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AAMC Readiness for Reform

Duke–National University of Singapore Case Study

Implementing Team-Based Learning for Medical Students

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The AAMC launched the Readiness for Reform (R4R) initiative in 2010 to support the nation's medical schools and teaching hospitals as they implement key elements of health care reform. R4R began with a voluntary institution-wide survey to assess members' level of preparedness for eight key focus areas of health reform: education, research/comparative effectiveness, payment reform, care delivery reform, community and patient engagement, access, quality, and health information technology (HIT).

The AAMC now supports a number of projects aimed at identifying and sharing best practices related to the R4R focus areas in member institutions. More information on the R4R initiative can be found at: www.aamc.org/initiatives/r4r.

Preparing an organization to succeed under the rapidly shifting paradigms of the current health care environment will require new leadership and management skills that extend beyond the C-suite and into the very fabric of the organization. This case study is one in a series that will highlight member success stories in the eight R4R focus areas.

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General Case Study Background & Summary

Health care providers across North America – and globally – are facing significant near and long-term challenges in how they will deliver care:

1. Health care costs continue to rise while both public and private sector resources available to pay for care are strained;

2. The demographic composition across the globe is shifting. As populations age and expand their cultural diversity, demand will grow for health care that is locally accessible and culturally sensitive;

3. Technology will remain a driver that advances innovation, speed and breadth of information influencing how health care is delivered; and

4. To meet the rising demand for health care, inter-professional teams[1] comprised of multiple care providers (i.e., physicians, care managers, nurse practitioners, social workers, allied health professionals, health "coaches," etc.) will be managing and delivering care. These teams will require skills that enable collaboration and team-based decision making.

Medical schools around the globe are responding to these changes in health care by re-designing the way they teach, engage, and train physicians. Medical educators are adapting undergraduate medical education programs to leverage information technology tools, strengthen medical students' critical thinking, and incorporate team-based and interactive learning techniques to better prepare physicians with the skills and experiences to practice medicine in the evolving health care environment. For example, as noted in a 2010 Academic Medicine article, several Schools of Medicine across the United States and Canada, including the University of Pennsylvania, the University of Oklahoma College of Medicine, the Wright State University Boonshoft School of Medicine, and the Northern Ontario School of Medicine have implemented Team-Based Learning (TBL) within their medical education programs. To reflect the growth of inter-professional care teams, several Schools of Medicine have adapted their medical education curricula to incorporate a special focus on inter-professional education. For example, at the University at Buffalo, School of Medicine and Biomedical Sciences State University of New York, five health science schools train together with simulated patients.[2]

Additional examples of these innovations can be found in the Academic Medicine September 2010 Medical Education Snapshot Supplement issue, and through the AAMC's MedEdPORTAL and iCollaborative (www.mededportal.org), which are online resources for accessing peer-reviewed and non-peer reviewed teaching resources and innovations in medical education, care delivery and research.

[1] "Core Competencies for Inter-professional Collaborative Practice"; *Sponsored by the Inter-professional Education Collaborative,* May 2011.
[2] "Medical Education in the United States and Canada, 2010", *Academic Medicine,* Brownell Anderson, Dr. Stephen Kanter, September 2010.

Duke-National University of Singapore's Commitment to Team-Based Learning for Medical Education

A pioneer in medical education, The Duke-National University of Singapore (NUS) Graduate Medical School has implemented a medical education strategy that is based upon the active, collaborative education concepts of Cooperative Learning as its primary pedagogic delivery method for basic science education.[3] Duke-NUS's learning strategy is called TeamLEAD (Learn, Engage, Apply, Develop) which pairs TBL with the latest technology to make Duke-NUS students efficient learners and Duke-NUS faculty efficient teachers.

Duke-NUS is one of the first Schools of Medicine to apply a TBL strategy comprehensively throughout the basic science medical education.

Duke-NUS Graduate Medical School leadership identify three key success factors for TeamLEAD:

Figure 1 - Three Success Factors for TeamLEAD

1. Achieving success from Team-Based Learning requires commitment to implement the learning strategy across the entire basic science program.
2. Faculty must be willing to assume new teaching roles & skills within a Team Based Learning model
3. Piloting a new learning model & medical education program should create clear value for both the medical school and its partners.

Overview of Duke-NUS TeamLEAD Program

Duke-NUS was established in 2005 as a collaboration between the Duke School of Medicine (DSOM) and the National University of Singapore (NUS) to train and cultivate a cadre of physician-leaders and further develop Singapore's biomedical science initiative.[4] Creating this new school provided a rare opportunity to review, modernize, and align the educational process with the prevalent working and learning styles of today's students and physicians.[5] Duke-NUS's mission is to effectively train outstanding physicians and improve and change the way medicine is practiced.

