

EDUCATION THEORY MADE PRACTICAL

VOLUME 5



Fant | Gottlieb | Li-Sauerwine | Krzyzaniak | Natesan | Schnapp | Chan



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Academic Life in Emergency Medicine

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EDUCATION THEORY MADE PRACTICAL

VOLUME 5

Editors

Abra Fant, MD, MS

Michael Gottlieb, MD

Simiao Li-Sauerwine, MD, MSCR

Sara Krzyzaniak, MD

Sreeja Natesan, MD

Benjamin Schnapp, MD, MEd

Teresa Chan, MD, MHPE

DEDICATION

This book is dedicated to all of the healthcare and other frontline workers who have continued to make our communities function during a second year of global pandemic. In particular, we want to recognize the tireless efforts of educators who have had to adapt and disrupt on an almost constant basis to keep their learners moving forward.

Additionally, we would like to thank Academic Life in Emergency Medicine for their continued support of the Faculty Incubator and medical educators in general. Dr. Michelle Lin has continued to be a light and leader during this difficult time and ALiEM resources have been a priceless trove as we have all adapted to virtual, hybrid and other forms of education.

Finally, we would like to thank the members of the 2020-2021 class of the ALiEM Faculty Incubator who have worked so diligently on creating this book, which will help other educators understand and utilize educational theory. We are so proud of the scholarly work you have accomplished here. We are also so proud of everything else you accomplished during 2020-2021 while balancing clinical responsibilities and all the additional burdens of pandemic life. We can't wait to see what you all accomplish next.

Abra Fant, MD, MS

Michael Gottlieb, MD

Simiao Li-Sauerwine, MD, MSCR

Sara Krzyzaniak, MD

Sreeja Natesan, MD

Benjamin Schnapp, MD, MEd

Teresa Chan, MD, MHPE

FOREWORD

When I was first asked to write the foreword for this 5th volume of *Education Theory Made Practical*, I jumped at the opportunity to share my thoughts about the importance of theory in medical education. As a residency program director, educator, researcher, and clinician, I find huge value in the interweaving of educational theory into all elements of my job, and I anticipated a relatively easy task of communicating this value and providing a meaningful opening for the book.

And then I received the list of topics. While a few theories—such as Sociocultural Theory and Situated Cognition—are familiar to me, most are not. My complete lack of awareness of Banking Theory, Ausubel’s Meaningful Learning Theory, and Constructive Alignment, among others, suddenly made me wonder if I was the right person to write this foreword. As imposterism bubbled inside me, I realized that my unfamiliarity with most of these theories is, in and of itself, why this text is so valuable.

First, it brings to our attention diverse theories likely to otherwise to remain off our pedagogical and academic radars. Indeed, a theory is only as useful as our knowledge of its existence. For most busy medical educators, sourcing meaningful theories from the seemingly infinite sea of literature—from sociology and anthropology to psychology, education, and beyond—is simply not feasible. And, thanks to books like this one, it’s not necessary: the authors and editors have done it for us. In reviewing the theories presented in this and previous volumes, I am struck by the breadth and diversity of areas covered, and I find myself wondering: how would I have become aware of all these theories without this series?

Second, this book takes complicated, complex, and rich theories and presents them in high-yield, digestible fashion. For example, in her *Theory of Sociomaterialism*, Wanda Orlikowski examines complex organizational dynamics by focusing on how social and material elements of technology and organization are enmeshed within the workplace. As a theory that grew from decades of work and numerous existing theories, one could spend hours attempting to elucidate, conceptualize, and understand its key elements. This level of inquisition simply

isn't feasible among the day-to-day demands of teaching and practicing clinical medicine, and here again, this book shines. For each theory, the authors define key terms, summarize conceptual origins, highlight modern advances, and review—in annotated fashion—critical accompanying references. The net sum of this gift to the reader is a high-level, contemporary overview that distills out the key aspects of a given theory and provides a roadmap for readers wanting to learn more.

Finally, what makes this book especially valuable is the extent to which the authors link the chosen theories to real-world scenarios in medical education. Notably, these real-world scenarios are placed at the beginning and the end of each chapter, situating the diverse range of theories in a practical context and transforming them into tools that serve the educator, the learner, and—ultimately—the patient.

Does a given theory provide the best or only way to navigate the scenario presented? Of course not. But it does provide an approach, grounded in science, from which an educator may begin this navigation and through which they may refine the theory's utility—or find an alternate theory that provides a better fit.

As we leverage the power of theory to navigate this path, we can only hope for multiple more editions of *Education Theory Made Practical* to come.

Will Bynum, MD

Associate Professor of Family Medicine
Duke University School of Medicine

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Editor: Sreeja Natesan, MD

ABOUT THIS BOOK

Education There's Made Practical (Volume 5) is the fifth volume in a well-established series of eBooks that aims to connect theory to clinical education. It continues our case-based discussion of core theories and frameworks in medical education. A collaborative project between the Academic Life in Emergency Medicine (aliem.com) and the International Clinical Educator (ICE blog), this project has helped many clinician educators to gain a better sense of how education theories and frameworks can apply to their daily practice.

The book has also selected 10 new concepts/models/theories/frameworks that have not yet been covered by our previous works. Building on the previous success of this series, each chapter has been written and edited by clinician educators for clinician educators, and then released on the ICE blog over a six month period. The posts are open for peer review by our health professions education community broadly, and then edited by our editors into this final compendium.

As with our previous books, each chapter begins with a common case that educators may face in the clinical or classroom setting followed by a discussion of the featured theory itself, its modern applications, and finally the case is closed by articulating how the theory could augment education practice. Additionally, we include an annotated bibliography so that readers can easily find additional resources for further learning. Each chapter can be read independently or as an entire book at the reader's preference.

This book (and its source materials) were originally derived as a part of the Free Open Access Medical Education (FOAM or #FOAMed) movement and funded by the Government of Ontario's eCampus Ontario initiative. We are thankful for the funding from our sponsoring agency to assist with being able to make this resource open access to the world.

Purpose

The Education Theories Made Practical eBook series was designed to provide an efficient primer on ten core educational frameworks or theories that can be applied by the reader in a practical manner, while also providing a resource for identifying further relevant lit-

Funding

This work has been funded by a generous grant from eCampus Ontario, which is an initiative of the Government of Ontario (Canada).



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Where can I find this online?

This book can be found in the ALiEM Library (aliem.com/library), Apple Bookstore, ResearchGate, and the Government of Ontario's eCampus library.

Editors

Abra Fant, MD, MS
Michael Gottlieb, MD
Simiao Li-Sauerwine, MD, MSCR
Sara Krzyzaniak, MD
Sreeja Natesan, MD
Benjamin Schnapp, MD, MEd
Teresa Chan, MD, MHPE

Foreword

William Bynum IV

Banking Theory

Authors: Eva Niyibizi MD, Susan Fraymovich DO

Editor: Simiao Li-Sauerwine, MD MSCR

A Case

Sarah was excited to start medical school. Her road to medical school was not the typical one. When she attended college, she majored in biology and had expected to work as a basic science researcher. She completed her master's degree in biology and even worked in the university lab for two years. She ultimately decided her passion was in medicine and after going back to school to complete her requirements, she was finally starting medical school.

Sarah's first month in medical school did not live up to her expectations. She found her physiology class boring and repetitive. Her class was held in a large auditorium with four hundred first-year medical students feverishly taking notes while the professor stood in the front of the classroom lecturing. She was disappointed that there were no engaging conversations or exchange of ideas during class time, as she had during her seminar classes during college.

Sarah had an advanced biology degree and the material being covered in class was something she herself had already taught while being a teacher's assistant in graduate school. Sarah felt like she didn't have an opportunity to share her knowledge nor develop additional skills in this type of learning environment. Sarah was frustrated. Is this what medical school was going to be like for the next four years?

Background

Paolo Freire was a Brazilian educator, socialist, activist (1921-1997). Freire's theory is based on a Marxist approach and his view of anti-colonialism stemming from his poor upbringing in Brazil. He believed his country's population needed to have increased access to education. Education, when done the right way, would empower the repressed to regain their sense of humanity and overcome their poor conditions. Freire's Banking Model viewed educators as oppressors who teach students to conform to their way of thinking. Students are oppressed and learn their place in society through their teachers. They do not ask questions and accept what they are being taught; they are passive learners who learn by repeating facts without using critical thinking skills. The teacher deposits knowledge directly to the student and the student is expected to memorize it exactly as it is being taught. This method does not facilitate free thinking or transformative thought. Freire argues instead that the utility of education is far more than the transmission of information. Instead, he views education in the broader context of liberation of oppressed peoples, as a tool for humans to discard the tools of oppression and liberate their potential. A teacher, in Freire's view, should foster learning without dictating content, while also being open to concurrent learning themselves. A learner is continually challenged by questions posed by the teacher, critically considers content, and is fully engaged in the creative dialogue.

OVERVIEW

The Banking Model by Paulo Freire described the teaching theory of students being “banks” for teachers. Teachers deposit knowledge in students while students memorize and repeat what they are taught. The teacher plays an active role while the student plays the passive role of absorbing the information. Preexisting knowledge of the student is ignored and all students are taught on the same level.

MAIN ORIGINATORS OF THE THEORY

Paolo Freire

Modern takes on this Theory

The Banking Model is based on teachers recapitulating their knowledge directly to students as accepted facts. There is no thought given to the background of the student or differing levels of knowledge of those in the classroom. Students, on the other hand, play a passive role in their own education. They do not use critical thinking or interpret the facts they are given. They are expected to memorize the content and recite it when asked. To overcome these antiquated teaching styles, Freire suggests the teacher should become a student and engage with students. Students come from different backgrounds of knowledge and skill; Students can learn from each other and educators can learn from them as well. Freire recommends problem-based learning, wherein teachers pose scenarios and allow students to formulate their own questions and answers.

In recent times, Banking Theory has been considered in the context of medical education. It is true that much of the foundational content in medical school curricula deals with a specific body of knowledge that is critical to impart. Building upon this, proponents of Freire also assert that it is critical in medical education to train students to have a deep understanding of the culture surrounding medicine as well as a commitment to supporting the humanity of all people. In Problem-Posing Education, teachers should lead by facilitating discussions and providing support, and should contribute information only after group dialogue takes place. In this way, educators empower learners and consolidate knowledge from shared experiences in order to translate and apply content to the real world. This approach lends itself in particular to medical school formats such as problem-based learning, and topics such as community health.

Other Examples of Where this Theory Might Apply

The Banking Model of imparting foundational medical knowledge is commonly seen in the first two years of medical school curricula, where an instructor is tasked with imparting a collection of facts in a time-constrained lecture format. In a push to combat this traditional approach, many schools are now adopting more innovative techniques such as problem-based learning.

Much knowledge and experience is also gained during residency training. Banking Model’s converse, Problem-Posing Education, is more frequently employed in the graduate medical education setting. Examples of forums allowing for lively discussion and shared knowledge include morning report, small

group discussions during resident conference, bedside teaching, and on-the-fly discussions amongst residents and attending physicians.

Limitations of this Theory

Some students need the structure and may learn best in a banking model, especially those in the beginning of their students who are learning frameworks and foundations. These students do not yet know enough to question or engage. Some concepts also lend themselves to direct instruction such as safety precautions in a laboratory or how to fill out a death certificate. Careful and direct instruction is necessary to avoid fatal errors.

After multiple classes in her first semester seemed to be structured the same way, Sarah had enough. She was not learning anything new and felt herself slowly disengaging from the classroom to the point where she was no longer showing up to class. Sarah decided to do something about it. She made an appointment and spoke to her professor.

Returning to the case...

After multiple classes in her first semester seemed to be structured the same way, Sarah had enough. She was not learning anything new and felt herself slowly disengaging from the classroom to the point where she was no longer showing up to class. Sarah decided to do something about it. She made an appointment and spoke to her professor.

At her meeting, Sarah discussed her disappointment in the classroom structure. She made it clear that she had a lot more to add than sitting and taking notes in the back of the class. Her professor listened intently and, together, they made some changes. They instituted small group learning. Instead of the lecture-style classroom, the entire class was split into groups of 10 people. Each group was given a topic with a question to answer. Each group was in charge of researching their idea and formulating a series of solutions to present to the class next week. Each team member was asked to contribute, engaging all players on the team. Sarah was able to use her prior experience from her master's program to help her team. In return, she was able to learn from her team mates who were each able to bring something unique to the group due to their varied past experience.

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This is Freire's original text in which he outlines the 10 defining features of the Banking Model of Education:

1. The teacher teaches while the students are taught.
2. The teacher knows everything while the students are ignorant.
3. The teacher thinks while the students are thought about.
4. The teacher narrates and the students listen.
5. The teacher disciplines and the students are disciplined.
6. The teacher chooses and the students comply.
7. The teacher acts and the students observe.
8. The teacher sets the curriculum and the students adapt to it.
9. The teacher claims authority to oppress the students.
10. The teacher is the subject while the students are objects.

2. Drew C. The Banking Model of Education: Pros and Cons. Helpful Professor Website. Accessed January 18, 2022. Available at: <https://helpfulprofessor.com/banking-model/>

The Banking Model of Education is a metaphor in which students are viewed as passive vessels in which teachers deposit knowledge. The opposite of this model is Problem-Posing Education, in which students learn with and from each other in problem-oriented exercises. This resource describes the advantages and disadvantages of Banking Theory.

3. Shor I. Freire for the classroom: A sourcebook for liberatory teaching. Heinemann Educational Books, Inc., 70 Court St., Portsmouth, NH 03801; 1987.

This book is an anthology of essays written by teachers on the application of Freire's methods to classroom teaching. The essays in the book describe the creative practices employed by teachers as well as benefits to students as a result of applying Freire's philosophy.

4. DasGupta S, Fornari A, Geer K, Hahn L, Kumar V, Lee HJ, Rubin S, Gold M. Medical education for social justice: Paulo Freire revisited. Journal of Medical Humanities. 2006 Dec 1;27(4):245-51.

This publication frames the work of Freire in the context of incorporating social justice curricula in medical education. The authors posit that Freire's non-hierarchical strategies can foster socially conscious medical professionals who are engaged in their communities.

Constructive Alignment

Authors: Sharon Bal, MD, CCFP, FCFP ; Kelly N. Roszczynialski MD, MS

Editor: Teresa M. Chan, MD, MHPE

A Case

Claudia has just become a new pre-clerkship curriculum coordinator for a prominent medical school. The program is currently undergoing curriculum renewal, and she has been tasked to advise on pedagogy that will ensure optimal student engagement and deep learning. She is provided a list of learning objectives that need to be covered throughout the pre-clerkship, as well as a document indicating “where and when” in the curriculum each topic is taught in the first two years. She is told that the medical school strategy is to modernize the curriculum as they move away from largely didactic teaching, but are not clear on where they want to land.

Claudia was just considering this project when she gets a call from a former medical school classmate, Michelle, reminiscing about their trials and tribulations of undergraduate medicine.

Remember when we just gave up studying and learned to memorize old tests? Man, I wished I’d known back then that CribNotes is all I needed for clerkship, I would have had so much less stress. It was like all the surgeons took their pimping questions straight from the book...

Claudia’s amusement quickly changes to chagrin as she realizes, her scope involves not just considering learning theory, but also providing instructions as to how best to align current curricular components such as assessment to ensure defined learning outcomes. She is cognizant that medicine is no longer simply about transmission of a body of knowledge, but about acquiring the skills to problem-solve and address gaps. She will need to consider these learning outcomes, and recommend the teaching activities and assessments that indicate success...wow, this was going to be a challenge!

