

# Kolb Meets Quality: Applying Learning Theory to a Process Improvement and Safety Curriculum

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## ABSTRACT

The healthcare landscape is changing, and the Accreditation Council for Graduate Medical Education has recognized the importance of training our physician workforce to demonstrate competency in quality, safety, and process improvement. In the renewal of our quality improvement and patient safety curriculum, we set out to create an impactful and relevant course of study using adult learning theories as a scaffold to design the curriculum and inform our teaching methods. In this Perspective, we describe a few key learning theories and demonstrate how we have used them in the teaching of quality improvement and patient safety concepts. Our intent was to create a curriculum that could equip the next generation of physicians with the knowledge, skills, and attitudes they will need to adapt to the changes they face in practice and improve their work environments.

### Keywords:

adult learning; learning theory; quality improvement; patient safety

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(Received in original form February 1, 2023; accepted in final form August 1, 2023)

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**Author Contributions:** Conception, design, drafting, and revision of the manuscript: M.M.L. and S.I.K.

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ATS Scholar Vol 4, Iss 4, pp 431–440, 2023  
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DOI: 10.34197/ats-scholar.2023-0021PS

Health care today is rapidly changing to meet various policy, financial, and regulatory requirements. These changes include value-based care and pay-for-performance models, which tie financial incentives to quality and safety outcomes. Physicians must have a basic understanding of quality improvement (QI) and patient safety (PS) concepts to support change in their work environments in response to these trends. The Accreditation Council for Graduate Medical Education has recognized the importance of QI and PS (QIPS) education and has made it a core requirement of training programs. Despite the need for optimized QIPS training, a standard curriculum has not been established. Education literature has shown that learning outcomes are improved if teachers have an understanding of educational techniques and learning theory (1). With our combined knowledge, expertise, and interest in both education and quality and safety, we set out to enhance the effectiveness of our training in QIPS. We developed a curriculum highlighting impactful and relevant QIPS concepts while intentionally using adult learning theory as a framework to inform our teaching methods. In this perspective, we demonstrate how we have used specific learning theories in teaching key QIPS concepts to increase the stickiness of the learning so that our trainees can use and apply them in their professional lives.

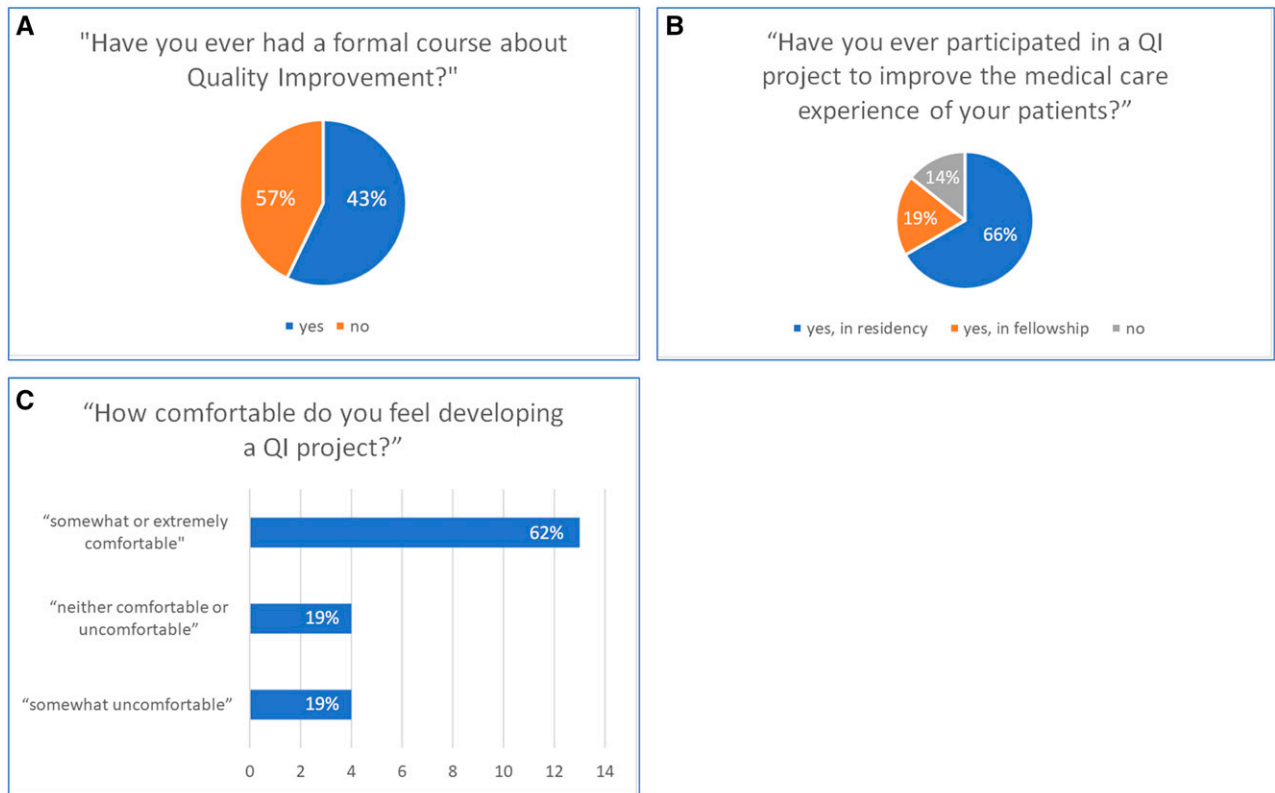
### NEEDS ASSESSMENT AND LITERATURE REVIEW

