

# The UNM ECURE Toolkit

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A practical handbook for designing and implementing ECURE sections

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## Welcome

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Welcome, and thank you for your interest in course-based undergraduate research experiences (CUREs). The UNM Expanding Course-Based Undergraduate Research Experiences model (ECURE) is designed to help you integrate undergraduate research at a level of immersion that fits your discipline, class size, and workload.

ECURE is built around a simple idea: research is not all-or-nothing. Students can learn about research, can engage in parts of research, or can carry a project all the way through. Any of these can be a meaningful, evidence-based experience. This handbook will help you understand the model, adjust your syllabus, design the activities, and assess student learning.

## A Brief Description of the ECURE Model

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ECURE (Expanding Course-Based Undergraduate Research Experiences) is a framework that lets instructors bring authentic research into ordinary courses at three different levels of student immersion.

ECUREs are an adaptation of CURE pedagogy. Course-based undergraduate research experiences (CUREs) are learning experiences where whole classes of students address a research question or problem with unknown outcomes or solutions that are of interest to external stakeholders. CUREs make research accessible to larger and more diverse student populations than out-of-class research, because they reach students who are not self-selected, they serve working students who cannot participate outside the classroom, and they do not require large co-curricular research infrastructures.

Traditional CUREs ask students to complete all stages of an authentic research project. The ECURE framework expands this idea so that it can be implemented more widely — including in large lower-division general education lecture courses — by recognizing that students can be involved in research at different depths. ECURE describes three levels of immersion: preparatory instruction (PREP), partial research engagement (PARTIAL), and full research engagement (FULL).

In PREP, students are taught how research is conducted, and how foundational skills connect to research processes, without yet engaging in research themselves. In PARTIAL, students engage in selected components of research — at least one essential element and multiple research stages — within a context where the answers are genuinely unknown, which distinguishes the work from a cookbook exercise. In FULL, students engage in a complete, authentic research project involving all of the essential research elements.

ECURE describes undergraduate research to students as investigating a question or problem where no one — including the instructor or other researchers — is certain what the answer will be or should be, and where participation may be individual or collaborative. The framework gives instructors a gradual on-ramp into undergraduate research, a fallback option when a planned full project must be scaled back, and a way to build student understanding and confidence step by step.

## Overview of Undergraduate Research Approaches

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***Before designing your own ECURE section, it helps to see where ECURE sits among the ways universities involve undergraduates in research. The following comparison is drawn from the UNM source materials.***

Undergraduate research can take multiple forms, each with distinct goals, structures, and levels of student engagement. Three primary models — Faculty-Mentored Undergraduate Research, Course-Based Undergraduate Research Experiences (CUREs), and Expanded CUREs (ECUREs) — represent a progression in accessibility, scalability, and curricular integration (Table 1).

### **Faculty-Mentored Undergraduate Research (UGR)**

Students work closely with a faculty mentor on original research projects, often outside the formal curriculum. The goal is to produce new knowledge, typically culminating in presentations or publications. This model offers deep, individualized mentorship and strong preparation for graduate research, but it is limited in scalability by faculty time and resources and is often accessible only to upper-level or high-achieving students.

### **Course-Based Undergraduate Research Experiences (CUREs)**

CUREs embed authentic research experiences into the curriculum, allowing students to engage in inquiry-based learning as part of a course. They are scalable and inclusive, introduce research to a broader student population, and emphasize process over product, which makes them suitable for early-stage learners. Their main limitations are that a single CURE may not cover the full research cycle and may be constrained by course structure.

### **Expanded CUREs (ECUREs)**

ECUREs build upon the CURE model by offering a two-dimensional framework: varying levels of research immersion (Preparatory, Partial, Full) and integration of eight core research elements. This allows tailored, scalable, and discipline-specific research experiences. A defining feature of ECUREs is their ability to integrate research and education by embedding inquiry directly into the curriculum, so that students develop disciplinary knowledge and research skills at the same time. ECUREs are highly flexible across disciplines, support early and sustained research engagement, promote inclusivity by meeting students at different readiness levels, and can be implemented even in resource-constrained environments. They do require thoughtful course design and, for long-term sustainability, faculty development and institutional support.

**Table 1. Comparison of undergraduate research models.**

<b>Model</b>	<b>Individualized mentorship</b>	<b>Scalable</b>	<b>Inclusive</b>	<b>Curriculum-embedded</b>	<b>Research depth</b>	<b>Flexibility</b>
Faculty-Mentored UGR	High	Low	Low	No	High	Low
CURE	Moderate	High	High	Yes	Moderate	Moderate
ECURE (Expanded CURE)	Variable	High	High	Yes	Variable	High

## The ECURE Model in Depth

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*This section gives the full, multi-dimensional picture of ECURE, with citations to the course-based research literature that supports it. If you have read the brief description above, this is where the model is unpacked: the CURE foundation it grows from, the three levels of immersion, the eight research elements, and the two-dimensional design space they create together.*

### The CURE Foundation and Its Five Dimensions

The Council on Undergraduate Research defines undergraduate research as a mentored investigation or creative inquiry conducted by undergraduates that seeks to make a scholarly or artistic contribution to knowledge (Council on Undergraduate Research, 2022a). CUREs, in turn, are defined as learning experiences where whole classes of students address a research question or problem with unknown outcomes or solutions that are of interest to external stakeholders (Dolan, 2016).