Background

OVERVIEW

“Constructive alignment” can be broken down into two components. The first is based on **constructivism**, the idea that learners construct their knowledge from learning activities that they can integrate and build upon their current belief system (meaning) and prior experience. Knowledge is not directly passed from teacher to learner, rather the learners must engage and create new meaning for themselves. The second component is **alignment**: the objectives, teaching activities, and assessment that support the learning. The intended learning outcomes are the driving force to then determine appropriate assessment strategy and finally align the teaching activities to the intended outcomes as well as the assessment tool.

Constructive alignment (CA) differs from the theory of criterion-referenced assessment which aligns assessment to objectives in that it also includes aligning the teaching methods with the focus on intended learning outcomes (ILOs). The goal of constructive alignment is to support students in developing meaning and learning from a considered, well-designed and aligned course.

In constructive alignment, as described by originator Biggs¹, one must **consider teaching and learning to be a whole system²**:

Describe ILOs for the unit using 1-2 verbs for each outcome noting how content will be disseminated

Create a learning environment using teaching/learning activities (TLAs) that engage students to each verb

Use assessment tasks (TAs) containing the same verb with predetermined rubrics to judge how performance meets criteria

Transform these judgements into final grades for students

MAIN ORIGINATORS OF THE THEORY

John B. Biggs

Other important authors or works:

Catherine Tang

Medical education since the turn of the last century was rooted in the reductionist, biomedical model of medicine itself. It was this tradition of hierarchy that determined that the role of teacher (mirroring that of physician) was, to a large extent, that of omniscient content expert. There was a large, but somewhat finite lexicon and inventory of factual knowledge, which learners were expected to master during their studies in medical school and subsequent training. The role of learner was, in this respect, more passive and the teacher's role was to transmit this body of knowledge to the student.³

In recent years, educational theories based in cognitive learning theory⁴ in support of active learning and less hierarchical paradigms have grown increasingly the norm in medical education. In constructivist alignment theory, the role of the teacher changes⁴ from transmitting knowledge to assisting learners in their own critical self-reflection. And, similarly, the locus of learning for the student has gone from an external to an internal one. The emphasis on the experiences and meaning in the construction of knowledge further moves away from the generalism of the didactic or traditional curricular design by acknowledging individuality in knowledge acquisition. It is the latter that makes the "alignment" of appropriate teaching activities to ensure student engagement, along with appropriate assessment tools, key to achieving the intended learning outcomes^{1,2} (ILOs). Modern takes on this Theory. Another key component of this theory, as described by Biggs in his 1996 article, is that constructive alignment comprises a whole learning system, which embraces "classroom, departmental and institutional levels." He contrasts CA with poorly designed systems in which curricular components such as teaching and assessment are not integrated as a unified process. For example, a psychiatry course on critical analysis that uses multiple choice tests as a final assessment, which does not test the students ability to display their logic or thought process. In fact, essential to CA is the outcomes-based approach² to teaching, the ILOs then define both the instruction and assessment. In this way, CA itself requires significant investment and energy to fully implement the learning environments, by starting with what we want students to know by defining the intended learning outcomes, we then align teaching and learning activities, and assessment plans.

Intended learning outcomes differ from traditional learning objectives in that they are demonstrable and focus on application and higher level learning as opposed to focusing on discrete knowledge that is being taught. ILOs must be written in such a way that they can be observed and measurable in order to appropriately align later with planned assessment. When determining the needed teaching and learning activities a distinction should be recognized, with a student centered approach, teaching is input while learning is output. Learning activities may include traditional direct instruction, readings, lectures, or assignments that can serve as both a learning method or a mode of assessment to ensure learning has been mastered. These activities may include simulations, case studies, presentations, lab work, or problem based learning.

Modern takes or advances in this theory

Outcome based medical education echos constructive alignment theory, by orienting training on intended learning outcomes. As described by Biggs and Tang (2011), in outcomes-based teaching the question changes from which topics are taught to "What do I want my students to be able to do" after curriculum completion². Medical schools have begun implementing such learning activities as problem based learning sessions, portfolio education exercises, and narrative exercises into undergraduate medical education. Medical simulation has become increasingly integrated into medical

education at both undergraduate, graduate, and post-graduate continuing education levels and can serve as both a learning activity with team based learning or for assessment such as OSCEs for undergraduate medical education.

In more recent times of crises during the COVID-19 pandemic a need surged for education on management practices and personal protective practices across the world. Institutions have used this same framework to first identify the learning outcomes of safe care for potential COVID-19 patients, developed quickly implemented learning activities through teleconferences, discussions, and simulations to align for assessment of these critical skills. Assessment in some settings includes auditing by Infection Protection and Control (IPAC) experts.

Other Examples of Where this Theory Might Apply

It is important to remember when designing intended learning outcomes the three domains of learning: cognitive, affective, and psychomotor. The classroom setting may be more applicable to cognitive learning outcomes such as students will be able to analyze the impact of socioeconomic status in rural medicine. Similarly this could be designed for the affective learning domain and written as students differentiate medical care received by patients of lower socioeconomic status in rural settings. Narrative exercises could be incorporated from both ILO domains and assessment may include case studies in the classroom setting or field work during a clinical rural medicine rotation.

Another application for constructive alignment in the clinical setting is in procedural training⁶. One common intended learning outcome in the postgraduate medical education and training is safe and effective central line placement for the critically ill patient. Other medical education theories and modalities, such as medical simulation and mastery learning can serve as excellent teaching and learning activities and have paired assessment with mastery learning checklist and rubric/criterion levels for evaluation.

Limitations of this Theory

Not all of medical education takes place with a curricular design plan or in a controlled classroom setting. In particular, the clinical rotations in medical education have a different structure for both the teacher and the learner. While the overall clinical clerkship course may allow for an overarching curricular plan, the daily “in and out” of clinical rotations limit the reach of constructive alignment educational theory. The variety and diversity of patient presentations during clinical rotations is often what inspires teaching topics and these change on a daily basis. Because of this inherent design of the clinical rotations the forethought and planning that are required for constructive alignment may not fit for every learning environment.^{5,6} Constructive alignment requires significant energy for appropriate reflection^{1,3} and preparation to develop the intended learning outcomes, design the associated teaching and learning activities, and create aligned assessment. This makes constructive alignment a difficult modality to employ on an immediate basis.

Returning to the case...

After a significant amount of research, and consultation with learners and faculty colleagues, Claudia feels that the best approach to ensuring deep learner engagement and achievement of intended learning outcomes (ILOs), would be basing the curriculum renewal in constructivist alignment theory. In presenting to the medical school's curriculum committee, Claudia references the work done by Biggs, and how intentional consideration of teaching activities and assessment will ensure achievement of medical education objectives.

Claudia finds an apt audience as she walks through the ways in which constructive alignment could apply to diverse instructional activities, including problem-based learning (PBL) tutorials, portfolio education exercises as well as clinical activities. She describes Biggs' distinction between declarative knowledge, and how this kind of tradition best reflects her own undergraduate education, versus functioning knowledge. It is this latter, deeper knowledge acquisition in our learners that should be our ultimate aim in designing curriculum. Construction of knowledge, which is anchored in both experience and meaning, is key for deep learning and the independent, learner-driven creative problem-solving that the modern student requires in the ever-changing landscape of modern medicine. The teacher's task now becomes fostering the engagement in the material to ensure students can use their knowledge - making it functional - and of use to them in their practice and increasing their confidence.⁴ She emphasized that alignment of curriculum includes assessment tools to ensure objectives will be met.

She reflects on how different the incoming medical students' experience might be from her own, and can not help but pick up the phone to brag a little to her classmate!

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This summary is written by the originator of the theory itself, John Biggs, and reviews the two key aspects of constructive alignment. It reviews the overarching steps to align intended learning outcomes, teaching/learning activities, and assessments to create a global high-level learning system.

2. Loretta M Jervis & Les Jervis (2005) What is the Constructivism in Constructive Alignment?, Bioscience Education, 6:1, 1-14, DOI: [10.3108/beej.2005.06000006](https://doi.org/10.3108/beej.2005.06000006)

In this paper the authors describe constructive alignment specifically focused from the constructivism perspective. They comment on the wide definition of constructivism and how its broad applicability has led to confusion particularly in science education where there is a need to distinguish realism as a knowledge theory from constructivism as a learning theory. They critically evaluate the application and limitations of constructive alignment and argue against its use in scientific education.

3. Biggs, J., & Tang, C. (2011). Train-the-Trainers: Implementing Outcomes-Based Teaching and Learning in Malaysian Higher Education.

In this paper, the authors responsible for describing constructivist alignment (Biggs) and the more detailed implementation of this theory (Biggs and Tang) review its implementation in Malaysian higher education using the Train-the-Trainer model. In reviewing this model, they review quantifying the level of understanding being sought when stating the intended learning outcomes, distinguishing between declarative and functional knowledge, and state that while much of university teaching is focused on the former (declarative) knowledge, what is required by practitioners is the functional type as their knowledge needs to inform action. Matching the ILOs, and subsequently the teaching and assessment methods to the knowledge type is imperative. The trainers, also, must understand constructive alignment such that principles are applied as intended.

4. Barrow M, McKimm J, and Samarasekera DD. Strategies for planning and designing medical curricula and clinical teaching. Medical education in Practice. *South-East Asian Journal of Medical Education*. 2010;4(1):2-8.

A brief review of curriculum developments in medical education discussing the practical application of constructive alignment and the shift towards learner-centeredness. A case example of the Yong Soo Lin School of Medicine revised five year undergraduate medical education is provided, showing the practice of the theory and inclusion of teaching and learning activities such as simulation, problem based learning, and team based learning. They also briefly address the gap that can exist between the clinicians teaching in the clinical setting and those designing the curriculum, highlighting the need to specifically design learning outcomes to be applicable to the variable clinical setting.

IDEO's Design Thinking Framework

Authors: Lauren Falvo, MD; Mohammed Hagahmed, MD

Editor: Abra Fant MD, MS; Teresa Chan, MD, MHPE

A Case

Dr. Pneumo is an assistant emergency medicine professor at Academic Hospital School of Medicine (AHSOM) located in Big City, USA. She has recently taken over the medical student clerkship and has been tasked with updating the school's approach to its core curriculum. Dr. Pneumo is excited to be a part of this change, but is new to curriculum design and still figuring out how to engage her learners.

AHSOM is located in the heart of the city and serves a large homeless population. Many of these people are struggling with mental health illnesses and are forced to use the emergency department to obtain many of their resources. During her shifts in the department, Dr. Pneumo has become increasingly concerned by the behavior of her learners. She has noticed that learners are joking more often about psychiatric patients, using the word "crazy." Other learners are frustrated with these patients, complaining that the patients are "poor historians" and cannot focus enough to have a history or exam.

Dr. Pneumo would like to update the medical student curriculum to promote awareness of the struggles that mental health patients experience. Her goal is to increase empathy and understanding for this population, so that they may be treated with the respect they deserve. She is also hoping that this improved foundation of knowledge will lead to better history and physical exams, and therefore better care for these patients.

With these goals in mind, how can Dr. Pneumo update the current curriculum?

OVERVIEW

Design Thinking is a problem-solving approach that can transform the way organizations develop products, services, and processes. The benefit of Design Thinking is that it brings together what is desirable from a human point of view to what is feasible from an economic and technological perspective. People who are not trained as designers are given the tools to address a vast range of challenges. As defined by Tim Brown, executive Chair of IDEO, the design company which created the Design Thinking Framework: “ Design Thinking is a human-centered approach to innovation that draws from the designer’s toolkit to integrate the needs of people, the possibilities of technology, and the requirement for business success.”⁷

Rather than convincing people to buy into what businesses are selling, Design Thinking focuses on the actual needs of people (known as “end users”). It revolves around field research and the exchange of ideas that often leads to unexpected results. It can weave together the elements of human psychology, sociology, demographics, environmental factors, and anthropology to generate novel solutions to some of the perplexing problems in business.

Another major feature of Design Thinking is the concept of rapid prototyping rather than thinking about feasibility. By creating and abandoning multiple prototypes (which can range from a sketch, symbol, or text, to a complex 3-dimensional model), idea generation is compounded and boundaries become less and less limiting.¹

MAIN ORIGINATORS OF THE THEORY

Tim Brown/David Kelley (CEO of IDEO/company founder of IDEO) and Roger Martin

Other important authors or works:

3 I Model and HCD Model (Tim Brown/IDEO)

Service Design Model (Stickdorn & Schneider)

Double Diamond model (British Design Council Institute)

Design Thinking model (Hasso-Plattner-Institute)

Background

In comparison to the rigorous scientific method of investigation, Design Thinking is a relatively new methodology. The practice originated as a response to the question of what design had to contribute to the modern world. The first person to mention design thinking as a way of thinking is the scholar and cognitive scientist Herbert A. Simon in his 1969 book titled, *The Science of the Artificial*.⁶ He continued to contribute many ideas throughout the '70s which are now regarded as principles of Design Thinking.⁴

Tim Brown and David Kelley are among the founders and originators of IDEO Design Thinking. Brown implemented three core steps for his method: Inspiration, Ideation, and Implementation. This 3 I's model was developed in the context of social innovation. The first Design Thinking space, Inspiration, involves identifying the idea or opportunity, creating a framework for the design team, and observing the habits and behavior of the target group in their environment. Then, Ideation creates a space for an interdisciplinary team to work together and share their insights into what was observed in order to provide solutions or design new models. Complex ideas or difficult problems can be broken down into less complicated concepts by utilizing visual representations or concept maps. Finally comes Implementation which is a Design Thinking space that is heavily focused on creating a Prototype of the action plan. Through prototyping, newly developed ideas are transformed to a final product delivered to its target audience. Contrary to one might think, innovation through the 3I's phases does not need to be linear. The process can start or end at any phase as deemed necessary by the design team and until the final product is created.² According to Brown, there are some important characteristics that the design thinker needs to have in order to be successful in his model. They include the following:

1. Empathy
2. Experimentalism
3. Optimism
4. Collaboration and teamwork
5. Ability to balance feasibility, viability, and desirability

Some of the success factors that are necessary for Brown's model include:

- "Fail earlier to succeed sooner" requires simple prototypes to receive early feedback;
- Focus on human needs, behavior, and empathy innovation through the 3I's phases does not need to be linear. The process can start or end at any phase as deemed necessary by the design team and until the final product is created.²

Modern takes on this Theory

As an example of how design thinking found its way to Medicine, students in a two-day course offered by the Hasso Plattner Institute of Design at Stanford looked for ways to improve the patient experience in the Emergency Department. Participants in the course were given roles as patients and family members to get a sense of what it actually feels like to be in the often chaotic and highly stressful environment of the Emergency Department. Before conducting the exercise, the course participants were asked to interview patients and family members who were being seen about their experiences with medical care. By connecting and empathizing with patients and their family members, students were then able to feel what was like to be in their shoes. The first day produced an abundance of material to guide the class' second day of *prototyping*. It became evident that certain themes were occurring frequently. Patients and their loved ones wanted a regular flow of information to help them understand what was going on with their care. They also wanted to know that their providers were communicating with one another. By ensuring clear communication and regular updates, patients would feel relieved which in return reduced the anxiety and fear experienced by their loved ones.

The participants concluded the class by presenting their research results and ideas to the administrative staff who decided to implement them to their ED design.³Design thinking has also been used in curricular design to expand data utilized in the course evaluation stage, as well as through the idea of prototyping.⁵

Other Examples of Where this Theory Might Apply

Design thinking serves as a unique opportunity to pair students' developing critical-thinking skills with a creative outlet. This level of brainstorming works well in earlier levels of training, before learners' creativity is limited by "rules" or tradition. Students can create needs assessments within their own class regarding aspects of the curriculum they feel need to be better addressed. They then have the opportunity to brainstorm with their colleagues and other schools (Public Health, Pharmacy, Nursing, Dietetics, Design, Engineering, etc.) and develop prototypes in a "flipped classroom" format.

