

Revised Understanding by Design (UbD) Template
for the CRUX Blended Learning Course in Cardiac Sonography

EDLD 5313 – Creating Significant Learning Environments

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Audience

This UbD design is written for cardiac sonography faculty, clinical preceptors, and program leadership who collaborate to prepare novice sonographers for safe, competent clinical performance. It provides a shared framework for aligning outcomes, assessments, and learning experiences across the CRUX blended learning model. The emphasis on collaborative instructional design reflects evidence that faculty development and shared pedagogical language strengthen instructional coherence (Aebersold, 2019).

Stage 1 – Desired Results**Established Goals**

The CRUX Blended Learning Course prepares novice cardiac sonographers to:

- Recognize cardiac anatomy in standard echocardiographic views.
- Connect anatomy, transducer manipulation, and image-plane formation.
- Apply introductory optimization principles during scanning.
- Demonstrate reflective practice, professional communication, and self-directed learning. (Cowden, 2026, pp. 3–12)

These goals align with CAAHEP, ARDMS, CCI, and ASE expectations for competency in anatomy recognition, image acquisition, optimization, and professional behaviors. They also reflect the broader movement toward competency-based medical education (Frank et al., 2010).

Backward design strengthens these goals by ensuring outcomes precede activities, a principle emphasized in science curriculum design (Whitehouse, 2014).

Big Hairy Audacious Goal (BHAG)

Students will become confident, reflective, and clinically prepared novice cardiac sonographers who independently connect anatomy, probe movement, and optimization principles to produce diagnostic-quality echocardiographic images in real patient encounters (Cowden, 2026, p. 3). This vision aligns with adult learning theory emphasizing autonomy, relevance, and self-direction (Taylor & Hamdy, 2013).

Enduring Understandings

Students will understand that:

- Diagnostic-quality imaging requires integration of anatomy, probe movement, and machine controls.
- Optimization is a dynamic, real-time decision-making process, not a checklist.
- Reflection and feedback are essential for continuous improvement and clinical readiness.
- Patient-centered care is inseparable from technical image acquisition.

These understandings reflect the importance of transfer in basic science education (Norman, 2009) and the role of psychological safety in supporting novice learners (Hsiang-Te Tsuei et al., 2019).

Essential Questions

- How do anatomy, transducer position, and image-plane formation interact?
- What makes an echocardiographic image “diagnostic quality”?
- How do novice sonographers manage cognitive load during scanning?
- How does reflection improve clinical performance?

Knowledge and Skills

Students will know:

- Cardiac structures in standard views.
- Sonographic terminology for image critique.
- Optimization controls (frequency, depth, gain, focus, sector width, TGC/LGC, dynamic range, power).

Students will be able to:

- Apply optimization principles during guided practice.
- Analyze image quality using appropriate terminology.
- Integrate CRUX visual models with hands-on scanning behaviors.
- Collaborate with peers and engage in reflective practice. (Cowden, 2026, pp. 10–18)

These skills align with the developmental progression of clinical reasoning and the importance of structured small-group learning (Edmunds & Brown, 2010).

Stage 2 – Evidence (Assessment)

Performance Tasks (Summative Assessments)

- Image Critique Assignment: Students evaluate scan quality using cardiac sonography terminology and propose optimization adjustments.
- Written Explanation of Image-Plane Formation: Students articulate how anatomy, probe movement, and acoustic physics interact.
- Lab Performance Evaluation: Students demonstrate scanning behaviors aligned with CRUX models.
- End-of-Unit Competency Check: Students perform standardized scanning tasks demonstrating readiness for clinical placement.

These assessments reflect UbD's emphasis on authentic performance tasks that demonstrate transfer (Wiggins & McTighe, 2005) and align with competency-based medical education principles (Frank et al., 2010).

Other Evidence (Formative Assessments)

- Low-stakes quizzes
- Image-plane matching
- Optimization checklists

- Peer feedback participation
- Guided notes
- Weekly reflections (Cowden, 2026, pp. 13–18)

Formative assessments support cognitive load reduction (Sweller et al., 2019) and align with team-based learning strategies that improve engagement and accountability.