CUREs have been linked to increased content mastery and improved scientific literacy, as well as to increased retention, degree persistence, and graduation rates (Brownell et al., 2015; Dolan, 2016; Rodenbusch et al., 2016). They are considered especially valuable for women and underrepresented minority students (Gregerman et al., 1998; Bangera & Brownell, 2014; Chang et al., 2014; Carpi et al., 2017). CUREs are most often defined through a set of dimensions that must be present for a course to be considered a CURE, summarized in Table 2.

**Table 2. Five dimensions that make a learning experience a CURE (Auchincloss et al., 2014).**

Dimension	Description
Scientific (disciplinary) practices	Uses generally accepted disciplinary practices to answer research questions.
Discovery	Generates new knowledge, insights, or understanding; focuses on questions where the answers are unknown.
Broadly relevant or important work	Findings are meaningful and important beyond the classroom.
Collaboration	Involves teams of researchers working together.
Iteration	Builds upon previous research and current knowledge.

These five dimensions are the benchmark a FULL ECURE aims to meet in its entirety. The power of expanding the CURE framework is that it allows instructors to treat these dimensions not as a pass/fail gate but as a set of features that can be introduced, practiced, or fully realized depending on the immersion level you choose.

### Expanding the Framework: PREP, PARTIAL, and FULL

While the CURE framework has been widely defined in the literature, a growing body of research describes the value of course-based research experiences that do not meet the full definition of a traditional CURE. These are sometimes called Pre-CUREs or undergraduate research pathways, and they involve learning about research outside of a complete research setting. Pre-CUREs teach students to think critically about research, to understand research methods and experimental design, and to value iteration; they build student confidence and

encourage later participation in research (Horsch et al., 2012; Mahatmya et al., 2017). Preparatory research experiences also improve pathways to undergraduate research for traditionally underrepresented students, especially those who cite a lack of research preparedness as their main barrier to participation (Hurtado et al., 2009; Mahatmya et al., 2017).

The UNM Academic Affairs General Education Faculty Fellows characterized and defined this model further to create an expanded framework — ECURE — designed specifically for general education courses (Figure 1). The expanded framework categorizes Pre-CURE into two levels of student immersion, preparatory instruction (PREP) and partial research engagement (PARTIAL), and combines them with the traditional full CURE model (FULL).

### **PREP — Preparatory instruction**

PREP teaches students how research is conducted, including how foundational skills connect to research processes, but without actual engagement in research. It can be taught in either lecture or active-learning environments. Examples include teaching students to differentiate correlation from causation, exploring the value of peer-reviewed literature compared with Wikipedia, developing research questions, practicing data collection techniques, or using a spreadsheet to determine statistical significance.

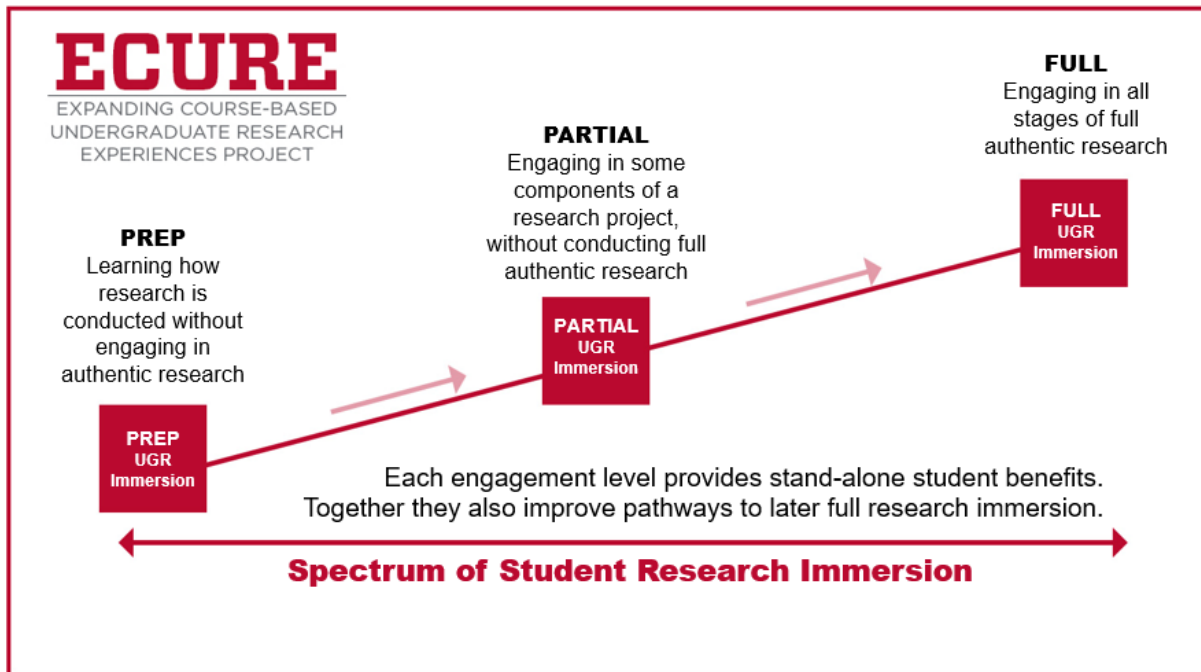
### **PARTIAL — Partial research engagement**

