

**New Culture of Learning:
Creating Significant Learning Environments Through the
Crux Flipped-Lab Imaging Library**

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Creating significant learning environments requires more than improving instructional efficiency or adding new technology to an existing course structure. It requires a cultural and pedagogical shift in how learning is designed, experienced, practiced, and sustained. In *A New Culture of Learning*, Thomas and Brown (2011) argued that meaningful learning occurs when learners have access to information, opportunities for inquiry, freedom to explore within boundaries, and participation in a collective learning environment. This view directly supports the goal of creating significant learning environments because it moves learning away from passive reception and toward active participation, practice, reflection, and learner ownership.

My innovation plan, Crux: A Flipped-Lab, Indexed On-Demand Imaging Library to Improve Cardiac Sonography Clinical Readiness, addresses a significant instructional challenge in the Cardiac Sonography program: students have limited hands-on lab time before their first clinical rotation, and too much of that limited time is currently spent receiving repeated instructor demonstrations rather than practicing scanning skills under direct feedback. Students complete only one 80-hour lab course before clinical placement, and the curriculum pathway provides little flexibility to add another lab course. Therefore, the program must rethink how existing lab time is used.

The Crux innovation proposes a flipped-lab model supported by a segmented, indexed, on-demand imaging library. Students will review standardized instructional videos

and images before lab, allowing in-person laboratory sessions to focus on hands-on scanning, coached troubleshooting, individualized instructor feedback, and deliberate practice. My full innovation plan can be accessed here: [ePortfolio link to Crux Innovation Plan.](#)

The purpose of this paper is to explain how shifting toward a significant learning environment can enhance student learning, improve clinical readiness, and support sustainable change within the Cardiac Sonography program. My intended audience includes the Cardiac Sonography Advisory Committee, Diagnostic Medical Imaging administration and leadership team, clinical partners, preceptors, and faculty responsible for laboratory instruction. These stakeholders need to understand that Crux is not simply a video library; it is a redesigned learning environment intended to increase student ownership, strengthen performance-based learning, and improve the program's ability to prepare students for clinical success.

The Need for a New Learning Culture in Cardiac Sonography Education

Cardiac sonography education is complex because students must develop both conceptual understanding and psychomotor fluency. They must learn cardiac anatomy, scanning windows, probe manipulation, image optimization, measurements, patient positioning, and professional decision-making. These skills cannot be mastered through observation alone. Students must practice repeatedly, receive corrective feedback, reflect on performance, and apply adjustments in real time.

The current instructional structure creates a capacity problem. Students in the

cardiac sonography program complete only one 80-hour lab course before their first clinical rotation. Faculty instructional logs indicate that approximately 50–60% of early lab sessions are spent on live demonstration. Although demonstration is necessary, this model leaves less time for students to perform scanning repetitions under instructor supervision. As a result, first-attempt competency pass rates average approximately 62%, and nearly one-third of students require remediation before clinical placement.

These data suggest that the primary problem is not a lack of faculty effort or student motivation. Instead, the problem is structural. The learning environment is organized in a way that prioritizes information delivery during the very time students most need performance practice. A significant learning environment can address this problem by reallocating instructional time and changing the role of both students and instructors. Students become active preparers, practitioners, and reflectors. Instructors become coaches, diagnosticians, and facilitators of feedback-rich practice.

Fink (2013) explained that significant learning includes foundational knowledge, application, integration, the human dimension, caring, and learning how to learn. This framework is especially relevant to sonography education. Students need foundational knowledge of cardiac structures and scanning protocols, but they also need application through hands-on scanning. They must integrate anatomy, physics, pathology, and patient care. They must develop professional identity and confidence. They must care about accuracy because their work affects patient diagnosis. Finally, they must learn how to continue improving throughout their clinical and professional careers.

Crux supports this broader form of learning by changing the purpose of lab time. Rather than using lab primarily for repeated instruction, Crux uses asynchronous modules to support pre-lab preparation and reserves face-to-face time for active performance, feedback, and refinement. This shift creates stronger alignment between the learning environment and the actual demands of clinical sonography practice.

Fundamental Ideas From *A New Culture of Learning*

A major idea from Thomas and Brown (2011) is that learning thrives when information is abundant and learners are supported in making meaningful use of it. In a traditional lab environment, students depend heavily on the instructor's live demonstration. If they miss a step, forget a probe movement, or need to review an image optimization technique, they may have to wait until the instructor can demonstrate it again. This dependency limits learner autonomy and slows practice.