The previous continuous QI program in the division was born out of a need to fulfill Accreditation Council for Graduate Medical Education requirements and created a space to address challenges in the various clinical environments in which

we practice. Despite good intentions, the conference lacked structure, did not have a defined curriculum, often confused QI with research, and became a forum for fellows and faculty to complain about perceived problems in our workspaces without clear plans to address them. Systemic structures related to PS were not discussed in a way that provided trainees the agency to improve the safety of the environments in which they worked. Although projects were emphasized, they had unclear scope, priorities, goals, and metrics, with few faculty mentors. Many projects would carry over year after year without clear progress or resolution.

To better understand gaps in knowledge and needs for a future curriculum, we performed a literature review and a brief needs assessment in January 2019 before developing our QIPS curriculum. We surveyed our fellows ( $n = 21$ ; 100% response and completion) about their previous QI experiences (Figure 1) and simultaneously administered a short 12-question quiz testing knowledge of fundamental QIPS principles. From these data, we concluded that many of our trainees had no formal education in QI, though most had participated in QI projects and felt comfortable doing so. In addition, they had relatively poor knowledge of fundamental QIPS principles, with an average score on the knowledge test of 50% correct ( $n = 21$ ; total 12 questions; range, 2–9 correct; mean score, 6; standard deviation, 1.8).

In our review of the literature, we affirmed that there is currently no standard curriculum or teaching methodology for QI education (2–7). In addition, it has been shown that learning in QI is more effective if implemented in a clinical setting and that an experiential component within these settings results in improved



**Figure 1.** Survey results. Results of our needs assessment survey completed in January 2019. (A) Fellows' previous exposure to QI curriculum. (B) Previous participation in QI projects (C) Comfort in developing QI projects. QI = quality improvement.

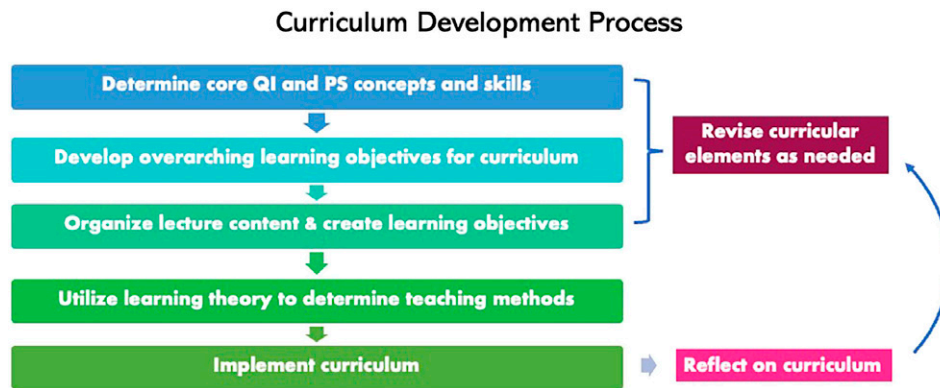
learner outcomes (4). A QI curriculum focusing on knowledge transfer alone is insufficient to address the gaps in delivering high-value health care in our current health-care system (5). Although the tools and methodology of QI are important, at the heart of QI is the ability of a group of individuals to learn and create change in their environment collectively and iteratively.