Stage 3 – Learning Plan

UbD emphasizes backward design, ensuring activities directly support desired results. The CRUX learning plan integrates asynchronous preparation with synchronous lab practice. This approach mirrors curriculum renewal recommendations emphasizing alignment, coherence, and faculty collaboration (McLeod & Steinert, 2015).

Asynchronous (CRUX-based) Activities

- Labeled image review
- Guided notes
- Mini-lectures
- Vocabulary practice
- Image comparison activities
- Pre-lab reflection prompts

These activities prepare students before lab, reducing cognitive load and improving readiness (Sweller et al., 2019). They also reflect active learning principles shown to improve faculty teaching effectiveness (Aebersold, 2019).

Synchronous (Lab-based) Activities

- Instructor-guided scanning practice
- Peer coaching using checklists
- Image critique discussions
- Real-time optimization practice
- Collaborative problem-solving

Small-group collaboration supports deeper learning and professional communication (Edmunds & Brown, 2010). Psychological safety is intentionally cultivated to support novice performance (Hsiang-Te Tsuei et al., 2019).

Reflective Activities

- Weekly reflection journals
- Peer feedback loops
- Self-assessment checklists

These activities support Fink's "Learning How to Learn" dimension and UbD's emphasis on metacognition (Fink, 2013; Wiggins & McTighe, 2005). They also align with adult learning theory emphasizing reflection and self-direction (Taylor & Hamdy, 2013).

Sequence and Flow

UbD requires intentional sequencing:

1. Pre-lab preparation (CRUX modules)
2. Guided practice (lab)
3. Feedback and reflection
4. Competency demonstration

This mirrors the constructive alignment described in your 3-Column Table (Biggs & Tang, 2011) and the backward-planning principles emphasized in science education (Whitehouse, 2014).

Comparison: Fink's 3-Column Table vs. UbD

Where Fink Excels

- Holistic learning across foundational knowledge, application, integration, human dimension, caring, and learning how to learn.
- Cognitive load management through structured sequencing.
- Transparency that helps students understand how activities connect to outcomes.

Where UbD Excels

- Backward design beginning with performance tasks.

- Stronger tools for designing authentic assessments.
- Program-level coherence supporting competency-based education (Frank et al., 2010).

How They Complement Each Other

- Fink ensures breadth and depth of learning outcomes.
- UbD ensures alignment and transfer through assessment-driven design.
- Together, they support competency-based health science education (O'Shea et al., 2023).

Reflection: How Both Design Processes Strengthen My Innovation Plan

Designing CRUX through both Fink and UbD has significantly strengthened my innovation plan.

1. **Greater Constructive Alignment** Fink helped articulate comprehensive outcomes; UbD ensured assessments and activities aligned tightly with those outcomes. This alignment is essential for competency-based education (Frank et al., 2010).
2. **Improved Cognitive Load Management** Fink's taxonomy guided sequencing that reduces cognitive load, while UbD ensured learning experiences build toward authentic performance tasks (Sweller et al., 2019; Norman, 2009).

3. **Stronger Accreditation Alignment** UbD's backward design made it easier to map assessments to CAAHEP and ARDMS competencies, while Fink ensured human dimension and caring components were not overlooked (Frank et al., 2010).
4. **Enhanced Faculty Collaboration** The UbD template provides shared language for faculty coordination, while active learning institutes demonstrate how structured faculty development improves instructional practice (Aebbersold, 2019).
5. **Clearer Student Pathways** Students benefit from Fink's holistic outcomes and UbD's structured learning plan, improving motivation, engagement, and clinical readiness (Taylor & Hamdy, 2013).
6. **Strengthened CRUX Innovation Plan** Together, these frameworks ensure CRUX is not merely a digital resource but a transformative learning environment that prepares students for real-world clinical performance (Cowden, 2026, p. 22).

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