Duke-NUS implemented the same framework for its basic science curriculum as the DSOM model

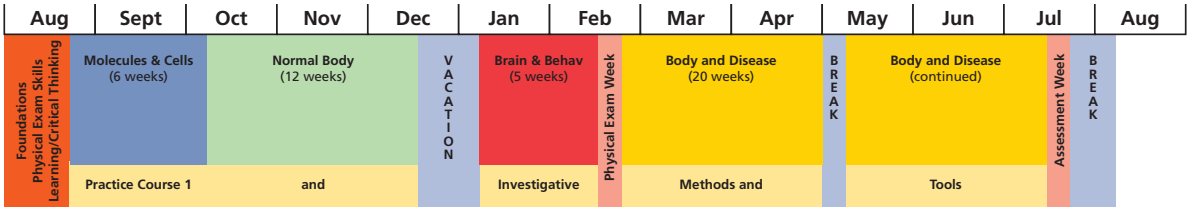
[3] http://www.duke-nus.edu.sg/education/learning-philosophy; Dr. Doyle Graham, Course Director, Body & Disease, Duke-NUS Graduate Medical School.

[4] Williams RS, Casey PJ, Kamei RK, et al., "A global partnership in medical education between Duke University and the National University of Singapore," *Academic Medicine.* Feb 2008; 83(2):122-127.

[5] Kamei, Cook, Puthucheary & Starmer, "21st Century Learning in Medicine: Traditional Teaching versus Team-Based Teaching," *Medical Science Educator,* Volume 22 (2).

in which the core basic science concepts are covered during the medical student's first year (see Figure 2, below). In most medical school programs, the core basic sciences are typically taught over the first 2 years. However, during their second year, DSOM and Duke-NUS medical students rotate through clerkships.

Figure 2 – First Year Curriculum at Duke-NUS[6]



Building upon the DSOM framework, Duke-NUS leadership implemented a Cooperative Learning Model across all components of the basic science courses taught in the first year of the medical school program. Cooperative learning refers to any educational environment in which groups of students work together in teams to achieve a common learning objective. This mode of TBL has resulted in excellent academic achievement, increased student self-esteem, and greater levels of student mutual support across a variety of educational settings.[7] Traditionally, TBL had been rarely implemented throughout an entire medical basic science curriculum[8]; generally, the TBL method is used within a single course, and sometimes, only in a single class within a course.

6 Ibid.
7 Kamei, Cook, Puthucheary & Starmer, "21st Century Learning in Medicine: Traditional Teaching versus Team-Based Teaching," Medical Science Educator, Volume 22 (2).
8 Ibid.

Overview of the TeamLEAD Program

"The Duke-NUS Graduate Medical School takes the innovative Duke School of Medicine curriculum as its foundation and builds onto that the best elements of Team-Based Learning. In TBL, lectures, readings and the review of supplemental material on a given topic are completed before class. In-class activity focuses on assuring understanding, applying principles, and solving problems within student teams facilitated by faculty.

- *Courses are run by multidisciplinary faculty teams of clinicians and scientists who are supported by education faculty with expertise in the science of learning.*
- *Classroom discussions are principally driven by student enquiry instead of faculty answers.*
- *Activities are built into the learning day that require students to make meaningful choices in order to respond to challenging questions, and students are given constant feedback from their peers and faculty on their learning.*
- *Students learn techniques for effective peer feedback and the peer evaluation process allows opportunities to practice and refine these skills.*
- *Educational technology including social media tools are integrated into all aspects of the learning experience; examples include utilizing classroom technology that facilitates interaction between students and faculty as well as converting traditional lectures into voice-annotated presentations that are reviewed prior to class sessions.*[9]

Within the TBL model, first year Duke-NUS medical students are required to demonstrate self-directed learning, intellectual curiosity, and participation in team-based problem-solving and collaboration on a weekly basis.

As illustrated in Figure 3, each student is individually responsible for learning the core concepts and principles prior to coming to class and using learning materials made available to them by the faculty. Students utilize technology tools to review materials available on-line, including pre-recorded Duke lectures and supplemental reading. Class time is used to reinforce and clarify learning, first by the Readiness Assurance Process (RAP) which includes individual assessments (IRA), usually given in the form of multiple choice questions (MCQ), followed by team assessments in which students repeat the same series of questions, but answer as a team.[10] Faculty found that the students as individuals answered approximately 65-75 percent of the MCQ questions correctly, but when these same problem sets were re-addressed as a team, they typically scored 90-95 percent correctly.[11]

[9] http://www.duke-nus.edu.sg/education/learning-philosophy; Dr. Doyle Graham, Course Director, Body & Disease, Duke-NUS Graduate Medical School.