Design thinking is also well-suited for problem-solving gaps in the curriculum. As an example, medical education is currently limited on its ability to encourage empathy in students, but advances in virtual reality (medical professionals working with engineers and humanities expertise) have allowed for students to simulate brief moments of time in their patients' days. Design thinking can also help address resource limitations by pooling supplies across multiple departments and developing more simplistic products or models to meet educational needs (ex. designing an intravenous pacer task trainer). Products created through design thinking can help adjust inconsistencies in train-

ing experiences. Collaboration with other schools of thought can enrich learning experiences, improve networking, and instill a deeper appreciation of other people's employment and passions.

Limitations of this Theory

While design thinking can be praised for its innovative approach and interprofessional culture, it is not without its limitations. For design thinking to function at its best, teams need to have adequate time to devote to brainstorming, and project design needs to take place in an environment that encourages and values creativity. Participants should understand that design thinking requires those who engage within it to have a failure-positive mentality; that is, not only is failure *acceptable* but rather it is *expected*, since innovators often fail so that they can learn about the weakness in a prototype and improve. This theory is most valuable when applied by a team with a diverse background, so projects taking this approach should be reaching out to additional collaborators from other schools of thought (engineering, design, etc.). The team should be open, interested, and actively engaged. It may be challenging to network with other departments and will take time to build working relationships with these new members of the team. Additionally, design thinking is still relatively new in its application to the medical field. There is a paucity of research on its efficacy in resolving obstacles in healthcare. As more schools adopt design thinking theory in their curriculum, we will have a better idea of its best role in our learners' education.

Returning to the case...

Dr. Pneumo understands that collaboration across professions is important in design theory, so she reaches out to neighboring engineering, design, and social work schools. She also networks with the hospital's psychiatry department and the local mental health clinic to interview patients with schizophrenia, their caretakers and family members, and the hospital's own healthcare providers. By doing this groundwork, Dr. Pneumo is able to get a better understanding of the obstacles these patients encounter daily, in their own words. Dr. Pneumo shares these interviews with the engineers and designers who have joined her team.

Together, they design a prototype for a virtual reality headset that mimics some of the consistent auditory and visual hallucinations the patients are experiencing in their daily lives. She shares this prototype with the patients and their families to assess its realism and incorporates their feedback into the scenario and software designs with her team. Once all team members are satisfied with the prototype, Dr. Pneumo introduces the hallucination glasses into a pilot curriculum for students. The glasses are well-received, with many students comments on how poorly they understood what their patients were going through.

Over time, enough data is collected to support making the glasses a permanent fixture of the clerkship curriculum. On a recent shift, Dr. Pneumo overhears a new rotator in the department venting about a "crazy" patient. "I tried asking him the same question, like, five times, and all he would do was stare at the wall right behind me! Clearly he doesn't want my help that badly if he can't take the time to talk to me." Before Dr. Pneumo can intervene, another learner pulls the new rotator aside. "Hold on," he says, "I know that you're frustrated and just want to help. I bet your patient is going through a lot right now, let's see how we can work together to get him the care he needs."

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This reference serves as a qualitative review of design thinking in health profession education starting in 2009 (the presumed advent of DT in the health profession). The fifteen articles selected are a blend of peer-reviewed research and commentary on the education framework that explore the possible role of design thinking in problem-solving, curriculum development, and quality improvement for patient care. The authors suggest that design theory is a unique approach to uncover novel solutions to current problems in both health education and the act of health care, while acknowledging that this framework's use in medical education is contemporary with limited data.

2. Madsbjerg C, Rasmussen MB. An anthropologist walks into a bar. *Harvard Business Review.* 2014 Mar 1;92(3):80-90.

This paper provides an overview of the design thinking process from a business angle and why various companies (e.g. Lego) have found it useful to engage in observations of their end-users. It provides an overview of the Sensemaking process (1. Reframe the Problem; 2. Collect the Data; 3. Look for Patterns; 4. Create the Key Insights; 5. Build the Business Impact).

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An excellent recent review of the design thinking literature within education. Provides linkages to empirical studies across all of education.

Practical Papers in Medical Education

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This paper provides some worked examples specific to a particular field (emergency medicine). Highlighting how design thinking may enhance curricular design.

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A more recent article that provides a worked example for how a group used rapid design thinking to overcome educational challenges during the COVID-19 pandemic.

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Another worked example of how a design thinking engagement helped a group redesign their continuing professional development needs.

The R2C2 Feedback Model

Authors: Sean Dyer, MD; Geoffrey Comp, DO

Editor: Michael Gottlieb, MD; Teresa Chan, MD, MHPE

A Case

Kate is the program director for an emergency medicine residency and is scheduling the upcoming end-of-year reviews. She has received verbal and written feedback that John, a new intern, has been continuing to demonstrate a below-average knowledge base, and has been having a challenging time balancing an appropriate patient load as well as developing appropriate treatment plans on shift.

Early on during the intern year, John struggled to keep up with other members of his class, and Kate had met with him for a mid-year evaluation. She discussed some of the comments she had received about his performance, and he seemed to react negatively toward the feedback. Kate tried to provide encouragement but was concerned that John has not made any changes to help him progress. This frustrates Kate as she took extra time and effort to help John but feels as though she wasn't able to get through to him.

Before the first feedback session, John felt he was on track for his level of training and was very surprised to receive negative feedback from the faculty. He felt defensive throughout the whole discussion and left the meeting frustrated, thinking that the faculty were unreasonable and were too judgemental.

Kate had hoped that the session would inspire him to make changes but is worried that John will not progress adequately. She would like to have a more constructive end-of-year evaluation session with John to help him meet the potential she sees in him.

OVERVIEW

The R2C2 Feedback Model is a structured, four-phase method for providing feedback to learners. The facilitator guides a collaborative discussion through the four steps of building **R**elationships, exploring **R**eactions, exploring the **C**ontent of the feedback, and **C**oaching for change, thereby enhancing feedback acceptance and use.^{1,2} In the first phase, the facilitator attempts to build the relationship and establish trust through empathy and establishing credibility of the process. The second phase involves exploring the learner's reaction to the feedback through open-ended questions and reflective listening with the goal of providing a safe environment. In the third phase, the content of the feedback is examined. The learner is encouraged to clarify any questions about the feedback and identify strengths, weaknesses, and opportunities for improvement. Finally, in the fourth phase, the facilitator provides coaching for performance change through mutual identification of actionable goals as well as specific strategies to attain these objectives. [2]Each of these four steps guides the feedback conversation and utilizes specific open-ended questions to promote self-reflection and self-direction by the learner.³

MAIN ORIGINATORS OF THE THEORY

Joan Sargeant, PhD

Karen Mann, PhD

Background

Feedback is essential to a learner's growth and continues to be an important area of study for medical educators.^{3,4} Effective feedback can be used to help a new learner acquire or solidify new concepts. It has been shown to improve technical hands-on skills as well as patient communication, leadership, teamwork, and physician well-being.¹ While the importance of feedback is widely understood, high-quality, evidence-based recommendations for feedback are lacking.⁴

The authors of the R2C2 Feedback Model sought to create an evidence-based and theory-informed model for facilitating performance feedback.² The authors sought to address the existing challenges with feedback receptivity and using feedback to inform one's self-assessment and performance improvement.⁵ Using theoretical frameworks and evidence from the literature, the team identified the following three components^{2,6}:

1. Focusing on enhancing individual self-awareness and engaging with the learner through a humanist and person-centred approach;
2. Using an informed self-assessment approach that allows a learner to utilize external feedback to help generate an appraisal of their own performance; and
3. exploring the science of behavior change to enhance the incorporation of feedback.

Through these lenses, the group derived a structured method to “facilitate formal feedback and coaching conversations, enable collaborative discussions between supervisors and residents, and establish a safe environment through a series of open-ended questions that emphasize reflection and continual improvement.”¹

The authors tested the method and provided both objective and subjective supporting evidence of the benefits of successful implementation of the system. The group performed two studies across multiple sites and programs in graduate medical education, demonstrating that the R2C2 model was effective in engaging residents in a reflective and meaningful goal-oriented interaction.^{3,7} The authors also developed and published an online tool kit comprised of templated handouts and video resources for implementation of the program.⁵

The authors surveyed educators and learners after implementation of an R2C2 session and identified three features that were most valuable in successfully providing and accepting feedback. First, the use of open-ended questions was reported to promote a respectful teacher-learner relationship, which was paramount in the success of the session. Second, the discussion was more effective when the content was oriented toward coaching and the learners use of assessment data. Finally, the goal of fostering teacher-learner collaboration assisted in the development of the learner’s goals and determination of areas for growth.³

Modern Takes on this Theory

Many of the techniques that Drs. Mann & Sergeant had introduced to the world via the R2C2 model overlap extensively with the key features of a number of findings in simulation debriefing. More recently, Dr. Sargeant has collaborated with a number of collaborators from the feedback and simulation debriefing world to attempt to coalesce two bodies of literature that have historically been quite disparate. This group have recent published a paper rebranding all of these post-learning encounters as *Learning Conversations*.⁸

Other Examples of Where this Theory Might Apply

A modified version of the R2C2 Feedback Model appropriate for shorter interactions has been described.¹ This allows for the teacher to still use the four stages as described above but in a shorter time period without losing the benefits provided by the model. This is a useful variation for teachers to ensure their feedback is given in the moment, instead of waiting until a mid- or end-of-year evaluation. While it was initially developed to guide a formal feedback session, a similar model can be used to help deliver feedback and provide coaching opportunities in real time. For example, an Emergency Medicine attending physician could use the R2C2 model at the end of the learner’s shift, rather than waiting until the end of the rotation.

Limitations of this Theory

The R2C2 Feedback Model has several limitations. One of the most commonly cited limitations in the initial articles was the time commitment. It requires a 30-60 minute meeting as well as time for the instructor to learn the technique and time for the learner to review their feedback ahead of time. These issues are partially addressed by the 'in-the-moment' modification discussed above. Additionally, in order to achieve meaningful feedback, the learner must be able to self-reflect on their performance and to discuss their reactions to the feedback. For learners who have difficulty with this step, it might limit the quality of feedback and coaching acquired with this model

Returning to the case...

Kate was determined to lead a constructive feedback session with John and used the R2C2 Feedback Model to structure the discussion. She started the meeting by setting the stage and building the relationship by explaining the purpose of the feedback session as well as the review process. She asked if he had any other questions, and she was surprised to hear that John was very nervous about the review and didn't know what he was supposed to learn from the process. John felt much more involved as Kate explained the review process as well as how the feedback was collected.

Kate then asked John to review the on-shift feedback with her. She asked him about his initial reactions as well as if there was anything that was particularly surprising. John was initially visibly hurt and irritated when reading the comments. However, Kate was able to listen and affirm his reactions to the feedback. Ultimately, she discovered he had been wanting to improve some of the weaknesses that were being uncovered but didn't know how to address them.

By asking if there were any issues with the content of the feedback forms, Kate was able to help John identify that charting on shift was a specific area he wanted to improve. John felt that he was listened to and started to change his opinion of the conversation from a negative, accusatory interpretation to one of encouragement and constructiveness.

Finally, Kate was able to help coach John by helping him identify one of his senior residents that he looks up to as a person to discuss charting skills. They also had an excellent discussion about some of the barriers John felt he needed to overcome in order to make the changes in his workflow. Both Kate and John left the meeting feeling encouraged by the discussion and optimistic for a positive change in John's performance.

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This is the landmark paper from the initial authors that provides the background research, assessment of previous work in the field, and description of the derivation of the R2C2 technique. The article contains an extended description of the methods with specific insight into each of the four components of the theory and examples of how they might be addressed.

2. Sargeant J, Lockyer JM, Mann K, et al. The R2C2 Model in Residency Education: How Does It Foster Coaching and Promote Feedback Use?. *Acad Med.* 2018;93(7):1055-1063.³

The authors build on their original framework by applying the R2C2 model to a larger population with a variety of learners and teachers. They discuss factors that influenced the quality of the R2C2 sessions including the relationship between the teacher and learner as well as the characteristics of each of the participants. The importance of a *Learning Change Plan* is emphasized in this article and suggests this might be the most novel and useful part of the theory for the learner as it provides them with a plan to move forward and take action on the feedback they received.

3. Sargeant J, Mann K, Manos S, et al. R2C2 in Action: Testing an Evidence-Based Model to Facilitate Feedback and Coaching in Residency. *J Grad Med Educ.* 2017;9(2):165-170.⁷

In this paper, the authors describe an approach to integrate the feedback and coaching method into mid- and end-of-year evaluations for residents. Many residencies already have this format of bi-annual or annual feedback already in place; therefore, this is a very practical example of how to integrate the R2C2 into practice with little additional structure. It provides a good framework for supervisors to provide feedback to the learners and incorporate coaching. It was found to be especially helpful in providing feedback and suggestions for improvement to students who were already excelling, as this can be more complicated for supervisors than the student requiring more attention.

4. Lockyer J, Armson H, Könings KD, et al. In-the-Moment Feedback and Coaching: Improving R2C2 for a New Context. *J Grad Med Educ.* 2020;12(1):27-35.¹

Previously, the R2C2 model was used primarily for end-of-rotation feedback sessions that encompass multiple types and sources of feedback. This paper discussed how to adapt the R2C2 model to use for individual, shorter encounters, such as at the end of a clinical.

Feminist Theory

Authors: Lauren Evans, MD; Dolly Yadav, MD

Editor: Sreeja Natesan, MD; Teresa Chan, MD, MHPE

A Case

As she pre-rounding for Trauma Surgery rounds, medical student Jane Adams felt she was as prepared as she could be. She had arrived early to interview their patient, Frank, and had been through all the labs twice. She again ruffled through her notes as the other student on the service, Jagdeep Sahotra.

“You’re late again,” she sighed.

“I know, I know...” replied Jagdeep as he quickly jotted down the latest vital signs. He had missed his chance to examine Frank that morning. Dr. Fox, the Attending Surgeon, had already arrived so they quickly rushed off after him. As they arrived at Frank’s room, Jane started with the presentation and John added in the additional vital signs and stated that Frank appeared in a better mood this morning.

As they walked into the room, Dr. Fox again introduced the students.

“Good morning, you remember student doctor Jane and student doctor Sahotra.”

“Yes,” Frank stated, “I remember them! It’s good to see you again Dr. Sahotra and Jane.”

Jane watched Dr. Fox, and hoped he would correct Frank but instead he just nodded along. John quickly responded to the patient with, “It’s good to see you again. I’m happy to see you doing so well.”

As they walked out of the room, Frank called out to ask for juice. Dr. Fox turned to Jane and asked her to go down the hall and grab the juice for him. She rushed off so that she could meet the needs of her patient, but when she arrived back on rounds, Dr. Fox had just finished discussing the plan for Frank that day. Dr. Fox commented on the excellent rapport Jagdeep had with Frank and announced that John would be the student to join him in the operating room that afternoon. Jane wondered what she could do about this disparaging situation.

OVERVIEW

Feminism has been defined by feminist scholar and author, bell hooks, as “a movement to end sexism, sexist exploitation and oppression.” While there exists no singular feminist theory, Sharma describes “a family of critical theories and approaches that enable us to understand complexity.” Sharma also wrote a scoping review examining feminist theory as it relates to medical education and medical education research and found four overarching topics that exist in the Feminist theory literature:

- Assessment of what is taught in medical curricula: Addressing the need for more education in women’s health and gender sensitivity.
- Female experiences in medical training: Perspectives of female trainees, including challenges faced.
- Pedagogical approaches to medical education: Scrutinizing hidden curriculum and assumptions.
- Methodologies and inquiries in medical education research: What questions are asked and is there action based on these questions.