Crux brings the new culture of learning into the cardiac sonography lab by making foundational demonstrations accessible on demand. Students will be able to review core cardiac views, probe placement, image optimization steps, and measurement techniques before, during, and after lab. The imaging library will be indexed by imaging window, view, anatomy, measurement type, troubleshooting scenario, and difficulty level. This structure supports timely retrieval and allows students to access guidance when they need it most.

Another important idea from Thomas and Brown (2011) is the relationship between the individual and the collective. Learning is not limited to what one student can discover alone; it is strengthened through shared practice, feedback, and participation in a learning

community. Crux can support this collective by creating common instructional language and standardized visual models across faculty, students, and clinical expectations. When all learners have access to the same core demonstrations, students and instructors can spend less time clarifying basic steps and more time discussing performance quality, troubleshooting, and clinical reasoning.

This collective dimension is especially important for faculty calibration. One risk in technical education is that different instructors may explain the same technique using slightly different language, which can confuse early learners. Crux will help reduce this variability by providing standardized models and supporting twice-annual faculty calibration sessions. These sessions will allow instructors to align expectations, review student performance trends, and update modules based on common errors observed during lab.

Thomas and Brown (2011) also emphasized the importance of play, imagination, and experimentation. In sonography education, “play” does not mean casual or unfocused activity. Instead, it means giving learners structured opportunities to explore, test adjustments, make mistakes, and learn from immediate feedback. Students need time to experiment with probe angle, pressure, rotation, depth, gain, and patient positioning. These small adjustments are essential to developing scanning fluency.

The flipped-lab model creates space for this kind of structured exploration. If students arrive with foundational knowledge already reviewed, faculty can spend more time observing students scan, asking guiding questions, and helping them troubleshoot. This

allows students to develop confidence through practice rather than depending only on memorized instructions.

How Crux Creates a Significant Learning Environment

Crux enhances learning by intentionally redesigning the relationship among content, time, practice, feedback, and learner responsibility. The imaging library is not the learning environment by itself. Instead, it is one component of a broader learning ecology that includes pre-lab preparation, hands-on scanning, instructor coaching, peer discussion, retrieval practice, competency assessment, and reflection.

First, Crux supports foundational knowledge by giving students access to consistent instructional modules. Each module will follow a predictable structure: setup, probe placement and orientation, image optimization, and measurement. This consistent design supports cognitive organization and helps students build mental models before attempting the skill in lab.

Second, Crux supports application by freeing lab time for scanning practice. Research on deliberate practice emphasizes that expertise develops through structured, goal-oriented repetition paired with immediate feedback (Ericsson, 2004). In the Crux model, students spend less time watching repeated demonstrations and more time performing the skills they need to master.

Third, Crux supports integration. Cardiac sonography students must connect anatomy, ultrasound physics, scanning technique, pathology recognition, and measurement accuracy. During lab, instructors can help students make these connections

through targeted questioning and coaching. For example, rather than simply telling a student to rotate the probe, the instructor can ask what structure is missing from the image, what adjustment might bring it into view, and how the resulting image affects measurement accuracy.

Fourth, Crux supports the human dimension of learning. Clinical readiness is not only technical; it also involves confidence, identity, and professional responsibility. Students who repeatedly struggle in lab may begin to see themselves as incapable, even when the issue is lack of practice time. A significant learning environment helps students view skill development as a process. By allowing repeated review and repeated practice, Crux can reduce anxiety and help students develop a stronger sense of professional competence.

Fifth, Crux supports caring. Students are more likely to value accurate scanning when they understand that image quality affects diagnosis and patient care. Faculty can use lab time to connect technical actions to clinical consequences. For instance, an incorrect measurement is not just a grading issue; it may influence how a patient's condition is interpreted. This connection can help students care more deeply about precision and professionalism.

Finally, Crux supports learning how to learn. Students will be expected to prepare before lab, identify areas of confusion, retrieve resources independently, seek feedback, and revise their performance. These habits are essential for clinical practice because sonographers must continue learning as technology, protocols, and patient needs change.