[10] Kamei, Cook, Puthucheary & Starmer, "21st Century Learning in Medicine: Traditional Teaching versus Team-Based Teaching,"*Medical Science Educator,* Volume 22 (2).

[11] *Ibid.*

Figure 3 – Components of TeamLEAD[12,13]

Self-Directed Learning (Pre-Class)	Readiness Assessment Phase Individual and Team	Applications Phase	Special
SDL	RAP	AP	CEL

During the Application Phase, students – in their teams – proceed through the open-book/open Internet Application exercises applying what they learned from their preparation for class to problem sets which require critical analysis, problem solving and creativity, and are all a part of their grade.[14] Duke-NUS students fully engage in their learning through active questioning, sharing information, challenging one another on hypotheses, and applying their learning to critically and creatively solve proposed patient problems, as posed by the faculty.

Throughout the learning phases, faculty members work collaboratively to develop course materials, multiple choice questions and problem-solving clinical scenarios, as well as facilitate the class and small student teams.

Success of TeamLEAD

The first evidence of impact of the TeamLEAD model upon student performance was assessed and quantified through a 2010 and 2011 comparative evaluation of U.S. and Duke-NUS medical students on the results of their National Board of Medical Examiners Comprehensive Basic Science Examination (CBSE) and United States Medical Licensing Examination (USMLE). In less curricular time (i.e., end of their first year), Duke-NUS students achieved comparable standards of basic science knowledge achieved by U.S. medical students. Duke-NUS students at the end of their second (clinical) year performed significantly higher than the U.S. students.[15]

Duke-NUS's experience and data led its program leaders to conclude that TeamLEAD is an effective strategy for instructing medical students in the basic science core concepts. This may be due, in part, because it incorporates elements of active learning and test enhanced learning which has been shown to improve student performance. Duke-NUS program leaders also believe the TeamLEAD strategy provides its students with teamwork skills, student mutual support, ability to engage one's curiosity, and ability to manage their own self-directed learning to master the core concepts.[16]

[12] Michaelsen LK, Parmelee DX, McMahon KK. Team-Based Learning for Health Professions Education, A Guide to Using Small Groups for Improving Learning. 1st edition ed. Sterling, Virginia: Stylus Publishing, LLC; 2008.
[13] Kamei, Cook, Puthucheary & Starmer, "21st Century Learning in Medicine: Traditional Teaching versus Team-Based Teaching," *Medical Science Educator,* Volume 22 (2).
[14] *Ibid.*
[15] Kamei, Cook, Puthucheary & Starmer, "21st Century Learning in Medicine: Traditional Teaching versus Team-Based Teaching," *Medical Science Educator,* Volume 22 (2).
[16] *Ibid.*

Three Success Factors for the TeamLEAD Program

1. **Achieving optimal levels of success from Team-Based Learning requires implementation of the learning strategy across the medical school's basic science curriculum.**

    - TBL requires a full commitment by both students and faculty to embrace and utilize the learning techniques. Students must understand that they are accountable to both themselves and their fellow students to achieve an active learning environment that will enrich their medical education experience and prepare them to positively impact the future practice of medicine.

    - When schools pilot TBL by implementing bits and pieces of the TBL concepts throughout coursework, there may be resistance from both students and faculty. It can be difficult for students and faculty to alternate learning and teaching styles between active, student-led TBL and the more passive, traditional lecture-focused formats.

    - Creating an environment that nurtures high levels of student engagement, student-led critical thinking, and creative problem-solving requires consistent practice of the TBL methodology. Consistent practice of TBL results in a learning culture that motivates students and faculty to confidently adhere to new learning and teaching styles that may initially feel different or uncomfortable.

2. **Faculty must be willing to assume new teaching roles and skills within a Team-Based Learning model.**

    - Under the TBL model, faculty are required to engage in new and different roles as medical educators. To implement and provide leadership to TeamLEAD's self-directed learning, faculty are asked to serve as facilitators and content experts that advance students' critical thinking and collaborative problem-solving skills rather than as conveyors of facts.

    - TeamLEAD faculty members will identify and develop students' course materials for the pre-class self-directed learning, collaboratively develop the multiple choice questions that students will answer both individually and as small teams, and serve as facilitators to support the small group discussions, providing clinical expertise and corrections as required.