### QIPS CURRICULUM

In creating the curriculum, we started by brainstorming fundamental QIPS concepts that we believed were the most important, relevant, and applicable for our trainees to learn. These topics reflected standard practices used in QIPS committees and projects, were informed by Lean methodology (8) and Institute for Healthcare Improvement (9) frameworks,

and mirrored the gaps in knowledge and practice that were elucidated from our survey and the literature review. We then set our overarching learning objectives, charted our lecture series by topic, and created the curricular content (Figure 2). Our goal was to create a dynamic and engaging curriculum that did not rely heavily on didactics and deliberately used adult learning theory to frame our teaching methods.

As a result, we developed an 18-month QIPS curriculum that incorporates both didactics and the application of concepts. We, the authors, lead and conduct all the hour-long sessions monthly for the fellows and faculty members. These meetings were conducted in person before the pandemic and have transitioned to a concurrent virtual and in-person classroom format. The capstone of the curriculum is



**Figure 2.** Curricular development process. PS = patient safety; QI = quality improvement.

a fellow-led PS or QI project in which they identify a problem, develop an improvement or safety plan, and pilot and implement the plan in their local clinical environment. Fellows are provided a rubric that sets expectations, delineates the process, and objectively measures project success. Fellows present quarterly project updates and receive feedback from faculty members and peers. The last component of the curriculum incorporates the division's monthly morbidity and mortality (M&M) conference to highlight and apply concepts and content addressed in the QIPS curriculum.

### LEARNING THEORY AND CURRICULAR DESIGN

Adult learning theory provided the basis for the structure and design of how we taught the QIPS curricular content. Using learning theories allowed us to choose the proper instructional strategies and learning aims on the basis of the context and learning environment (10). We recognized that there is no single overarching theory of learning but rather groups of theories that share common elements. Although we used many different learning theories, transformative, social, and experiential learning theories are most distinctly demonstrated in the curricular design.

Incorporating these pedagogies into the development and teaching of the QIPS curriculum exhibits their practical application. Our intention in using these teaching methods was to add depth and relevance to the content and increase engagement from faculty members and fellows. This deliberate use of learning theory in our curricular design is an example for further QI curricular design and development (Table 1).

### TRANSFORMATIVE LEARNING THEORY

Developed by Jack Mezirow in 1978, transformative learning theory hypothesizes that learners make sense of the world using different assumptions, expectations, and beliefs (11).

Transformative learning challenges learners to change their existing beliefs and frames of reference using procedural tasks, problem solving, and self-reflection. Transformative learning occurs when learners face a “disorienting dilemma” that causes them to confront their current perspectives and practices and results in reflection on the scenario. Learners engaging in reflective discourse must test one another’s assumptions and consider others’ perspectives. An environment of empathy