MAIN ORIGINATORS OF THE THEORY

Sandra Lee Bartky, Annette Claire Baier, Simone de Beauvoir, Ferdinand Bebel, Grace Lee Boggs, Judith Butler, Hélène Cixous, Voltaire Cleyre, Juana Inés de la Cruz, Patricia Hill Collins, Mary Daly, Angela Davis, Emma Goldman, Sally Haslanger, bell hooks, Catharine MacKinnon, Amina Mama, Louise Michel, John Stuart Mill, Kate Millett, Martha Craven Nussbaum, Estelle Pankhurst, Carole Pateman, Val Plumwood, Gayle Rubin, Nawal El Saadawi, Gayatri Chakravorty Spivak, Suzanne Voilquin, Mary Wollstonecraft, Iris Young, Clara Zetkin.

Background

In 1848, a group gathered in Seneca Falls, New York seeking equal rights for women, including suffrage, education, and property rights, but later focused mainly on the right to vote. This first-wave feminism ultimately led to the 19th amendment being passed in the United States in 1920. The movement continued in other countries, and Saudi Arabia became the last country to allow women to vote in national elections (2015). After women's suffrage was passed, there was a decline in the movement in the United States. In the 1960's, a second-wave feminism was born and since that time feminism has been a constant, evolving theory. Second-wave feminism focused primarily on workplace rights and reproductive rights. They sought equal pay, equal job opportunities, and improved childcare options. Third-wave feminism challenged gender identity and the rights of underrepresented females, and fourth-wave feminism has focused on sexual harassment.

Sharma² identifies 11 different feminist theories that are present in the medical literature, including examples and critiques. These broad theories show the diversity of the topic and the avenues for future research. We have adapted the table by Sharma below for your reference.

Table: A summary of feminist approaches that are commonly encountered.

Please note that this table is not exhaustive and is only meant to show the breadth of approaches within feminist theory.

	Principles	Examples in Health Professions Education	Problems or Critiques with this approach
Liberal Feminism	All genders are fundamentally equal; social conditions create and dictate differences and inequities; political and structural changes are required to close the gap.	Implementing quotas and other recruitment policies that increase the number of women in leadership positions.	Has been critiqued for the lack of intersectional awareness of other oppressive factors (e.g. race, class, language, sexual orientation, etc..).
Cultural Feminism	Women and men are fundamentally different and that there are certain attributes within women (e.g. being more relational or empathetic) that come more naturally to them.	Examining the caring nature of more “feminine” specialties within medicine.	Rather reductionistic at times. Notion of male vs. female attributes, values, and set points are problematic for many. Denies a spectrum of genders.
Queer Feminism	Core to this movement are the concept that sex and gender are socially constructed.	Work that examines gendered experiences between men and women physicians with other staff within the operating room setting.	Focuses on discourse and therefore may preclude examination of social structures that are at play (e.g. race, class, sexual orientation, etc..)
Radical Feminism	Identifies the patriarchy as the main source of oppression and gender as a tool of these individuals to oppress women. Suggests that radical (and not incremental) change is required.	Enacting legal changes to legislation around women’s reproductive rights.	Many critics feel that radical change is unlikely to occur in most jurisdictions and may be a fantasy.
Anti-racist Feminism	Race is an oppressive construct.	Creating a curriculum that examines the intersectionality of gender AND race in the clinical learning environment.	Leans heavily towards seeing intersectionality as a probably solution. May not examine other sources of structural or cultural oppression.
Socialist Feminism	Emphasizes economic oppression. Women’s oppression is part of a large structural inequity that is driven by class and economics.	Creating new policies for encouraging all genders to engage in parental leave.	Often misses out on other sources of oppression (e.g. race, language, sexual orientation, etc..)
Postmodern Feminism	Language and social discourse create our understanding of women and their identity.	Examining medical literature or policy documents for evidence of gender bias.	Focuses largely on language and does not often create new structures and enable change.
Indigenous Feminism	Focuses on how decolonisation and indigenous sovereignty may intersect with feminism.	Indigenous cultural safety training for clinicians and trainees.	Often very North American-centric, although Australia and New Zealand are often thought of as leaders in this space as well.
Marxist Feminism	Sees capitalism as primary source of oppression, leading to a devaluing or undervaluing of women’s labour.	Determining differences in women and men’s clinical revenues and academic contributions to see if women are penalized for increased caregiving and household labour responsibilities.	Does not usually account for other intersectional sources of oppression (e.e. race, language, sexual orientation).
Postcolonial Feminism	Asks us to examine via a postcolonial lens whether white women’s experiences and values are being generalised inappropriately.	Examination of a medical school application system to examine how non-White women experience this process.	Colonialist and imperialist practices are still pervasive in the world, so perhaps the “post” in postcolonialism is inappropriate.

Modern takes on this Theory

Organizations, such as FemInEM (feminism.org), have created online communities of practice directed at gender equity and empowering all physicians. They aim to “address gender disparities in a positive way.” This community has open access to resources for gender studies in medicine directed at both personal and group development. They also have in-person events available for further networking and education. FemInEM also supports research into gender equity in medicine. SheMD is another example of an organization that uses the online social media platform of Twitter to educate on topics of gender equity, workplace disparities, and more. National organizations such as ACEP, SAEM, and others have created Women In Medicine committees to also help advocate for policy changes, increase education on gender equity issues, and allow networking and creation of a community for women in medicine.

Other Examples of Where this Theory Might Apply

In the classroom, Feminist theory has recognized the “one-sex body” present in the pre-clinical curriculum. Studies have found that anatomy textbooks have more anatomic illustrations of male figures than females as the “norm.” The concerns that arise are that medical students are less likely to fully recognize the normal female anatomy or the differences between the sexes. In Emergency Medicine, we can see an example of this with the teaching of thoracostomy tubes. One of the most commonly used books for procedures, Roberts and Hedges’, uses a male figure to show anatomy and states “the fifth intercostal space is approximately at the level of the nipple,” but “the position of the female breast mass leads to variance” with no further information provided. The concern is that students who use these resources will be less prepared to properly care for a female patient compared to their male counterpart.

Feminist theory has also looked broadly at the experience of females in the clinical setting. There has been literature that focuses on the different experiences of female and male medical students, residents, and faculty. This research has identified significant challenges including sexual harassment and hostile work environment. There has also been significant research into the reduction of female career advancement and the lower numbers of female editors in medical journals.

Limitations of this Theory

Sharma² notes that there appears to be a deficit in the number of publications referencing feminist theory in medical education. She notes that this is possibly related to a publication bias. There has been literature that identifies a male dominance in the editorial boards of prominent medical journals,⁹ with up to only 21% of editorial board members found to be female. There has also been research into the underrepresentation of female authorships in both medical and general sciences literature.

Returning to the case...

Jane focused on the morning's events wondering what she could have done differently. She knew that she had been better prepared for the day than John, but felt frustrated that she had still missed out on the afternoon surgeries. She discussed the problem with her roommate and he suggested that she speak to Jagdeep about it tomorrow.

"Maybe he didn't realize what was happening?" he asked.

The next morning when Jagdeep arrived, Jane brought up the topic. Initially, Jagdeep felt frustrated because he knew he deserved to see the surgeries. She reminded him that he had been late that day and hadn't even examined Frank.

She then asked him "Did you notice how Frank called you Dr. Smith and then referred to me as Jane and Dr. Fox just ignored it?"

She reminded him that Dr. Fox had sent her to go get juice instead of hearing about the plan for her patient. The more examples of the sexism that had occurred, the more Jagdeep realized the struggles that Jane was facing.

"I didn't realize what was happening or I would have said something!" Jagdeep said.

Jane believed him, but wondered what could be done to prevent it from happening again. She had heard about some medical schools that were incorporating gender awareness into their curriculum and thought maybe her school could do the same. Jagdeep agreed that it was needed and asked to be a part of this new project. They set off that afternoon to find a mentor for their new curriculum and to figure out ways to disseminate this to the faculty and staff as well.

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Provides an excellent overview of Feminist theory and how it can be applied within medical education.

2. Babaria P, Bernheim S, Nunez-Smith M. Gender and the pre-clinical experiences of female medical students: a taxonomy. *Med Educ*. 2011;45(3):249-260. doi:10.1111/j.1365-2923.2010.03856.x

A qualitative study looking at female's pre-clinical experiences relating to gender. The students reported multiple negative experiences that left them isolated and questioning of a future in the medical field.

3. Cheng LF, Yang HC. Learning about gender on campus: an analysis of the hidden curriculum for medical students. *Med Educ*. 2015;49(3):321-331. doi:10.1111/medu.12628

This paper examines posts by medical students from multiple schools posted on an online communication board. Authors found biased treatment of women and overt sexual harassment present from both students and faculty. Among the strategies suggested to promote gender sensitivity is recounting examples of the lived experiences of those who have been discriminated against in medical curricula.

4. MacLeod A, Frank B. Feminist pedagogy and medical education: why not now? *Med Educ*. 2013;47(1):11-14. doi:10.1111/medu.12095

This paper examines the need for social sciences such as gender and race studies in medical curriculum.

5. Mendelsohn KD, Nieman LZ, Isaacs K, Lee S, Levison SP. Sex and gender bias in anatomy and physical diagnosis text illustrations. *JAMA*. 1994;272(16):1267-1270.⁴

This paper looks at the disproportionate number of male illustrations in anatomy textbooks used during pre-clinical years. Thus further perpetuating the male body as the medical standard and limiting medical student's understanding of female anatomy. Also, female images were disproportionately higher in the reproductive chapters versus male's.

Sociomaterialism

Authors: Fawziah Alsalmi MD; Lorne Costello MD, MSc; Kristine Prince DNP, APRN;

Editor: Sara M. Krzyzaniak, MD

A Case

Ms. Smith, an 87 year old with a past medical history of untreated hypertension, called the ambulance when she developed significant chest pain. On arrival, she informed Shannon, one of the paramedics, that the severe, tearing pain began suddenly about one hour prior and radiated into her left arm and back. As per her medical directive, Shannon began transporting the patient and consulted with an emergency physician, Dr. Lee, via a telemedicine link.

During transport, the telemedicine platform had connection issues and kept cutting in and out, much to the frustration of Shannon and Dr. Lee. As a result, Shannon was unable to relay much of the patient's history or her vital signs, so Dr. Lee asked that she just send the ECG. He planned to review it to determine appropriate triage prior to the patient's arrival. His review of the ECG showed ST elevation in the inferior leads (II, III, and aVF), and he interpreted this as consistent with an inferior ST-elevation myocardial infarction. The concerned emergency physician informed the paramedics to bypass the emergency department and transport her directly to the cardiac catheterization suite for primary coronary intervention. He requested that the paramedics give aspirin and sublingual nitroglycerin. As Shannon started to express her concern about the patient's atypical sounding chest pain, Dr. Lee was called overhead to attend to another sick patient. He apologized and ended the telemedicine call.

On arrival at the cardiac catheterization suite, the patient had received the requested medications. The patient was now short of breath and hypotensive. As the paramedics handed over the patient to the interventional cardiology team, Dr. Sam, the cardiologist, performed a bedside echocardiogram. The bedside echo demonstrated hypokinesis of the inferior wall with moderate aortic regurgitation and a large pericardial effusion. Dr. Sam raised the concern for an aortic dissection, which is what Shannon had been concerned about all along.

Shannon and her partner transported the patient down to the emergency department while Dr. Sam called for an emergent cardiac surgery consult. As the paramedics bring the patient into the emergency department, Shannon hears a familiar voice; standing before her is the now shocked emergency physician, Dr. Lee.

OVERVIEW

The term “social”, defined as “relating to society or its organization,” dates back to the 17th century and is derived from the Latin word *Socialis*.¹ “Material” is defined as “denoting or consisting of physical objects rather than the mind or spirit” or “important; essential; relevant.”² In the literal sense, sociomaterialism is a noun of the blending of the terms ‘social’ and ‘material’ first postulated by Wanda Orlikowski as a conceptual framework for the theory of sociomateriality.³ Rather than treating the social and material environments as two different entities, Orlikowski argues that the two are intertwined with one being no more important than the other, a concept known as as “constitutive entanglement.”³ Derived from previous work of relational theorists, it is this constitutive entanglement that blurs the overlap of technology, work, people, and organization.

Sociomateriality consists of five central ideas identified in the literature: materiality, inseparability, relationality, performativity, and practice.⁴

- Materiality can differ among professions and areas of studies, but in general refers to how something is used.
- Inseparability describes the close interrelatedness of humanity (in sociality) and materiality.
- Relationality is the inseparability of humanity and materiality in that each entity depends on one another.
- Performativity is the notion that the “boundaries between humans and technologies are enacted in practice.”⁴
- Practice relates to the development of a lens to improve one’s knowledge base and understanding.⁴

In its resurgence since 2007, sociomateriality has been described as an umbrella theory containing a number of sub-theories. These sub-theories exist within the aforementioned central ideas to aid in formatting the framework of sociomaterialism. Additional viewpoints on this conceptual framework include agential realism by Barad, imbrications by Leonardi, and materiality and relationality by Martine and Cooren. Barad’s agential realism states that there is no absolute distinction between social or material and that the concept is purely sociomaterial as one singular concept.⁷ Leonardi’s imbrications, or critical realism, states that social and material are separate and only “imbricates,” or overlaps, as people create a link between the two, creating sociomaterialism.⁷ Martine and Cooren’s materiality and relationality were developed to help clarify the confusion created by constitutive entanglement’s language, suggesting that the two concepts can be singular or joint depending on the situation in which the concept(s) is/are needed.⁶

MAIN ORIGINATORS OF THE THEORY

Wanda Orlikowski, Susan Scott

Other important authors or works:

Bruno Latour: actor-network theory

Karen Barad: agential realism Paul M. Leonardi: imbrications

Thomas Martine and Francois Cooren: materiality and relationality

Background

The core tenant of sociomateriality is the effect technology has on human interaction, personal and professional lives, and sociality. This framework concurrently describes effects of people on the design of, use of, and dependence on technology in the modern world. Commonly cited examples in the literature include internet search engines and smartphones. Sociomaterial is a concept that has been circulating in the fields of sociology and economics since the 1950s. There has been a relatively slow evolution of the topic up until 2007, a key point-in-time for sociomaterialism and advances in related research and application. In 2007, Orlikowski built upon her work from 1995 and sparked a renewed interest in sociomaterial through the development of sociomaterialism and the concept of entanglement.³ As previously discussed, constitutive entanglement is the intertwining of social and material as a singular concept.³ Subsequently, several authors have debated the soundness of Orlikowski's constitutive entanglement and theorists have created several branching theories under sociomaterialism including artefact, apparatus, affordance, constrain, object, entity, and actor-network-theory.^{5,6}

Modern takes on this Theory

Despite its 2007 resurgence, sociomateriality has had few modern advances apart from the aforementioned viewpoints, notions, and debates.⁸ Regardless, its value is increasingly recognized in the impact of technology in the modern world and is now be utilized in many fields of study after years of being used primarily in organization and information systems literature. The constitutive entanglement described by Orlikowski is evident more than ever with humanity's dependence on technology in nearly all aspects of everyday life. There are myriad benefits to the advances of technology in the modern world including but not limited to worldwide connection, rapid communication and dissemination, ease of access to information, improved productivity and efficiency of industries, and increased lifespan. However, there is a darker side to technology including vulnerability, risk of breaches of sensitive personal information, diminished need for human rote memory and knowledge, and human job loss as processes become automated. More significant concerns include pandemics due to synthetic biology, climate change with geoengineering, production of weapons of mass destruction via distributed manufacturing, and unpredictable artificial intelligence systems.⁹ While the benefits of technology outweigh the risks, individuals and organizations must be cognizant of these risks to mitigate adverse outcomes. Sociomaterialism is the conceptual framework surrounding these issues.