Influence on My Innovation Plan

Adopting the perspective of creating significant learning environments strengthens my Crux innovation plan because it prevents the project from becoming a simple technology upgrade. Without a learning-environment perspective, Crux could be misunderstood as a collection of videos or an optional study resource. However, the true purpose of Crux is to change the structure and culture of lab learning.

The innovation plan already includes several key actions: acquiring a 360-degree camera, producing instructor-led video modules, creating an indexed imaging library, deploying the resource outside the LMS for continuous access, piloting the library with foundational scanning instruction, collecting performance data, and implementing continuous improvement through module updates and faculty calibration. These actions support the development of a significant learning environment because they are not isolated technology tasks. They are part of a redesigned instructional system.

Crux will also support the program's three-year implementation plan. In year one, the focus will be development and pilot implementation. In year two, the model will expand across all first-year cohorts and include graded pre-lab preparation. In year three, Crux will be embedded into curriculum governance, faculty onboarding, and potentially expanded to vascular and abdominal tracks. This phased approach aligns with the idea that culture change must be developed over time through shared ownership, evidence, and refinement.

The significant learning environment perspective also clarifies the data that should be collected. Success should not be measured only by whether students watched videos.

Instead, the program should examine readiness quiz performance, supervised scanning repetitions, first-attempt competency rates, remediation frequency, student confidence, faculty feedback, and clinical preceptor evaluations. These measures provide a more complete picture of whether Crux is improving learning conditions and clinical readiness.

Anticipated Challenges and Responses

The first major challenge will be faculty resistance or fatigue. Faculty may worry that Crux adds work, replaces instructor expertise, or creates another technology initiative that will not be sustained. To address this concern, I will frame Crux as a way to protect the instructional value of faculty time rather than reduce it. Faculty expertise is most valuable when instructors are observing students, diagnosing errors, giving feedback, and coaching improvement. Crux moves repetitive foundational demonstration into an accessible format so faculty can focus on higher-impact instruction.

The second challenge will be student compliance with pre-lab preparation. A flipped-lab model depends on students completing foundational review before arriving in lab. If students do not prepare, lab time may still be consumed by basic instruction. To address this challenge, pre-lab accountability will be embedded through short readiness checks, LMS analytics where appropriate, and direct connection between preparation and lab performance expectations. Students must understand that pre-lab review is not optional homework; it is part of the laboratory learning process.

The third challenge will be maintaining quality and consistency across modules. Poorly designed videos could increase confusion rather than reduce it. To address this,

modules will be short, segmented, and structured consistently. Each module will focus on a specific skill or view and follow the sequence of setup, probe placement, image optimization, and measurement. Faculty review sessions will ensure that modules remain clinically accurate and aligned with program expectations.

The fourth challenge will be technology fatigue. Students and faculty already navigate multiple platforms, and an additional resource could become burdensome if it is difficult to use. To address this, the imaging library will be indexed for rapid access and hosted in a way that supports use before, during, and after lab. The goal is not to create a complicated content repository but to create a practical, searchable tool that students can use at the moment of need.

The fifth challenge will be sustainability. Many educational innovations begin with enthusiasm but fade when the initial developer moves on or when resources become limited. Crux addresses this risk by including annual maintenance costs, faculty calibration, curriculum governance integration, and a recurring institutional budget plan. Sustainability will depend on treating the imaging library as a maintained instructional system rather than a one-time product.

Organizational Impact

Adopting a significant learning environment perspective can positively impact the Cardiac Sonography program and the broader Diagnostic Medical Imaging department. At the program level, Crux has the potential to improve clinical readiness by increasing supervised scanning time and reducing remediation needs. The implementation plan

projects a 20–30% increase in first-attempt competency pass rates and a 25% reduction in remediation sessions by year two. These outcomes would benefit students, faculty, clinical partners, and the institution.

For students, Crux can increase confidence and reduce anxiety before clinical placement. Students will have repeated access to demonstrations and more time to practice with instructor feedback. For faculty, Crux can reduce repetitive demonstration demands and allow more time for individualized coaching. For clinical partners and preceptors, better-prepared students may require less basic correction during early rotations and may contribute more effectively to the clinical learning environment.

At the organizational level, Crux aligns with institutional priorities related to student success, workforce readiness, instructional innovation, and fiscal responsibility. The projected three-year cost is \$22,800, with estimated three-year efficiency gains of \$21,000 and break-even occurring during year two. However, the deeper value is not only financial. Crux represents instructional productivity reallocation. It uses existing lab time more effectively and strengthens the conditions under which students develop clinical competence.