**Table 1.** Learning theories and how they were applied in the quality improvement and patient safety curriculum

Learning Theory	Summary of Theory	Application of Learning Theory in QIPS Curriculum
Transformative	<ul style="list-style-type: none"> <li>• The goal is to help learners change or transform their current frames of reference through problem solving, procedural tasks, and self-reflection</li> <li>• Use of reflective discourse to challenge assumptions and consider others' perspectives</li> </ul>	<ul style="list-style-type: none"> <li>• Revised M&amp;M format                             <ul style="list-style-type: none"> <li>○ Discussion of human factors and cognitive biases</li> <li>○ Identify variability in processes that lead to systems failure</li> <li>○ Have learners reflect on assumptions they carry in approaching the identified problem</li> <li>○ Propose the next steps to prevent failures from reoccurring</li> </ul> </li> </ul>
Social	<ul style="list-style-type: none"> <li>• Meaning is derived from the real-world context</li> <li>• Educators immerse learners in authentic activities and apprenticeships</li> </ul>	<ul style="list-style-type: none"> <li>• QIPS projects                             <ul style="list-style-type: none"> <li>○ Trainees are expected to observe their work environments and identify relevant opportunities for improvement</li> <li>○ Projects take place in trainees' work environments</li> <li>○ Involve local stakeholders from various disciplines in the design and execution of the project</li> <li>○ Project presentations quarterly to gain feedback and perspective</li> </ul> </li> </ul>
Experiential	<ul style="list-style-type: none"> <li>• Learning and change happen when concrete experiences are integrated with cognitive processes</li> <li>• Individuals show knowledge acquisition or learning when applying theoretical concepts to new situations</li> </ul>	<ul style="list-style-type: none"> <li>• Classroom simulation and practical application and simulation                             <ul style="list-style-type: none"> <li>○ Briefs and debriefs (e.g., code blue, intubation, family meeting)</li> <li>○ PDSA cycles: trainees present each cycle of change during quarterly project updates</li> </ul> </li> </ul>

*Definition of abbreviations: M&M = morbidity and mortality; PDSA = plan-do-see-act; QIPS = quality improvement and patient safety.*

and trust is necessary to make these discussions the most effective.

The change in our M&M conference structure as a part of our QIPS curriculum best exemplifies our intentional application of transformative learning theory. M&M conferences have been commonly used in medical education to identify opportunities for learning and improvement (12, 13). M&M conferences incorporate clinical knowledge gaps and aim to identify systems issues contributing to untoward outcomes or failures.

Before the institution of our revised QIPS curriculum, cases presented at M&M conferences did not follow a standard structure. Conferences often transitioned away from better understanding how failures occurred and turned into case conferences at which learners focused on common clinical errors and their representation in the literature. Trainees variably connected how providers interacted with one another and how systems in their environment influenced their practice.

Recognizing that trainees have many more opportunities to identify clinical knowledge gaps and very few opportunities to understand better the systems in which they practice, we believed that a properly structured M&M conference would be a vehicle to challenge their understanding of existing processes, consider their impact on the system in which they work, and reflect on human factors and bias. In that vein, we designed a case-based M&M format to identify systems and human factors contributing to undesirable quality or safety outcomes. After presenting the clinical timeline of the case and the error, near miss, or quality threat (delays in care, miscommunication, etc.), trainees create a fishbone diagram identifying causes in

discrete categories—people, environment, policies and procedures, technology, and others as appropriate to the case—that led to the untoward outcome or effect. There is also a specific focus on cognitive biases that may have affected the outcome, identified through interactive discussion.

Finally, on the basis of the systemic gaps and inherent biases, the participants devise a plan to mitigate the harm or undesirable outcome in the future. The faculty moderator creates a safe space to discuss errors and push the learners to question their assumptions. This specific format intentionally forces learners to discuss their reflections on why and how we do what we do if our work is appropriate and highly reliable and contemplate how biases and mental models may have affected care.

## SOCIAL THEORIES OF LEARNING

Social learning theories postulate that learning occurs in a social context and that people learn primarily by modeling and observation. Context and community are at the crux of social learning theories and propose that students are more inclined to learn in the setting in which the knowledge gained is applied. Situated learning or situated cognition describes how learners gain knowledge by participating in a “real world” context. Students move from the periphery of a community to the center as they gain knowledge and expertise, actively engaging and participating in the sociocultural practices of the community or a “community of practice” (14).

Learning is often unintentional and occurs when students participate in collaborative activities in which they are challenged to use critical thinking skills and participate in their learning experience. In situated cognition theory, knowing is inextricable

from doing, and educators are called to immerse learners in authentic activities and apprenticeships (15). Social learning theories recognize that the learning process goes beyond transmitting content knowledge. Instead, the interactions between the learner and their communities of practice help develop skills and experience within their real-life setting.