With the rapidly changing face of technology and its impact on humanity, sociomaterialism and sociomateriality are among the most commonly discussed and debated conceptual framework and theory applications in many fields of study and organizations. Applications of sociomaterialism are also evident within the COVID-19 pandemic with mitigation measures, rapid transition from face-to-face interaction to digital platforms, use of technology in continuing patient care without in-person interaction, as well as significant educational responses in light of COVID-19.¹⁰

Other Examples of Where this Theory Might Apply

With technology's far-reaching impact in many aspects of the modern world, the classroom and clinical settings are prime locations for application of sociomaterialism as technology intersects these arenas. Within the classroom, sociomaterialism is rooted within use of advanced technology (e.g. computers, smartboards and projectors), online teaching practices or mobile learning, simulations, use of social media to disseminate information or provide educational opportunities, open educational resources via the Internet, and access to unlimited digital resources that benefit both the educator and learner.¹¹⁻¹⁴

Within the clinical setting, there is a plethora of medical literature applying sociomaterialism and sociomateriality to both medical education and practice. Examples of application include multidisciplinary approaches to patient care, medical technology, distributed medical education (e.g. distance education, web conferencing, video conferencing, online educational platforms and online communities), use of social media to disseminate evidence-based practices and free open access medical education (FOAM), electronic medical records, use of smartphones and tablets, simulation-based learning, and digital resources.^{4,15-19}

Limitations of this Theory

Limitations to sociomaterialism depend on the field of study or area to which the conceptual framework is being applied. However, common limitations noted in the literature include the lack of addressing of problems in social inequality, strong versus weak versions of sociomaterialism, confusing language of the framework itself, and ruminating design.

- Social Inequality: sociomaterialism and sociomateriality assumes equal access to technology among all individuals and organizations. This limitation is highlighted in work using sociomaterialism within the fields of education and literacy. This limitation is also seen in healthcare applications, for example the use of a computerized algorithm that assumes equal access to care
- Strong versus weak versions: weak sociomaterialism denotes separateness of social and material while strong sociomaterialism does not.⁵
- Language and descriptors can be very difficult to understand.⁵ This, combined with multiple definitions and overlapping theories, lends to significant confusion.
- Ruminating design: authors repeatedly debate the soundness of the foundation rather than focusing on the establishment of the framework and its application to individuals, relationships, and organizations.

Returning to the case...

After Ms. Smith is quickly stabilized in the emergency department and transferred to the operating room, Shannon asks Dr. Lee if they can discuss the case since she feels uneasy about what has happened. Dr. Lee agrees and they go to a quiet room.

Shannon expressed that she feels guilty for not speaking up sooner and is frustrated that there were technology issues that prevented clear communication. Furthermore, she felt that she was dismissed by Dr. Lee who rushed her off the phone. Dr. Lee stated that he also felt guilty for missing the correct diagnosis, leading to a delay in care. He apologized to Shannon for dismissing her earlier - reiterating that there was a sick patient and he was faced with competing urgent issues that needed attention. They agreed on the importance of better communication in this and decide to file a safety report with their respective leadership teams to help mitigate the risk of a similar incident in the future. Within their meeting, Shannon and Dr. Lee unknowingly identified key issues applicable to sociomaterialism. The lack of functional technology prevented both parties from doing their job correctly and led to frustration. Shannon was unable to communicate her concerns and Dr. Lee, with minimal information, switched to another material (ECG) to decide how he would act next. Furthermore, this technology glitch changed the way that both the physician and paramedic interacted. Similarly, the environments that they both were in also influenced their behaviours and interaction. For example, Dr. Lee was paged overhead to attend to another sick patient, despite being within eyesight of the patient's room and available to immediately help.

Beyond this conversation, there were other factors at play in this constitutive entanglement. Sociomaterialism supports that medical practice is a collective sociomaterial enactment and not a question solely of an individual's skills. It decenters the human as the focus to allow for a deeper exploration of the complex, messy and non-linear relationships between materials and social practices.²⁰

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Aleksandra Bavdaz dives into the topic of sociomaterialism in an extensive review. The review covers a number of topics including the evolution of definitions of material, social, and technology. It also describes varying viewpoints on sociomaterialism, a discussion of research junctures and associated metatheories, studies of the features of the conceptual framework. Finally this paper reviews examples of real world application and highlights points for further research.

2. Jones M. A matter of life and death: Exploring conceptualizations of sociomateriality in the context of critical care. *MIS Q.* 2014;38(3):895-925.

This paper provides a detailed background on sociomateriality including historical perspective and key features/notions of the conceptual framework including materiality, inseparability, relationality, performativity, and practice. Jones also provides a comprehensive literature review surrounding sociomaterialism from 2007-2013 having found 146 papers that are outlined in table format. After reviewing sociomaterialism, Jones then goes on to apply the conceptual framework to the “implementation of a computer-based clinical information system in a 25-bed critical care unit” and describes how each of sociomaterialism’s core ideas play a role in the case example. The article concludes with a discussion of sociomaterialism’s influence in the information systems world and dives deeper into the conceptual framework’s importance of the principle of the interaction of technology and humans.

3. Leonardi PM. Theoretical foundations for the study of sociomateriality. *Inf Organ.* 2013;23(2):59-76. doi:10.1016/j.infoandorg.2013.02.002

Paul Leonardi highlights two theoretical foundations of sociomateriality: agential realism and critical realism. For agential realism, the paper discusses the foundation of the theory and reviews shifting definitions. The paper then reviews challenges of agential realism and describes how these lead to the development of critical realism as a solution to these problems. The paper also provides graphical descriptions of the structural approach of technologies from 1986 to 2000 and key differences between agential realism and critical realism. The paper concludes with comparing and contrasting the two theories.

4. MacLeod, A. and Ajjawi, R., 2019. Thinking sociomaterially: Why matter matters in medical education. *Academic Medicine.* DOI: 10.1097/ACM.0000000000003143

This primer introduces sociomaterialism and its role in health professions education and scholarship. It begins with a coherent and readable overview of the ontological, epistemological, axiological, and methodology.

Logic Model of Program Evaluation

Authors: Kathryn Fisher, MD, MS; Jeanne Macleod, MD; Sarah Kennedy, MD

Editors: Benjamin Schnapp, MD, MEd; Teresa Chan, MD, MHPE

A Case

Sarah has just finished her ultrasound fellowship and is working at a new hospital in the Emergency Department. She has discovered that many of her new partners are not familiar with or comfortable using bedside ultrasound in clinical practice. When she inquires about this, many of her coworkers mention that they were educated prior to 2006, when ultrasound became incorporated into residency training as part of the required curriculum for residents.

Sarah would like to design a certification program for her colleagues to help them become more comfortable with performing and interpreting ultrasound in clinical practice. She would like to develop a curriculum initially with some core ultrasound applications to teach her colleagues how to perform and interpret basic bedside ultrasound studies and then expand to other imaging applications. How can the Logic Model of Program Evaluation help her design a program? What activities can be planned and what outcomes could be measured to ensure success of her program?

OVERVIEW

The logic model is a conceptual tool that can be used when facilitating program planning, implementation, and evaluation. This tool is designed to examine a program’s resources, planned activities, and proposed changes or goals in an organized fashion. It describes the linkages between resources, activities, outputs, outcomes, and their impact on the program as a whole. It provides a model of how a program might function under certain situations.¹

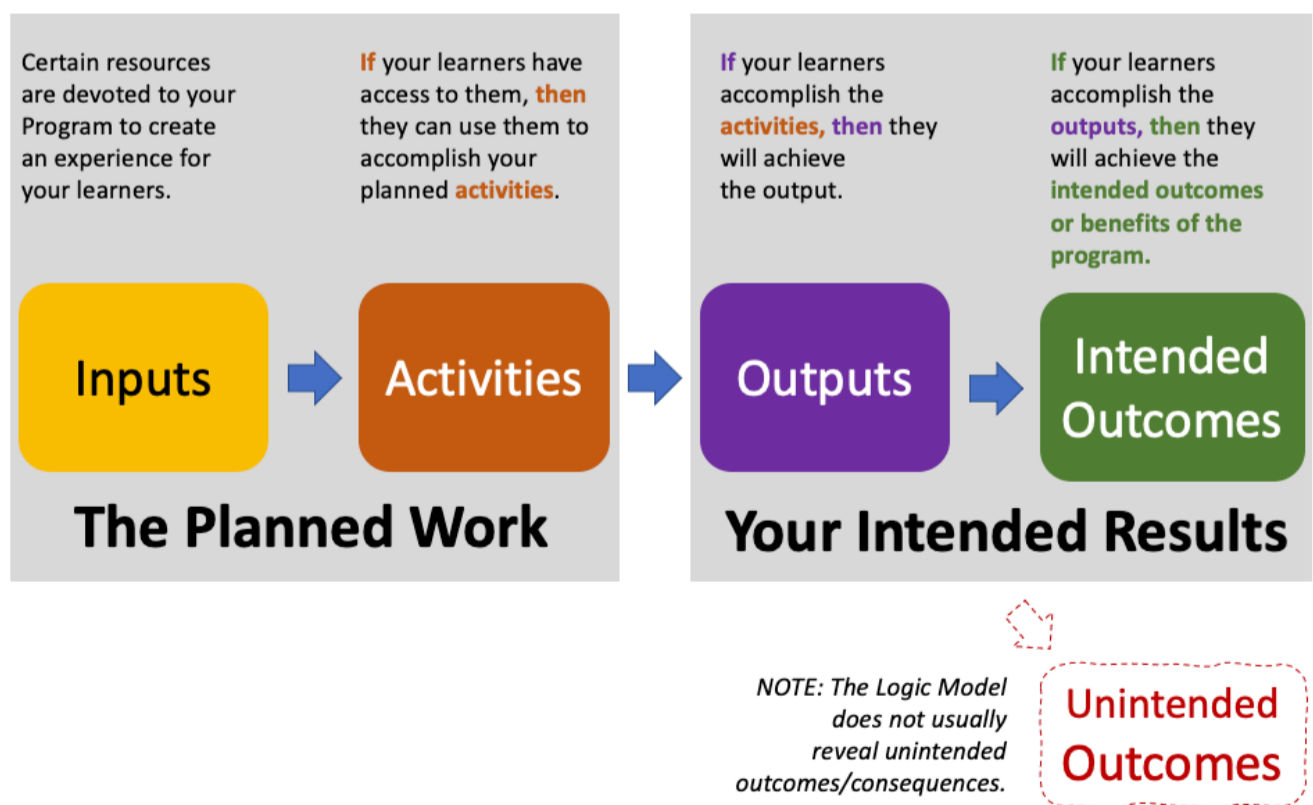
The logic model is represented visually in four main sequential components including inputs, activities, outputs, and outcomes. These comprise two main domains: planned work and intended outcomes. Planned work includes inputs and activities while intended outcomes reflect the outputs and outcomes. Outcomes can be measured as immediate, intermediate, and long-term. Some sources also suggest a fifth component, a measurement of impact, at the end of the model in lieu of, or in addition to, long-term outcomes.² In business applications, many logic models also contain a schematic of external influences as arrows into each of the components to show how each of these external factors affects each of the steps of the model.

This model has been used in initial program design and planning, in program evaluation and restructuring, and for other individual or group evaluative processes. It provides a structured framework to systematically evaluate program components and to communicate with team members. The logic model is a tool applied to facilitate acquisition of the information necessary in decision making as it relates to evaluation and restructuring. The logic model is specifically useful in determining evaluation for medical education programs.³ Figure 1 below depicts the workflow of a typical logic model where a program’s intended inputs are linked to the program activities, and then to the program outputs, which should result in the intended outcomes. In figure 1, we depict how the unintended outcomes are not usually measured by the logic model, which focuses on the intended outcomes.

Figure:

The Logic Model - a series of “if/then” statements that link the logic of the program and its elements.

Note that logic models are notorious for not accounting for unintended consequences or outcomes.



MAIN ORIGINATORS OF THE THEORY

Edward A. Schuman

Joseph S. Wholey

Background

The early ideas of logic models were first raised in a 1967 book by Edward A. Schuman about evaluative research.⁵ Over the next decade, two types of logic models emerged. One called Theory of Change and the other termed Program Evaluation or Outcomes Model. The Theory of Change model is more conceptual and provided the foundation for the Program Evaluation Model, which is more operational.⁴

The concept of a logic model was previously captured in other structures and under different variations including “Chains of Reasoning,” “Theory of Action,” and “Performance Framework.”¹ Bickman 1987 introduced logic models as a tool for program evaluation that emphasized program theory.⁶

The first publication using the term “Logic Model” was by Joseph S. Wholey (1983).⁷ McLaughlin and Jordan³ were also champions of the logic model approach. The first developers of the logic model came from business, public sectors, international non-profit sectors, and other program evaluators. Logic models did not become widely used until the United Way published Measuring Program Outcomes in 1996.⁸ This article was important in establishing the terms and structure used today for developing Logic Models. The W.K Kellogg Foundation published a widely available Logic Model Development Guide which has been used for public policy and healthcare planning.⁹ Over the last decade logic models have also been used for medical education program evaluation.

Inputs can be seen as certain resources necessary to operate the program.³ Inputs include resources dedicated to or consumed by the program and can include financial resources and funding, protected time for faculty or staff, expertise of faculty and staff, administrative support, and physical resources such as facilities and equipment.

If a program has access to inputs, then it can use them to operate planned activities.³ Activities represent what the program does with the inputs it has to fulfill its mission. Activities may include any combination of needs assessments, teaching, curriculum design, planning of sessions, faculty development, development of systems, or performance evaluations. These activities are dependent on the program’s mission.

If the planned activities are accomplished, then the program will deliver the intended product or service output.³ The outputs section in logic models describes the direct, measurable outputs of the activities. This can include demographics such as number of participants in a program’s activities, number who completed a certain curriculum, or program metrics such as number of programs, time in existence, or number of graduates of a program.

If the planned activities are accomplished to the extent represented in the outcomes, then the organization will be affected in certain ways as described by the outcomes.³ Outcomes can be measured immediately, as well as in the intermediate and long-term time frames and are generally split into these time designations. They look at the benefits for participants during and after program activities. These can include increased knowledge or skill, satisfaction with quality of activities, or improvement in evaluations. Additionally, outcomes can be measured by various metrics dependent on the program for clinical, teaching, program, or academic success following the implementation of activities. Awards, productivity, shared resources, and increased involvement can also be measurable outcomes.

Finally, if the benefits of the program are achieved then the activities implemented as part of the program will have an impact on external factors such as an organization or system.³ This can relate to impact on an industry or system based or impact it has on the community, environment, or infrastructure.

