	2/128		
13. Pharmacology (MS2)	6/140		
Rochester			
14. Molecules to Cells (MS1)	1/200	Positive faculty response (14)	Expand use (14)
		Positive student response (14)	Use in 2 additional courses next year
Texas Tech			
15. Biochemistry (MS1)	2/100	Positive faculty response (15-19)	Continue use (15-19)
16. Histology (MS1)	2/50	Positive student response (15,16,19)	Initiate a new, mandatory, active learning course (all or mostly Team Learning) in MS1 and MS2 entitled "Integration and Analysis"
17. Inro to Clini Med (MS2)	6/100	Mixed student response (17,18)	
18. Pharmacology (MS2)	6/100	Academic performance, good (17,18)	Initiate TL in GME core curriculum
19. Pediatrics (Residency)	2/8	Student report in focus groups that desired group behavior occurs (15-19)	
		High student engagement (15-19)	
		Peer evaluation controversial (17,18)	
UNC			
20. Cardio-Pathophys (MS1)	34/34	Positive student response (20)	Continue to use (20)
		Academic performance, good (20)	Add peer evaluation (20)
			Perhaps, new courses
UT Houston			
21. Biochemistry (MS1)	8/81	Mixed student response (21)	Continue use (21)
		Academic performance, good (21)	Introduce into 2 courses next year
UTMB			
22. Psychiatry Clerkship (MS3-4)	8/16	Positive faculty response (24,25)	Continue use (22-25)
23. Neuro-behavior (MS1)	7/38	Positive student response (24,25)	Expand use (22)
24. Research Methods (PA1)	20/60	High student engagement (22-25)	Research attitudes regarding peer evaluation (22)
25. Practice Issues (PA1)	45/45	Academic performance, good (22-25)	Evaluate impact on (22)
		Peer evaluation controversial (24,25)	Expand to other PA courses
		Student attitude about value of teams increased (22,23)	
UT Southwestern			
26. Physiology (PA1)	8/63	Positive faculty response (26)	Continue use (26)
		Positive student response (26)	Will extend to 2 clinical courses next year for PA students
		High student engagement (26)	
		Academic performance good (26)	
Wright State			
27. Human Structure (MS1)	12/180	Positive faculty response (27-40)	Continue an expansion of TL to reduce lecture hours (MS1 & MS2)
28. Mole, Cell, Tissue Bio (MS1)	2/140	Positive student response (27-30)	
29. Principles of Disease (MS1)	4/160	Mixed student response (31,32-40)	Development, by students, of a peer evaluation process which students will invest in more seriously (27-30)
30. Evid Based Medicine (MS1)	14/120	Peer evaluation controversial (27-30)	
31. Pathobiology (MS2)	4/60		
32. −40.9 organ system courses (MS2)	21/360		

*The omission of a comment does not imply that an evaluation did not occur; only that it was not reported by the individual institution. The authors have included all reported responses.
†The numbers in parentheses correspond to the activities in the first column.
‡Baylor has completed pilot studies in various programs including both residency and CME. Not all are presented here.

regular attendance. A negative bias might result when the exposure is so small that the real benefits of the method may not have surfaced. Adding only a few hours of TL into an established course requires small changes to curriculum and scheduling and may minimize the importance of the impact of the method on desired learning behaviors (i.e., increased in-class engagement, application of content). Consequently, we acknowledge that our "rapid screening test" needs to be corroborated with data from ongoing and future uses of the method, especially in courses with a relatively large "dose."

2. Influence of "early adopters." As with most innovations, it is likely that the instructors using TL thus far are the most innovative, creative teachers who are willing to experiment and take risks. Assuming this is the case, care must be taken in generalizing these preliminary results to all faculty, especially those with strong commitments to other established methods such as lecture or PBL.

3. Influence of grant funding. Partners were selected to receive grant funding based on their interest in TL and their willingness to pilot the method to achieve the goals of the grant. In effect, we established a working relationship based on the assumption that everyone benefits when we generate positive outcomes that can be reported to the granting agency. We assume that such a relationship may have prompted partners to report results with a positive bias. We hope in the long term to avoid this bias by involving outside critics in reviewing and critiquing all results in our proposed National Consensus Conference.

In addition to extending implementation support, we have also encouraged our partner institutions to maintain an ongoing process of evaluation and data collection. We anticipate that they will publish independently results of their programs. We will hold a TL National Consensus Conference in 2005 to consolidate lessons learned and merge our data. In this way, we are committed to an evidence base for future decisions about the adoption and implementation of TL in the medical education arena.

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