    - Advantages for Duke-NUS faculty include the ability to continuously assess student progress throughout the courses, rather than just after mid-term and final examinations. This also permits faculty to have time to identify students' gaps, correct misunderstandings, and foster critical thinking.[17]

[17] Kamei, Cook, Puthucheary & Starmer, "21st Century Learning in Medicine: Traditional Teaching versus Team-Based Teaching," *Medical Science Educator,* Volume 22 (2).

3. **Piloting a new learning model and medical education program should create clear value for both the medical school and its partners.**

    - To be successful, the Duke-NUS Graduate School of Medicine needed to create value for both the DSOM and the Government of Singapore. For the Government of Singapore, the Duke-NUS investment needed to provide a platform for growing the country's translational research and cadre of physician–scientists. For Duke, the new school needed to extend the Duke brand internationally and provide a positive educational experience for students and faculty.

    - In designing its curriculum, Duke-NUS had to ensure that it covered the same content as the DSOM curriculum. Duke-NUS leadership also had to ensure that the process of trans-locating a new educational philosophy into a different cultural and physical environment did not adversely affect student learning outcomes.[18]

The positive outcomes experienced with Duke-NUS's TeamLEAD model has led the DSOM to implement a similar learning strategy for their students in Durham, North Carolina, as well as inspire courses in the undergraduate schools.[19] The TeamLEAD TBL model has been implemented within several Duke courses, including Honors Chemistry, Biology, Global Health, International Relations and Medical Statistics, as well as at the Duke Institute for Brain Sciences.

The use of TBL will continue to expand across the School of Medicine[20] and other Schools at Duke. In March 2012, Duke University faculty leaders from the Schools of Medicine, Law, Trinity College of Arts & Sciences, the Pratt School of Engineering, the Nicholas School of the Environment, and the Sanford School of Policy met to discuss and share experiences with TBL. During the session, Dr. Stephen Nowicki, Vice Provost of Undergraduate Education at Duke, encouraged faculty from across Duke's Schools and disciplines to pursue opportunities to explore best practices offered by TBL along three "dimensions of innovation":[21]

1. Transitioning from passive lecture-based learning to active, student-led problem-solving
2. Moving from an individual to a TBL environment
3. Shifting from "in-house" prepared content by faculty to "out-sourced" global content identified by faculty and made available to students

Through its Center for Instructional Technology, Duke is offering TBL Course Design Fellowships for its faculty. Running from May – December 2012, fellows will work together to design TBL-based courses through the summer, then meet monthly to share feedback on course facilitation and the TBL experience for faculty and students. Fellows will serve as resources for other faculty who have not participated in the Fellowship and wish to pursue TBL for their courses.[22]

[18] *Ibid.*
[19] *Ibid.*
[20] "Duke School of Medicine Embraces Team-Based Learning" video; http://www.youtube.com/watch?v=gW_M426V2E0&feature=youtu.be
[21] "Dean Steve Nowicki on Duke's Support for Innovative Teaching"; http://cit.duke.edu/blog/2012/03/teams-for-learning-duke-workshop-report/
[22] http://cit.duke.edu/services/fellowships/fellows-archive/2012-team-based-learning-course-design-fellows/

While Duke-NUS has not incorporated an inter-professional focus to TeamLEAD, that could be a future initiative for program expansion both in Singapore and at Duke's main campus in North Carolina.

Lessons Learned for Other Schools of Medicine that May Pursue a Team-Based Learning Strategy

1. **Begin implementing TBL across select courses in the School to introduce and support faculty and students to adapt to a new learning paradigm.** This initial set of successes will create the enthusiasm and momentum to expand TBL within more courses across the School of Medicine curricula.
2. **Engage multiple faculty to collaborate on selecting content and course design.** Just as TBL is a powerful framework for students, collaborative, team-based course development is valuable for both faculty and the overall quality of the course.
3. **Create a campus-wide "innovative teaching center" that can provide the resources, technology, and expertise to support implementation of TBL techniques.** This central home for teaching innovation will be critical to facilitating the education of faculty and staff in TBL approaches and tools, providing the infrastructure for TBL courses, evaluating the successes of TBL courses, and communicating the outcomes and strategy for TBL across the campus.
4. **Strategically assign students to permanent small teams that will be sustained throughout the TBL course.** Evaluating each student's strengths and personality styles (e.g., extrovert vs. introvert) and assembling a mix of strengths and personalities on each team will help to create balanced teams that can deliver a superior learning experience for all students.

Additional Resources

TeamLEAD at Duke-NUS Curriculum Overview Video:
http://www.youtube.com/watch?v=BlVPLYGdBLg

"The NUS Provost Contemplates" Blog Feature:
http://blog.nus.edu.sg/provost/2012/09/04/technology-enhanced-education/