Modern takes on this Theory

The Logic Model is a tool that can facilitate communication and can be used for idea sharing, identifying projects critical to goal attainment. The logic model can identify if there are implausible linkages among program elements or redundant pieces.¹ Benefits of the logic model include gaining a common understanding and expectations of resources, their allocation, and results. In the past few decades, the logic model has been applied to various applications in medical education and healthcare. Generally, the model is most widely used for innovations and new program design or in evaluation of current programs. Program managers are using the logic model to argue how or why the program is meeting a specific customer need, whether that customer is in a private sector or the customer is a medical learner.¹ In a more cognitive sense, the logic model is used to facilitate the process of thinking through faculty development and other large-scale initiatives.³ Other uses have been adopted on a larger system scale for healthcare systems innovations.¹ They have also been used on a larger scale in the public health workforce to support ongoing program planning and evaluation and for communication between divisions.¹⁰ Portfolio evaluation, or the evaluation of multiple projects with a common purpose, also benefits from the use of logic modeling as a visual tool.¹¹

Logic models have been used as a way to determine consensus among leadership or with stakeholders in a certain situation, as one can examine both the inputs and the desired outcomes and how they will be measured. This approach can be applied to medical education in the setting of institutional self-review.¹² The World Federation for Medical Education utilized a logic model applied to further define and evaluate each of their accreditation standards. In this specific case, the logic model was used both for standard setting and consensus of their standards, but also as an evaluative tool.¹²

Other Examples of Where this Theory Might Apply

Van Melle et al proposed how to use the Logic Model in Program Evaluation for Competency-Based Medical Education (CBME).¹³⁻¹⁵ The authors provide an outline of how to use a logic model to focus

CBME program evaluation, how to make a program evaluation scholarly, and how to build capacity for program evaluation. They used the Logic Model framework to provide an outline on how to evaluate CBME initiatives in a residency program. This is broken down into a flow chart of an Outcomes Logic Model. First step being the Purpose of CBME, then resources to implement (Inputs), followed by what Activities are critical for CBME. The final step is that the program results are broken down into Outputs: the description of competencies and Outcomes: proximal and distal. The proximal outcome being enhanced readiness for practice and the distal outcome being improved patient care.¹⁶

Limitations of this Theory

The Logic Model's main limitation is that it may lead to over-simplification and miss many of the unintended consequences because of its focus on the program's desired outcomes. Medical educational programs are often complex and don't always follow a linear path. To overcome this limitation the Logic Model needs to be well designed. The creators of the model should have a thorough understanding of how change works in the educational program being evaluated. Both intended and unintended outcomes should be anticipated, and feedback loops must be incorporated into the model to address these complexities. The Logic Model design needs to be flexible and dynamic in order to integrate unexpected complexities. Educators and researchers need to be prepared to revise the model as the program is being implemented. Therefore, the development and revision of a logic model can be a time-consuming process.

Complexity can be built into the Logic Model by the addition of multiple tiers. Mills et al attempt to address this problem in their 2019 article.¹⁰ The authors propose a typology of logic models. They categorize logic models into four types, ranging from simple (type 1) to the most complex (type 4). The type 4 logic models attempt to provide more insight into the interactions between interventions and context (social, political or cultural factors in the environment where the program exists).

The greatest challenge is to find the balance between precision, which may require many data points, with the creation of a concise, easy to understand model.

Returning to the case...

Sarah uses the Logic Model to plan a curriculum for her coworkers to obtain initially core and then global ultrasound certification in a step-wise approach. See Figure 2 for a diagram of her logic model. She creates a pre-survey and pre-test to see initial attitudes and knowledge. She then creates educational opportunities to teach her coworkers. She has a post-survey and post-test to evaluate how behaviors, knowledge, and attitudes have changed over the course of a year. Sarah makes a goal of certifying 75% of her colleagues in core ultrasound applications and then expands her program to include other imaging applications.

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1. McLaughlin, J.A. and G.B. Jordan, Logic models: a tool for telling your programs performance story. *Evaluation and Program Planning*, 1999. 22(1): p. 65-72.¹

This paper was one of the first to outline in detail, the practical applications of the Logic Model. It was intended to explain to program managers in the public and private sectors how to measure and evaluate a business program and how to use that knowledge to improve a program's effectiveness. By utilizing clearly outlined figures and tables, these authors provided a detailed explanation on how to build a Logic Model for business managers.

2. Logic Model Development Guide, ed. W.K.K. Foundation. 2004.⁹

This Kellogg foundation document outlined important definitions of the Logic Model as a method of program evaluation. "The program logic model is defined as a picture of how your organization does its work- the theory and assumptions underlying the program. A program logic model links outcomes (both short and long term) with program activities/processes and the theoretical assumptions/principles of the program."

3. Otto, A.K., K. Novielli, and P.S. Morahan, Implementing the logic model for measuring the value of faculty affairs activities. *Acad Med*, 2006. 81(3): p. 280-5.³

Otto *et. al* in 2006 published the first landmark article in Academic Medicine suggesting the use of logic models in medical education. They suggested use of logic models for measuring the contribution of faculty affairs and development offices to the recruitment, retention and development of a medical school's teaching faculty in efforts to reward faculty for teaching. They nicely review the structure of a logic model overall and give an example of its use in a visual format with a comprehensive associated list of components in each category. Use of the logic model is suggested to facilitate the process of thinking through the entire faculty development process.³

4. Frye, A.W. and P.A. Hemmer, Program evaluation models and related theories: AMEE guide no. 67. *Med Teach*, 2012. 34(5): p. e288-99.⁴

AMEE Guide No. 67. This paper takes a broader view of various program evaluation models. It is useful because it compares and contrasts several different models. In addition to the Logic Model, it also discusses the experimental/quasi-experimental model, the Context/Input/Process/Product Model (CIPP model), and Kirkpatrick Model. It delves into the strengths and weaknesses of each type of model and how they can be applied to Medical Education. The authors in this paper provide a good description and analysis of each of the four essential elements of the Logic Model. It provides various medical education centered examples of each of these elements.⁴

Situated Cognition

Authors: Drew Kalnov, DO; Jennifer Whitfield, MD; Sophia Lin, MD

Editor: Abra Fant, MD, MS; Teresa Chan, MD, MHPE

A Case

“I’m worried about Paul’s scores, they are concerning and put him at risk to not pass boards. I just don’t get it, he is a solid performer in the department”

Most of the faculty at the clinical competency committee meeting nod in agreement as they review the inservice exam scores.

“What can we do about it? He seems so clinically competent when caring for patients. He always gets my pimp question about patients we are caring for correct and asks great follow-up questions. How can he be struggling so much on a test when he clearly knows the answers?” states another faculty member.

The committee chair comments “he probably needs to be placed on a corrective action plan to help him. He probably needs to do more practice questions and a few practice tests. If he can improve his score on a practice test in a few months then we can look at taking him off the plan”.

Another member remarks “I’m not sure that is the answer. I just pulled up his progress through the practice question bank, he has completed nearly 90% of the questions, far more than most of the other residents. He obviously needs test taking help, but I feel like there is more we can do to help bring out his knowledge in the testing setting.”

“Let me think about it a bit more,” added another faculty member, “but can you believe Peter’s score?! He can be awful to work with in the department, how did he score in the top 10%?”

The case we presented is a common problem in student and resident training, a disconnect in one's perceived knowledge, clinical competency and test taking abilities. Often some of the highest performing learners in the clinical setting struggle to translate this to static questions and tests, while others excel in test taking but struggle to apply that knowledge in the clinical setting. What education theory can help explain why many learners perform in this manner, and what are some methods that can be used to improve their performance across all assessment mediums?

OVERVIEW

Situated cognition is an educational theory that proposes knowledge cannot be separated from the environment and situations in which it is learned and applied. Knowledge is not self-contained. Understanding physical, social and cultural contexts in which concepts are used, and teaching these concepts within these contexts, is paramount for students to truly master knowledge.

This theory contrasts with the more traditional information processing theory in which learning is thought to occur when decontextualized ideas are committed to long-term memory. With information processing, students are taught information in a classroom setting, in isolation from the environment in which it is to be used. This information relies solely on the learner and is independent of environment. It is later retrieved from the learner's memory during situations in which it is used, making learners "storage-retrieval systems".¹ Ideas taught using this traditional theory are incomplete, however, because their full meaning is dependent on context. With situation cognition, information is truly learned only in the context in which it is used. Information is intertwined with situation. How a learner perceives the information taught depends on both the environment in which it is taught as well as the environment in which it is to be used. Learners must be exposed to realistic situations requiring utilization of knowledge. It is only through this exposure to concepts in situ that an individual can truly understand what is being taught. With situated cognition, the learner is a "perceiving-acting system"¹ who can more easily draw on adaptable knowledge to apply to more varied situations.

MAIN ORIGINATORS OF THE THEORY

Lev Vygotsky

Other important authors:

Alexi Leon'tev;

John Seely Brown

Lucy Schuman

Background

Situation cognition was first formally described in the mid-1980s as a result of collaboration between the Institute for Research and Learning, a multi-disciplinary think tank tasked with studying the process of learning and the XEROX Palo Alto Research Center.² However, its origins lie in earlier theories from a broad range of disciplines. These theories include phenomenological philosophy from philosophy, cultural-historical activity theory and ecological psychology from psychology, American pragmatism from education, enactivism from theoretical biology, embodiment from physiology, and situation semantics from linguistics.

In their collaboration, Seely Brown and colleagues sought to determine if knowledge could be learned as a mental representation of a concept within an individual, independent of context, and whether or not this internalization is requisite in successfully mastering complex human behaviors. In their research, Seely Brown and colleagues liken the acquisition of knowledge to the acquisition of vocabulary as studied by Miller and Gadea. While a child can certainly learn words and their dictionary meaning without being exposed to use of these words in real-world conversations, this method is less efficient and less effective than learning these words in the contexts in which they are normally used. Seely Brown et al. also compare knowledge to tools. To achieve a full “implicit” understanding of a tool’s function and the settings in which it’s used, a learner must actually use the tool in situations it was designed to be used. A community develops amongst individuals who use a tool and from this, culture and a community of practice form. This culture also adds to the full conceptual understanding of a specific tool. Seely Brown and colleagues posit that students need exposure to knowledge being applied by real-life practitioners. Learners must also engage in “authentic activity,” both basic and more advanced situations. When attempts at translating authentic activity to activities that are more easily accomplished in a classroom, knowledge becomes limited to the domain of the classroom, making it less easily extracted in real-life domains.^{4,5}

As a more effective alternative to traditional pedagogy practices, Seely Brown et al. proffer cognitive apprenticeship. Concepts are introduced within the framework in which they are to be applied in the real world. As students master fundamentals, they then progress to more autonomous activity, all under the tutelage of a practitioner who uses these concepts in authentic domain activities. By using their basic understanding of concepts taught in real-world situations, their knowledge further evolves. Apprenticeship also organically leads to “enculturation” within a community of practice. Integral to a community of practice are social interaction, social constructs of knowledge, and collaborative. Cognitive apprenticeship can be applied broadly across multiple fields and is especially useful in disciplines involving higher-order human activities.

Modern takes on this Theory

Situated cognition theory has played a starring role in the evolution of modern medical education, particularly at the undergraduate level. The traditional model of reliance on didactics, written testing, and acquisition of factual knowledge that once defined medical school curricula, particularly in the 1st and

2nd (often called “preclinical”) years, has largely disappeared. Recognizing the need for a holistic educational framework, in which the student physician acquires knowledge not only from a textbook but within the dynamic clinical environment, educators have developed novel curricula that embrace the situated cognition theory. The following examples illustrate use of this theory in recent adaptations in medical education:

Problem-based learning (PBL)⁶: A massive shift away from lecture halls to PBL has occurred recently in medical education and is a model example of situated cognition in practice. Students are provided with a case, initially simple and appropriate to the learners level, and are given more information as they progress through the case, in an attempt to provide quality care to the simulated “patient” This process is necessarily iterative; students must adapt and learn based on new and increasingly complex information from the hypothetical patient, context and clinical environment. Thus is the learning situational and acquired in the context of the patient-provider relationship.

Preceptor-style clinical learning: The core of this theory is that education must take place in authentic environments, Preceptorships allow the student to learn from an expert in the chaotic and complex “real” patient care setting. Skills such as shared decision - making and delivery of bad news are as invaluable as they are impossible to learn outside of a situated and authentic setting.

Patient-centered learning⁷: Patient-centered care focuses on patient participation, the relationship between the patient and the provider, and the context and accessibility of the care, and is now the gold standard for health care provision. medical education has necessarily become patient- centered as a result. Clinical exposure for students starting early in the first year and opportunities to follow patients longitudinally are novel applications of situated cognition, allowing the student to learn factual medical knowledge while concurrently understanding how the patient is affected by the disease within the larger sociocultural context. Additionally, there has been a recent emphasis in residency training programs on the use of patient feedback as an opportunity for reflection and improvement, again adopting the situated cognition theory that “book” knowledge is insufficient to learn excellent clinical care if the patient is unable to receive the care compassionately, sensitively, and professionally.

Other Examples of Where this Theory Might Apply

Situated cognitive learning is occurring in clinical settings by a matter of course. The constant and complex interplay of the patient and the environment, the other staff and providers, as well as the experiences of the learner and educators, necessarily both affects the learning process and informs it. The inclusion of timely reflection and feedback is essential to learning in this environment as well, as the learner must be allowed to identify how and why the care of the patient changed as the interaction developed, and what he or she learned from that experience that will improve his or her future practice.

In the classroom setting, simulations that allow for problem - based learning, in which information about the patient and the context are dynamic, are prime examples of the situated cognition theory at work. For example, emergency medicine fellowships in wilderness and global health use simulated case scenarios to teach fellows how to care for patients in low - resourced and austere settings. At this post -

graduate level, the learner is highly educated in the field of emergency medicine but only in the context of the relatively highly-resourced western emergency department. For example: During a simulation, we may create a precipitous childbirth case with complicating shoulder dystocia - a condition the fellows should be able to manage. However, we add in a power outage and remove some equipment that would normally be available or place the scenario in a rural clinic with long transport times to a hospital. Such adaptations allow the fellow to learn in a dynamic and innovative fashion, in a scenario essential to the core competency of the fellowship.

Limitations of this Theory

There are several limitations to practically adapting a situated cognition model in medical education. First, adaptation of traditional medical school structure to accommodate problem-based learning, longitudinal patient interactions, and early preceptorships - activities that embrace situated cognition theory - may be logistically and culturally difficult. Such a shift requires not only educators who are well-versed in these learning styles, but also a willingness to shift a well-worn and ingrained paradigm of medical education via lecturing, Socratic-style questions, and written tests. Moreover, placing learners in clinical situations or even high-tech simulation labs can be challenging depending on availability and cost of such resources. Such opportunities are also time-consuming, often requiring travel, and may be dependent on unreliable patient volumes.

Another limitation is effectively evaluating learning interventions that use situated cognition: Without a traditional test or score sheet, the ability to measure acquisition of knowledge gained using situated cognition may be difficult and time-consuming. One must rely on direct observation, OSCE-style simulations, and qualitative data to evaluate within this theoretical context.

Returning to the case...

Faculty continued to discuss multiple residents' performance and ultimately returned to the discussion of how to address perceived performance deficiencies.

"In addition to individual plans for improvement, do we need to be looking at our curriculum and how our weekly conference is going?"

Since many of the faculty are also on the curriculum and conference committees, this discussion amplified and began to look systemically at the manner in which much of the programs learning is being delivered.

"You know, several of us have been discussing the need for more integrated simulation and small group case discussions" one faculty remarked. "We seem to be very heavy on delivered lectures without always making full connections to the clinical application of the knowledge. I suspect that providing a more immersive experience may be beneficial for both learners like Paul and Peter."

To further address the variety of learners within the program and in hopes to further engage faculty involvement in conference, program leadership looked to invoke principles related to situated cognition. By increasing the use of clinical case discussions in conference, faculty and residents felt that the information was more relatable and applicable to clinical situations. Additionally on shift, there was in-

creased effort to relate clinical situations to common board-style questions that the learners will encounter.

Through these changes, both learners and educators felt there was significant improvement in knowledge translation, both from conference topics to the clinical setting but also through utilizing clinical situations to cement the application of knowledge and allow it to be recalled based on the situational experience.

While it will take some time and additional evaluation to determine if these changes result in improvement across the board, both with clinical application of knowledge and translating that to knowledge recall in a standardized testing environment, initial indicators appear promising. By providing a learning experience drawing on situated cognition, Paul has improved his practice test scores significantly while on an improvement plan and Peter has been receiving significantly better on-shift evaluations and feedback.

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This manuscript provides a concise and clear summary of the situated cognition theory, specifically how it differs from information processing theory, and then discusses how and which medical education practices use the theory. The article clearly defines the theory and discusses how it is particularly useful in medical education. Moreover, the author discusses the challenges of researching the efficacy of medical education based in situated cognition and provides examples of how such research can be done effectively, i.e. reliance on mixed - methods approach and emphasis on qualitative data.