This approach can also create a model for other programs. Once Crux is developed and validated in cardiac sonography, the same flipped-lab structure could be adapted for vascular and abdominal sonography tracks. In this way, the innovation may influence not only one course or cohort but the broader culture of clinical education within the department.

Helping People Think Broadly and Systemically

To support a new culture of learning, stakeholders must think broadly about the learning environment rather than focusing only on individual tools, courses, or assignments. In this assignment, thinking broadly does not mean adopting holistic learning as a separate concept. Instead, it means recognizing that learning is shaped by an interconnected system of time, access, feedback, assessment, faculty practice, student responsibility, clinical expectations, and institutional support.

Crux helps stakeholders think systemically by shifting the central question. Instead of asking, “How can we add more instruction?” the program can ask, “How can we redesign the environment so students spend more time doing the work that builds competence?” This question moves the conversation away from content coverage and toward performance development.

To encourage this broader thinking, I will use guiding questions with faculty and stakeholders:

- What do students need to be able to do independently before clinical placement?
- Which parts of lab time currently produce the greatest learning value?
- Which instructional tasks can be moved outside lab without reducing quality?
- How can faculty time be used for coaching rather than repeated delivery?
- What evidence will show that students are becoming more clinically ready?
- How can we sustain this model beyond the pilot year?

These questions help stakeholders see Crux as an instructional redesign rather than a technology purchase. They also reinforce that meaningful change requires alignment among instructional practice, leadership support, assessment, budget planning, and faculty collaboration.

A Foundational Perspective for My Learning Philosophy

My perspective on significant learning environments is broad enough to become a foundational influence on my learning philosophy and leadership practice. As a program director and educator, I believe learning should be designed around what learners need to become capable of doing, not only what instructors need to present. In cardiac sonography, competence develops through repeated performance, corrective feedback, reflection, and increasing independence. Therefore, my learning philosophy must prioritize active practice, learner ownership, and authentic application.

The COVA framework of choice, ownership, voice, and authentic learning, supports this philosophy by emphasizing that learners are more engaged when they have meaningful agency in the learning process (Harapnuik et al., 2018). Crux supports COVA by giving students more ownership over preparation and review, more choice in when and how they revisit demonstrations, more voice through feedback on module usefulness, and authentic learning through direct connection to clinical scanning performance.

This perspective will influence my actions as a leader. Rather than leading change through compliance, I want to lead by creating conditions where faculty and students can see the value of the innovation for themselves. For faculty, this means inviting

collaboration, using data transparently, and respecting professional expertise. For students, it means setting clear expectations while giving them the tools and responsibility to prepare, practice, and improve.

Ultimately, creating significant learning environments requires a self-differentiated leadership stance. Resistance is inevitable when instructional routines change. However, if I remain grounded in the purpose of improving student clinical readiness, I can respond to resistance with clarity rather than defensiveness. Crux is not about replacing what faculty do well. It is about redesigning the learning environment so faculty expertise and student effort are used where they matter most.

Conclusion

Creating a significant learning environment can enhance learning in the Cardiac Sonography program by shifting the culture from demonstration-centered instruction to performance-centered learning. *A New Culture of Learning* provides a useful foundation for this shift by emphasizing access, inquiry, collective learning, imagination, and learning through participation. Fink's significant learning framework further clarifies that meaningful learning includes foundational knowledge, application, integration, human development, caring, and learning how to learn.

The Crux flipped-lab imaging library addresses a real instructional problem: students have limited lab time before clinical placement, and much of that time is currently used for repeated live demonstration. By moving foundational modeling into an indexed, on-demand library, Crux reallocates lab time toward coached scanning, troubleshooting,

feedback, and deliberate practice. This shift supports stronger clinical readiness, greater learner ownership, and more effective use of faculty expertise.

The success of Crux will depend not only on producing videos but on creating a sustainable learning culture. Faculty calibration, student accountability, data-informed refinement, administrative support, and clinical partner feedback will all be necessary. If implemented thoughtfully, Crux can become more than an innovation plan. It can become a foundational model for how the program designs learning environments that prepare students for authentic clinical practice.

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