Social learning theory is highlighted in the QIPS curriculum in the didactic sessions that lay the foundation for the improvement process and in the capstone QIPS project in which the trainees participate. The QIPS projects require that trainees perform projects to improve their local clinical environments through observation and reflection on the systems in which they work. As part of the QIPS project, trainees must observe the environment and process they wish to improve, noting the interactions among people, systems, and the environment. This practice, or “Gemba” in Lean methodology, aims to understand the work in the context of the local environment so that the identified problems and the improvements are specific and relevant (8). The notion of Gemba, meaning “the actual place” in Japanese, fits very well with this learning theory. Intending to contextualize the problem in its current ecosystem, the Gemba allows learners to consider local culture and processes when designing each stage of their improvement project.

Successfully executing a project in context brings to light the interdependency of team members and the social ecosystem in which the project is being conducted. As projects evolve, learners are encouraged to consider scalability in other areas by trialing the same project in a different system, again using a Gemba approach so that their projects can be appropriately

adapted to other environments. In each case, trainees are expected to interact with local leaders, influencers, and stakeholders to assess the feasibility and how unique challenges of the varied microenvironments can affect the operationalization and success of the project. Thus, learners develop a community of learning, can develop expertise within their community of practice, engage in a collaborative learning environment, and are immersed in authentic and meaningful activities.

## EXPERIENTIAL LEARNING THEORIES

Experiential learning theories focus on the individual’s experiences and are the type of learning strengthened or weakened by the consequences of behaviors or actions. The best known of these theories is that of David Kolb. In Kolb’s experiential learning model, learning and change happen when concrete emotional experiences are integrated with cognitive processes. Kolb believed that individuals could show knowledge acquisition or learning when applying these theoretical concepts to new situations (16).

In Kolb’s experiential learning theory, learners progress through a four-stage cycle. The first stage is *concrete experience*, in which learners encounter a specific experience when they engage in an activity or task. Second, in *reflective observation*, they step back and reflect on the task. Communication is vital in this stage and allows questions and discussion. Next is *abstract conceptualization*, in which learners make sense of the experience and, from reflection, draw conclusions using their prior knowledge and discussing possible theories with peers. Last is *active experimentation*, or the testing phase, when learners return to participating in a task and apply their conclusions to new experiences. They make

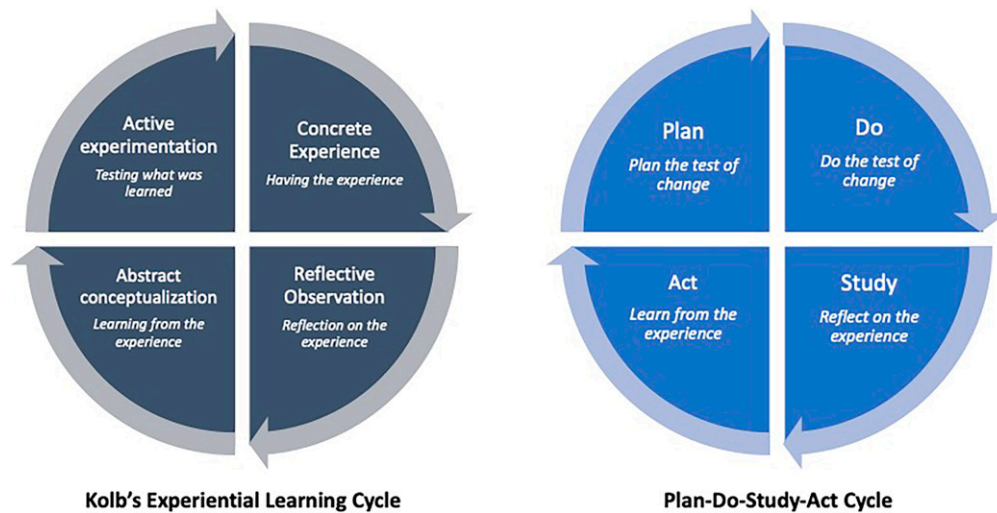


Figure 3. Comparing Kolb's cycle and the plan-do-see-act cycle.

predictions, analyze tasks, and make plans for the acquired knowledge in the future (16). A hallmark of Kolb's learning theory is applying abstract concepts to new experiences. In the QIPS curriculum, this application occurs in various classroom simulations and real-life settings. Two areas in which experiential learning theory is highlighted in the curriculum include briefing and debriefing tools from the Agency for Healthcare Research and Quality and plan-do-see-act cycles.