2. Brown, J. S.; Collins, A.; Duguid, S. (1989). "Situated cognition and the culture of learning". *Educational Researcher*. 18 (1): 32–42. [Link here](#)

This manuscript by Brown et al. is amongst the first and most referenced works firmly introducing the concept of situated cognition as a learning theory. The authors clearly define the framework for the theory including examples to illustrate the concept that knowledge and thus learning is situated in the context and activities where it is acquired. The fundamental argument of the work is that education has traditionally relied on the explicit at the sacrifice of the implicit instead of creating a cohesive balance.

3. Hearn J, Dewji M, Stocker C, Simons G. **Patient - centered medical education: A proposed definition.** *Medical Teacher* 2019, 41(8):934-938. DOI: [10.1080/0142159X.2019.1597258](https://doi.org/10.1080/0142159X.2019.1597258)

The aim of this paper is to review literature on patient- centered medical education and arrive at a standard definition and description of this learning style. The authors first identify and define “patient-centered care” for the reader, recognizing that this model of health care has become the gold standard internationally. As a result, patient - centered medical education has become essential. The authors identify it as any learning opportunity that focuses on the patient’s input, socio- cultural context, and health needs. Introduction of medical students to patients early in their career, as well as opportunities for them to interact longitudinally with patients, are used as examples, as well as the novel inclusion of patients in development of medical school curricula and selection of medical student applicants.

Ausubel's Meaningful Learning Theory

Authors: James Hoffman, MD; Ricciardo Bianchi, PhD; Muhammad Durrani, DO

Editor: Michael Gottlieb, MD

A Case

John is a medical student on a rotation in the Emergency Department. On a busy Friday evening shift in the Emergency Department, John asks Dr. Smith if he can see a new patient with a chief complaint of “shortness of breath.”

“Of course,” Dr. Smith replies, and John goes to assess the patient.

Dr. Smith is then handed the patient’s ECG, which shows an anterolateral ST-Elevation Myocardial Infarction (STEMI). The team begins to mobilize and the interventional cardiologist is paged.

Both Dr. Smith and John note that the patient is short of breath with peripheral edema and his blood pressure is low. Dr. Smith shows John the patient’s ECG and discusses with the patient what is currently going on and that it appears the patient needs to undergo emergent cardiac catheterization. After stabilization and resuscitation of the patient, the patient is transferred to the catheterization suite for percutaneous coronary intervention.

After Dr. Smith and John return to their workspace, Dr. Smith asks “Do you have any questions about the case we just saw?”

John admits that he has not seen a STEMI patient before and is confused about how the patient’s symptoms of shortness of breath and hypotension fit.

In an effort to simplify the concept for John, Dr. Smith confidently and clearly states that “the antero-lateral STEMI caused a large area of infarct in the left ventricle and this led to cardiogenic shock.”

John is confused and tells Dr. Smith that he still does not understand what exactly happened and is also struggling with the concept of cardiogenic shock as he has never taken care of a patient with it before.

It is nearing the end of Dr. Smith’s shift and she is frustrated that she cannot convey this seemingly simple concept to John. Dr. Smith prints out a review article on cardiogenic shock from the American Heart Association and asks John to read it while she finishes up her shift.

John senses Dr. Smith’s frustration and says that he will look it over and thanks her for her time.

Both of them are left frustrated and wondering how the situation could have gone better.

OVERVIEW

Educational psychology, the study of the social, emotional, and cognitive processes that occur in learners, has come a long way in the past 70 years.¹ The development of behaviorism in the 1950s considered learning in the form of conditioning, with a focus on observable and measurable external factors. However, this theory did not account for cognitive processes and the internal factors influencing the learner. This led to a shift in education theory towards a focus on cognitive processes and constructivist ideas. David Ausubel, an American psychologist, contributed greatly to this field by developing one of the most profound educational theories, Meaningful Learning Theory, first published in 1963.²

Ausubel advocated that the most important factor in learning is that which the learner already knows. “Meaningful learning occurs when the learner interprets, relates, and incorporates new information with existing knowledge and applies the new information to solve novel problems”.³ External factors, such as one’s learning environment, were still considered significant, but the emphasis was primarily on internal factors and the individual learner. Previously, classroom teaching was primarily paternalistic in nature with the teacher serving as the foundation and relaying information to learners. With meaningful learning, the teacher primarily functions as a facilitator, helping learners to experience and absorb new information. This is accomplished by creating an environment in which learners are encouraged as well as permitted to experiment with concepts and act freely. The learner serves as the foundation in this situation.

Meaningful learning encourages teachers to use tools such as advance organizers to assist in the process of learning. These tools can be used prior to a learning experience to prepare the learner’s mind and activate specific prior knowledge that will be needed to understand and interpret the new information. An example can be a chart, graph, or an experiment.⁴ This involves active learning techniques, where the tools can stimulate learners to make meaningful connections between preexisting and new knowledge.⁵ Advance organizers are capable of serving this function because they are at a higher level of abstraction or generality than the information that follows, and they are based on what the learner already knows.⁵

In relating new information to old, the information is incorporated into a framework that makes sense of an overall concept. “The interaction of new knowledge with the existing ideas allows, through its cognitive activity, the learner to develop new meanings, which are unique to them.”⁶ To achieve this, a learner must be willing to learn as well. Only then will it be deemed interesting and meaningful so they can substantiate and understand the information. As new information is cognitively integrated within a framework of longstanding concepts and information, the learner is more readily able to assimilate and develop new meaning, while constantly reinforcing it each time it is applied.

MAIN ORIGINATORS OF THE THEORY

David P. Ausubel, MD, PhD

Other important authors or works:

Joseph D. Novak, PhD

Background

Educational psychology, the study of the social, emotional, and cognitive processes that occur in learners, has come a long way in the past 70 years.¹ The development of behaviorism in the 1950s considered learning in the form of conditioning, with a focus on observable and measurable external factors. However, this theory did not account for cognitive processes and the internal factors influencing the learner. This led to a shift in education theory towards a focus on cognitive processes and constructivist ideas. David Ausubel, an American psychologist, contributed greatly to this field by developing one of the most profound educational theories, Meaningful Learning Theory, first published in 1963.²

Ausubel advocated that the most important factor in learning is that which the learner already knows. “Meaningful learning occurs when the learner interprets, relates, and incorporates new information with existing knowledge and applies the new information to solve novel problems”.³ External factors, such as one’s learning environment, were still considered significant, but the emphasis was primarily on internal factors and the individual learner. Previously, classroom teaching was primarily paternalistic in nature with the teacher serving as the foundation and relaying information to learners. With meaningful learning, the teacher primarily functions as a facilitator, helping learners to experience and absorb new information. This is accomplished by creating an environment in which learners are encouraged as well as permitted to experiment with concepts and act freely. The learner serves as the foundation in this situation.

Meaningful learning encourages teachers to use tools such as advance organizers to assist in the process of learning. These tools can be used prior to a learning experience to prepare the learner’s mind and activate specific prior knowledge that will be needed to understand and interpret the new information. An example can be a chart, graph, or an experiment.⁴ This involves active learning techniques, where the tools can stimulate learners to make meaningful connections between preexisting and new knowledge.⁵ Advance organizers are capable of serving this function because they are at a higher level of abstraction or generality than the information that follows, and they are based on what the learner already knows.⁵

In relating new information to old, the information is incorporated into a framework that makes sense of an overall concept. “The interaction of new knowledge with the existing ideas allows, through its cognitive activity, the learner to develop new meanings, which are unique to them.”⁶ To achieve this, a learner must be willing to learn as well. Only then will it be deemed interesting and meaningful so they can substantiate and understand the information. As new information is cognitively integrated within a framework of longstanding concepts and information, the learner is more readily able to assimilate and develop new meaning, while constantly reinforcing it each time it is applied.

Modern takes on this Theory

In its original presentation, Ausubel’s Meaningful Learning Theory focused on the acquisition and retention of verbal knowledge in classroom settings where groups of young learners were presented with subject-specific information by teachers.² Over the years, this theory has increasingly impacted

learners of different ages in various learning environments. In his second monograph, Ausubel underlined that “the acquisition and retention of knowledge are [not] necessarily restricted to the formal instructional contexts of schools and universities, where designated teachers and pupils interact in stereotypical ways mostly for this purpose.”⁸ Actually, the acquisition and retention of knowledge are pervasive and lifelong activities essential for the competent performance, efficient management, and improvement of daily work tasks”.⁸

Ausubel also noted that the “promise of the cognitive approach to school (subject-matter) learning and to the acquisition, retention, and organization of knowledge in the learner's cognitive structure has been amply fulfilled since the publication of ‘The Psychology of Meaningful Verbal Learning’ in 1963.”⁸ However, the effects of meaningful learning and its application to instructional methods still remained to be investigated at higher levels of education.

As changes from passive and teacher-centered learning in large classrooms to active and student-centered learning in small groups have been increasingly adopted, the principles of the Meaningful Learning Theory have provided the foundation for new instructional methods. The emphasis on subsumption of new knowledge into the learner’s existing cognitive structure brings the focus on individual learners, emphasized in the self-directed learning modalities. The requirement for the learner to process the acquisition of new knowledge engages active learning, which is a prerequisite of adult learning theories. The achievement of meaningful learning ensures that the educational experience has practical applications for the learner and promotes their personal growth, which is the basis for goal-directed and competency-based learning.

In recent years, an effective strategy to achieve meaningful learning has emerged with the use of concept mapping.⁷ Concept maps are visual constructs of interconnected elements (concepts) that result from the processing of instructional material and relevant ideas by the learner. Concept mapping reflects the learner's cognitive structure assimilating new knowledge. Studies support the effective application of concept maps in medical student learning.

Gonzalez et al.³ had students learn a cardiovascular module of a medical physiology course by constructing concept maps related to cardiovascular physiology. The learning was supported by ‘mediators’ (i.e., faculty who assisted students with the cognitive process rather than with subject content). These students performed significantly better on problem

Other Examples of Where this Theory Might Apply

Other examples of where this theory might apply in both the classroom & clinical setting

Meaningful learning trains the learner to actively find ways to connect the new information gained from experience to current knowledge, thereby reorganizing and expanding the learner’s knowledge and skills. This educational approach is currently being utilized in many medical education programs to integrate basic and clinical sciences, to develop clinical reasoning, and to promote interpro-

fessional learning. One example includes the integration of basic and clinical sciences by promoting the collaboration of first- and fourth-year medical students during clinical grand rounds presentations, with a faculty member guiding them through concept maps.¹⁰ In this interesting application of the Meaningful Learning Theory, the advanced modifiers initially laid down by the faculty facilitator were adapted during the discussion towards the cognitive constructs of the students who explicitly guided the refinement and completion of the concept maps. Focus groups revealed that students appreciated the integrated learning of basic science and clinical medicine concepts, as well as the clinical reasoning thought processes.

In a methodological study on the construction and validation of an American Heart Association Basic Life Support course for distance learning, the authors provided a concrete example of direct application of Ausubel's theory for health professional education.¹¹ Using Bloom's taxonomy, cognitive educational objectives were defined, as per American Heart Association recommendations, to guide the course material development, the teaching-learning process, and the assessment. Three conditions of Ausubel's theory were built into the course to enable meaningful learning: (1) to tap into pre-existing knowledge of the learner, cases that the learners were familiar with were proposed; (2) to ensure the explicit predisposition of the learners to learn, objectives were targeted to the needs of the learners; and (3) to supply new and structured knowledge, content material was presented in a systematic and logical sequence.

Limitations of this Theory

Central to Ausubel's theory is the idea that selective anchoring of new material to existing cognitive structures is necessary for meaningful learning to occur. Yet the conditions that govern this selective anchoring also exposes inherent limitations to Ausubel's theory. Specifically, Ausubel's assertion that meaningful learning can only occur when a learner is conscientiously willing to learn highlights limitations that may arise when the intention and goals of the learner and teacher are not congruent with meaningful learning. For example, if the learner simply wants to store content for an upcoming examination, learning becomes mechanical instead of meaningful. Similarly, if the goal of the learner or teacher is to do well on an examination that rewards rote memorization, it may be more advantageous to the learner to justify mechanical learning in the short term.

Another limitation arises from the need for content to be meaningful from a psychological perspective to the learner. Each learner encompasses a unique outlook and has varied experiences that constitute their cognitive structure. Thus, if a learner cannot perceive or integrate the content being presented into their cognitive structure, teaching may become meaningless.

Lastly, Ausubel's theory necessitates that ample time be available to allow for anchoring and reinforcement of content. Depending on the educational system or constraints upon an individual and the teacher, the lack of ample time may steer the learner to mechanical learning instead of meaningful learning.

Returning to the case...

A few days later, John is on shift again with Dr. Smith. Dr. Smith comes over and asks, "Hi John, did that review article on cardiogenic shock help you to better understand the patient we saw together?" John admits that the review article was very complicated, and he was unable to understand it.

Dr. Smith nods and gestures for John to sit. "I've been thinking more about the patient we saw together and how to better teach you about cardiogenic shock."

Dr. Smith asks John about his background and any previous jobs he had held. John says that his family owns a plumbing business and he helped with jobs growing up. Dr. Smith says she wants to use John's plumbing background to try and explain cardiogenic shock and the patient's presentation to John (condition 1: material has significance to the learner).

John remarks that he knows about different plumbing systems, pumps, tanks, and pipes (condition 2: learner possesses relevant cognitive structures to anchor new information).

John is excited and highly motivated to prove to Dr. Smith that he can grasp this material (condition 3: intrinsic motivation for meaningful learning).

Dr. Smith begins by searching the internet for visual representations of different plumbing systems that utilize pumps, tanks, and pipes and shows this to John (graphical advance organizer). She remarks that she wants to use John's knowledge of plumbing systems to teach him about the patient they encountered (comparative advance organizer).

Dr. Smith tells John that there are systems of pumps, tanks, and pipes in our body just as there are in the field of plumbing (derivative subsumption). John knows the concepts of pumps, tanks, and pipes and now considers how these are also present in the human body.

Dr. Smith then discusses how the body's pump, tank, and pipes move blood similar to how sewage and water are moved through pipes (correlative subsumption). John realizes that he must alter his concept of pumps, tanks, and pipes as they relate to plumbing to now include the possibility of blood flowing through them.

Dr. Smith tells John to think of the body's system of pipes, tank, and pump as interconnected and states that this is how the circulatory system of the body works. She tells John that the tank represents the inferior vena cava bringing blood to the pump, which is represented by the heart. And lastly, John is told that the heart pumps blood through the pipes which can be thought of as the aorta and arteries of the body (superordinate learning). Although John has a working knowledge of plumbing and different pumps, tanks, and pipes, he is now able to grasp the concept of circulation through his previous experience.

Lastly, Dr. Smith tells John that, similar to plumbing, the body's pipes can become clogged from different materials. Dr. Smith relates to John the concept of atherosclerosis and plaque rupture.

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This seminal work introduced Ausubel's idea that learning of unfamiliar but meaningful content can be aided using "advance organizers" as a tool. It is hypothesized that the use of "advance organizers" will trigger pre-existing superordinate concepts that have been previously entrenched in a learner's cognitive framework to cultivate meaningful learning. Additionally, advance organizers serve as a tool to provide context and an organized overview of the information to be integrated utilizing known concepts.

2. Ausubel, D. The psychology of meaningful verbal learning. New York: Grune & Stratton; 1963.²

Ausubel first introduced his Meaningful Learning Theory in 1962, but fully elaborated his theory in this seminal work. He defined and emphasized meaningful learning and laid out the conditions that need to be met for meaningful learning to occur. Ausubel makes a distinction between rote learning and meaningful learning. He describes rote learning as arbitrary and non-substantively incorporated knowledge which is inefficiently integrated into a learner's cognitive structure. He contrasts this with meaningful learning, which he describes as conscientiously integrated knowledge building upon the learner's pre-existing cognitive structure in a non-arbitrary, non-verbatim fashion. He outlines that for this meaningful learning to occur, the material must have potential meaning or significance to the learner. Additionally, the learner must possess relevant previously acquired concepts to anchor and integrate the incoming knowledge. Lastly, the learner needs to conscientiously link the incoming knowledge to their cognitive structure and have intrinsic motivation in order to meaningfully learn.

3. Ausubel DP. Educational psychology: a cognitive view, Ausubel DP. Holt, Rinehart, and Winston, New York; 1968.¹³

In this work, Ausubel further refines and outlines his Meaningful Learning Theory. This narrative goes over a detailed description of the various components of his theory in chapters 2 and 3. Ausubel outlines the importance of the learner's cognitive structure as a critical factor influencing learning. Additionally, the ideas behind meaningful reception of information, subsumption of knowledge, and advanced organizers are further elucidated. Ausubel particularly defines and illustrates four processes in these chapters. He outlines derivative subsumption, correlative subsumption, superordinate learning, as well as combinatorial learning, and their role in meaningful learning.

4. Novak JD. Meaningful learning: The essential factor for conceptual change in limited or inappropriate propositional hierarchies leading to empowerment of learners. Sci Educ. 2002;86:548-571.¹²

The heuristic devices of concept mapping and vee-mapping built upon and helped to translate Ausubel's theory into practical use. Concept mapping allows for a visual representation of the cognitive structure through its components of concepts, relationships, hierarchy, and cross-links.

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Sociocultural Theory

Authors: Tabitha Ford, MD; Mala Joneja, MEd, MD; Anna Bona, MD

Editor: Sreeja Natesan, MD

A Case

Julia is a resident in Internal Medicine covering the clinical teaching unit in July of her first year.

After a busy Monday night on-call covering the inpatient teams, she was happy when she looked back and realized that she was able to problem-solve and appropriately treat various patients who needed attention. She was especially glad that she effectively arranged the transfer of a patient with COPD to the Intensive Care Unit (ICU), and successfully talked one patient out of leaving against medical advice (AMA), in addition to dealing with all of the other calls and pages overnight.

She met the daytime team on Tuesday morning and gave her signout to the senior resident, Lisa, listing the main issues that came up. Remembering the final months of medical school when a highly-respected ICU attending gave a mandatory lecture on the key components of a handing over patients during sign out, Julia focused on trying to give the oncoming resident a good transition of care.

On Wednesday, Lisa ran into Julia after a lecture and mentioned that, on Tuesday morning, the daytime team was unable to send Mrs. Smith, a woman with newly diagnosed metastatic breast cancer, for her planned interventional radiology procedure. Julia had started the patient on heparin therapy overnight for a new pulmonary embolism and had not informed the day-team. Julia remembered the case, and was horrified to realize that she had forgotten to communicate this in the sign out.

Though Lisa provided this feedback in a very kind senior-to-junior resident teaching manner, Julia felt that she had let down the day-team by neglecting to convey this particularly important detail during the transition of care. As she reflected on the sign out list, she recalled feeling overwhelmed with all of the issues that had occurred during her shift, including the ICU transfer and the patient who was going to leave AMA.

In October of the same academic year, Julia was scheduled to begin an 8-week rotation in the ICU as a junior resident. Not only was she very nervous to begin a rotation where she would be responsible for making multiple critical decisions on shift, but she was also more afraid that she would make another error during the handoff and that a patient would have a poor outcome caused by her oversight. Over the past few months, she had independently researched transition of care and tried different techniques, but she still felt unprepared as October loomed closer.

OVERVIEW

Sociocultural learning theory (SCT) is based upon the concept that learners initially develop new knowledge and skills by observing and interacting with others in their environment. It highlights the importance of social interactions for all learners, from children to medical residents. For example, children are only able to master a new capability after watching their caregivers perform the task. Similarly, medical residents develop over time the ability to efficiently and effectively communicate the details of a patient's condition to others through observation and practice. This is refined only after several years of hearing details discussed in the language of clinicians, witnessing their preceptors conducting similar tasks, and being immersed in the social norms of the medical field.

The primary components of sociocultural learning theory are:

- **Social influence precedes individual development:**¹ Before a learner can adopt and understand a new practice or notion, they must first witness the behavior being performed by another or be engaged in an environment that promotes the understanding of a novel concept.
- **Psychological tools are important for the expansion of knowledge:**¹ Language is considered to be the primary psychological tool used by humans to promote learner development.
- **The sweet spot for learning is the Zone of Proximal Development (ZPD):**¹ In this area, learners are pushed to develop their proficiency by undertaking tasks that would be too difficult alone, but are possible with the help and guidance of another.
- **A “more knowledgeable other” is necessary for the ideal transfer of knowledge:**¹ In the ZPD, students need to have another person present, an instructor, who is familiar with the topic, and can assist the learner when they get stuck.
- **Learner support is maintained by a concept called scaffolding:**¹ Just as a scaffold is used to deliver materials and workers to required areas in a building under construction, learners need someone to support their growth and provide necessary tools for their development.

There are multiple definitions to remember when striving to understand sociocultural learning theory. Here is a quick glossary for your reference as you continue reading:

- **ZPD (Zone of Proximal development):** tasks or ideas that a learner may master with the assistance of another, but are too difficult to grasp alone
- **MKO (More Knowledgeable Other):** a peer or teacher who is more adept in a particular topic or skill and may help the learner progress
- **Scaffolding:** supporting a learner's development through the use of demonstration, tips, guidance, or other educational tools
- **CoP (Community of Practice):** a group of people working together to reach a common goal and learning together through their efforts

MAIN ORIGINATORS OF THE THEORY

Lev Vygotsky

Other important authors or works:

Jerome Bruner

Jean Lave & Etienne Wenger

Background

The person credited with the establishment of sociocultural learning theory is Russian psychologist, Lev Vygotsky, in the 1920s. This theory was contrary to the popular views of the time that centered around the concept of knowledge acquisition primarily depending upon the individual traits of a learner.¹ Vygotsky is most well known for his descriptions of the ZPD and the importance of a “more knowledgeable other” in a child’s advancement. In addition to being known for establishing sociocultural learning theory, Vygotsky also made significant contributions to educators’ understanding of the impact of language on learning.¹⁻²

After Vygotsky’s untimely death from tuberculosis in 1934, there was a long period of time in which his work was not widely known and was heavily edited due to barriers of language and political discourse.^{1,3}

In 1976, Jerome Bruner and his colleagues expanded on Vygotsky’s theory by describing scaffolding, a term used to characterize the aid a “more knowledgeable other” contributes to the development of learners, by supporting students until they are ready to work on their own.⁴⁻⁵ Scaffolding has been applied to adult learning theory in many fields, and more recently, some have proposed the usage of technological tools to perform scaffolding functions.⁵

In the 1990s, Lave and Wenger worked to describe Situated Learning Theory (SLT) in which learners progress through legitimate peripheral participation in a community of practice (CoP).⁶ A CoP is an environment in which multiple participants work towards a common goal by sharing information and learning from each other as they interact.⁷ Novice learners are typically included at the periphery of a CoP through intentional involvement with the guidance of central, more experienced participants, gradually increasing their level of participation as they gain comprehension and familiarity. Today, a community of practice may be utilized in the workplace, in the classroom through team-based learning, or in an online setting to further knowledge acquisition and productivity.⁶⁻⁸

Despite the increasing presence in literature describing sociocultural learning theory in education over the past 30 years, medical educators have tended to focus on learners as individuals and did not strongly consider the effects of the learning environment and social interactions on medical trainees. However, more recently, instructors in the field of medical education have begun to realize the importance of team dynamics and interprofessional development in the learner experience and have started integrating these theories into their practice.⁹⁻¹¹

Modern takes on this Theory

Modern takes on Sociocultural Learning Theory include Cultural-Historical Activity Theory in simulation education and the incorporation of the Zone of Proximal Development in surgical education.

Cultural-Historical Activity Theory provides a framework to evaluate simulation training by analyzing learners' relationships and the connections between thoughts and emotions related to their actions.¹²

Key points Yrjö Engeström emphasizes in this theory are that:

- 1) learning is accomplished as a group working towards a common goal,
- 2) context has many elements of influence, and
- 3) that measured outcomes have multifaceted perspectives.²

Simulation is a social activity, and incorporates a group of learners, which differs from the longstanding individualized theories typically applied in medical education.¹⁰ The use of simulation education has increased over the past decade, and its utility in team training has been recognized.¹³ The evaluation of simulation education using this model includes having a collaborative inquiry, with cycles of action and reflection which can be related to learning objectives, a simulation, and debriefing respectively.¹⁰

An example of an application of this theory is an interprofessional cardiac arrest simulation. The overarching objectives (*inquiry*) may be optimizing communication, collaboration, and developing a shared mental model with successful resuscitation management.¹⁴ The cardiac arrest simulation (*cycle of action*) has influences from each individual's prior experiences and knowledge, the physical setting and location, and the patient's characteristics. Each of the participating learners will have differing perspectives, from acting as team leader, to performing airway management, and to deciding on medication administration. Debriefing (*reflection*) will help to determine the connection between learners' perspectives and their actions.

In keeping with the principles of sociocultural learning theory, simulation can provide an ideal environment to create a ZPD for specific skills that is appropriate for learners to repeatedly practice skills.¹¹ Various scaffolding supports could include teachers, checklists, education videos, etc. that are added as needs, and then removed as learners progress.

As medical educators continue to recognize the need to emphasize teamwork and communication, Team-Based learning may be another useful framework where peers and near-peers can determine the ZPD and create a CoP.⁸

Additionally, surgical education has recognized the four stages of the ZPD as a useful educational model. Stage I includes assistance from more capable others, using modeling or guidelines. As the learner progresses, the support or scaffolding can be decreased, referred to as Bruner's Handover Principle. Utilizing feedback and frequent, clear goals can aid in this progression. In Stage II, the learner is self-assisted internally, before progressing to Stage III, independent practice with automatized performance. Stage IV results in deautomization and regression to the ZPD. The key point is that all levels of surgeons can benefit from assessment and feedback, particularly for rarely performed surgeries at high risk of deautomization.¹⁵⁻¹⁶ Future potential for medical education includes integrating these stages to help develop and maintain not only trainees', but also experienced providers' competency, thus extending the relevance of modern takes on SCT to continuing professional development.

Other Examples of Where this Theory Might Apply

Additional applications of this theory include online and virtual education. There is potential for virtual educational programs to provide scaffolding, with both assistance and tools to help learners accomplish tasks that they could not accomplish independently. This assistance can be in the form of prompts, videos, checklists, or explanation feedback.⁵ An example of such an educational program would be an online module on teaching how to give a high-quality signout for transition of care, including a demonstration video with modeling of an example and a detailed checklist.

Virtual communities provide a ripe opportunity for growth both in the classroom and clinical setting. In Australia, a high school utilized a "work progress" shared electronic writing platform that allowed the teacher and fellow classmates to provide written feedback for the learner's research project.¹² This shared format allowed for numerous educational social interactions for the construction of knowledge. ALiEM and CanadiEM created CoP to aid in scholars exchanging knowledge and mentorship.^{7,17} A CoP can be created in various clinical or academic environments to promote shared, group learning and a CoP can be a part of either medical school or residency training to help accomplish educational goals. In addition, a CoP could contribute to Team Based Learning, helping learners identify and progress through their ZPD stages together until automaticity is achieved.

Limitations of this Theory

The primary limitation to an in-depth understanding of Vygotsky's theories is the incomplete nature of his work due to his untimely death. In addition, there have been multiple translations of his original thoughts from Russian and it is thought that some details may be widely misinterpreted today.^{1,3}

Learning environments influenced by sociocultural learning theory often have many learners interacting and speaking in conjunction. This may cause undue stress for learners who have auditory sensitivities or difficulty with social interactions. Instructors must remain mindful of the individual needs of their students and be sensitive to their potential discomfort in this setting, providing options for less stimulating surroundings if necessary.

Every learner has a different ZPD. Sociocultural learning requires the instructor or “more knowledgeable other” to be attuned to each students’ current level of development and potential for knowledge expansion, individualizing feedback to promote an optimal level of advancement for all.

Returning to the case...

Julia began the first week of her ICU rotation with the experience of a few inpatient medicine rotations now comfortably behind her. On the first day of the ICU rotation, the attending physician, Dr. Rogers, suggested that Julia sit in on the morning signout meeting between attendings to observe the transition of care before going to see her assigned patients.

Julia noticed that the overnight ICU attending who was signing out had a clear and systematic approach to reporting to the daytime attending, and the same system was employed by each ICU physician signing out every morning. She made note of the acronyms used, keeping them in the notes section of her phone, and she also observed the amount of detail given for each case. She enjoyed the back-and-forth discussions during the signout, finding this to be an interesting learning experience as well.

At the end of the first two weeks, Julia approached Dr. Rogers to ask what training the ICU fellows receive around transitions of care. Dr. Rogers explained that signout was a key skill of ICU physicians and part of the practice culture, and they prepared fellows for this with frequent in-person simulation scenarios and regular direct observation by attending staff with feedback. She directed Julia to online videos that were used for the ICU training program and asked Julia why she was interested in transitions of care in particular.

With remorse, Julia silently recollected the case of Mrs. S. from July and the omitted detail of the new heparin drip at the signout.

Julia decided to share that she found the structured education of proper signout effective to improve provider communication and, therefore, improve patient safety and care. For her, the ICU learning environment was instrumental in developing her skills in transitioning care through observing and interacting with the attending physicians as they demonstrated proficiency in effective signout. By the end of the assignment, Julia was pleased to realize that she had made no significant errors during her handoffs and she felt much more comfortable advancing to her next clinical rotation.

Afterwards, she made a suggestion to her program leadership that the next year’s interns should have a simulation session regarding appropriate signout techniques during their orientation, monitored by experienced providers.

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This chapter succinctly summarizes the key features of sociocultural theory and provides examples for utilization in practice. Although it is primarily aimed at educators designing K-12 curriculums, the concepts can be easily expanded to medical education. This is a recommended starting point for those who are beginning to delve into social educational theory.

- 2. Yardley S, Teunissen PW, Dornan T. Experiential learning: AMEE Guide No. 63, *Medical Teacher*. 2012;34(2): e102-e115. doi: 10.3109/0142159X.2012.65074**

This is a thorough and accessible guide to experiential learning. It includes a summary of the theory and background on the theorists. It highlights the socio-cultural perspective on experiential learning, and brings together common threads and practical examples of learning. It finishes by including both a section on both clerkship education and a section on residency education which will help clinical educators apply the concepts of SCT in their teaching.

- 3. Verenikina I. *Vygotsky in Twenty-First-Century research*. Paper presented at the Proceedings of the World Conference in Educational Multimedia, Hypermedia and Telecommunications, Chesapeake, VA. <https://ro.uow.edu.au/cgi/viewcontent.cgi?article=2337&context=edupapers>. Published 2010. Accessed May 28, 2020.**

This paper discusses the history of sociocultural theory, from Vygotsky to modern day applications. The beginning discusses the background of Vygotsky and his development of sociocultural theory. One highlight is that, in addition to explaining the theory, it provides some context for SCT's development. It continues on to detail the ZPD, scaffolding, Situated Learning Theory, Cultural-History Activity Theory, and other contributors and influences to SCT including discussion of Human-Computer Interaction where humans use a computer, instead of language, as a tool. The closing provides examples and discussions of SCT education studies.

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