With communication cited as one of the most common root causes of errors in health care (9), our QIPS curriculum emphasizes the importance of communication practices that have been shown to decrease errors, increase shared mental models, and increase contingency planning on teams. Briefs and debriefs, tools from the Agency for Healthcare Research and Quality's TeamSTEPPS framework (10), are structured communication tools commonly used to align communication around specific events. We practice these scenarios in classroom simulations and common intensive care unit (ICU) processes that

benefit from preplanning, such as central line placement, intubation, and family meetings. Using an intubation procedure as an example, we ask our fellows to perform a brief with the team. The brief includes the time-out, a review of the role of each person in the room, the medication plan, the intubation plan, and contingency planning to address what the team would do to adapt to deviations from the expected process. Team members read back their roles to achieve the common goal of shared understanding. It also requires individual collaboration and provides a plan for performing the upcoming process. The intubation is then performed: Kolb's concrete experience. Then team members are asked to debrief after the completion of the procedure. Debriefs are another communication tool encouraging reflection and improvement after an event. Debriefing allows the trainees and team members to recap the event and provides them with immediate feedback for reflective observation. Supervising faculty and team members participate in the debrief to help with the abstract conceptualization to make sense of what the trainees did



well and what needs improvement. Active experimentation is the last step, applying and incorporating the improvements discussed into subsequent intubation procedures. Then the cycle is repeated. In the next brief, learners are expected to incorporate lessons learned from past cycles and incorporate them into practice.

Second, the plan–do–see–act improvement cycle (17) is another example of the complete cycle of experiential learning theory, closely mirroring Kolb’s learning cycle (Figure 3). We intentionally teach this concept using medical and nonmedical scenarios, allowing learners to understand the full impact and applicability of the process. In classroom simulations, students are given a goal to achieve and asked to iteratively work with their team to improve the task given to them. This experience is translated into their process improvement projects, and trainees are asked to present each learning cycle of their projects to the larger group during their quarterly report-outs.

## CONCLUSIONS

Before implementing our current QIPS curriculum, the previous learning sessions had poor attendance and minimal participation from fellows and faculty members. There appeared to be a variable understanding of distinctions between research and QI and how QI and PS fit in healthcare delivery. Projects lacked rigor, had minimal collaboration among stakeholders, and often did not result in a sustained change in the clinical environment.

The catalyst for revamping the QIPS curriculum was to ensure that this crucial topic was taught in a way that would be meaningful, impactful, and applicable

both to the learners and the systems in which they work. Incorporating learning theory to inform the curriculum has increased engagement and participation by both faculty members and fellows and has improved the relevance of the projects.

We have also observed that the QIPS curriculum has changed behavior within our division. Trainees and faculty members spontaneously discuss and address biases while at the bedside during rounds; briefs and debriefs are increasingly part of the culture and practice in the ICU, there is a better awareness around processes and systems-based learning, and trainees have taken the initiative to report near misses and unsafe practices. Also, projects initiated through our curriculum have continued and created sustainable change, such as implementing an ICU checklist and decreasing the number of ordered chest X-ray examinations in the ICU after a chest x-ray reduction project.

Our curriculum is unique in that there is intentionality in building reflection into the curriculum’s classroom and project elements. There is less emphasis on imparting information and “knowing the tools.” Instead, the focus is on promoting inquiry, self-reflection, and improvement habits. Implementing this QIPS curriculum informed by learning theory has given us a way to equip the next generation of physicians with the knowledge, skills, and attitudes they will need to adapt to the changes they face in practice and improve their work environments.

**Author disclosures** are available with the text of this article at [www.atsjournals.org](http://www.atsjournals.org).

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