PARTIAL engages students in selected components of research without requiring all of the essential elements of a full CURE. For example, students might be given a research problem, a summary of existing knowledge and a research method by the instructor, then collect and analyze data and report their findings in a research journal. ECURE operationalizes PARTIAL as engaging students in at least one essential CURE element and multiple research stages, within a context in which students ask or answer questions whose answers are unknown. This is what differentiates PARTIAL from a cookbook experiment.

### **FULL — Full research engagement**

FULL engages students in a complete and authentic research project that involves all five essential CURE elements, from question through dissemination.

ECURE provides a gradual on-ramp for instructors who are hesitant to add research because of limited classroom support, rigid content requirements, or large class sizes. It provides a fallback for instructors who aim for FULL but must scale back at the last minute. And it scaffolds undergraduate research pedagogy for students with no prior exposure, building understanding and confidence gradually. Think of the three levels less as a hierarchy of quality and more as a spectrum of immersion you can position your course along.



**Figure 1. ECURE Student Immersion**

## The Two-Dimensional ECURE Model

The two-dimensional ECURE model combines two critical dimensions: levels of research immersion and eight core research elements. This dual-axis structure lets you design research experiences that are both pedagogically meaningful and logistically feasible. The first dimension — levels of immersion — defines the extent of research integration in a course: Preparatory ECUREs suit introductory or general education courses and large classes; Partial ECUREs suit intermediate courses where students have some familiarity with research and some instructional support is available; and Full ECUREs suit upper-level or capstone courses or courses with smaller class sizes and access to additional instructional support.

The second dimension is the set of eight research elements, described in detail in the next subsection. The strength of the ECURE model is in combining the two: you can mix and match a level of immersion with the specific elements you choose to emphasize, creating a customized experience aligned to your course goals, your students' readiness, and your available resources. The matrix below provides a framework for planning this decision. Use the blank version (Table 3) to map your own course.

**Table 3. The two-dimensional ECURE planning matrix (blank — mark the cells you will engage).**

Research element	Preparatory	Partial	Full
Background Gathering			
Ethical Awareness			
Freedom to Discover			
Evidence Preparation			
Communication / Collaboration			
Real-World Research Practice			
Failure and Iteration			
Outcome Novelty			

## The Eight Research Elements

The research elements of a course-based undergraduate research experience are: (1) background gathering, (2) awareness of research ethics, (3) freedom of discovery, (4) evidence preparation, (5) collaboration and communication, (6) real-world research practice, (7) failure and iteration, and (8) outcome novelty. ECUREs allow different degrees of engagement and immersion in each of these elements.

- **1. Background gathering.** Students acquire foundational knowledge relevant to the research topic, including literature reviews, theoretical frameworks, and methodologies. This may be tiered or scaffolded for different entry levels, using diverse and interdisciplinary materials so students from different backgrounds can participate meaningfully.
- **2. Awareness of research ethics.** Students are introduced to core ethical principles — consent, data integrity, responsible conduct of research, and ethics in communicating scientific ideas. Ethics is embedded throughout the research process rather than confined to a single module, and may include equity, data privacy, plagiarism prevention, and ongoing reflection.
- **3. Freedom of discovery.** Students pursue research questions with some autonomy, within boundaries set by the instructor. This element can be expanded to allow instructor- or student-driven inquiry, personalized research pathways, and co-creation of research questions, encouraging intellectual risk-taking and ownership of the process.
- **4. Evidence preparation.** Students design, collect, and analyze data to support their questions. The process can be qualitative, quantitative, or mixed-methods and can use multi-modal evidence such as interviews, coding, or digital artifacts, with attention to rigorous analysis and to the limitations of the evidence.
- **5. Collaboration and communication.** Students work in teams and present findings to peers and instructors. Collaboration can broaden to cross-disciplinary, community-engaged, and even international partnerships, and communication skills are developed for academic, public, and professional audiences through iterative feedback and peer mentoring.
- **6. Real-world research practice.** Research problems reflect real-world challenges, require genuine disciplinary practices, or contribute to ongoing projects. Projects may be

co-designed with community, non-profit, or industry stakeholders, with attention to translational impact, policy implications, and knowledge mobilization.

- **7. Failure and iteration.** Students learn from failed hypotheses or procedures and refine their approaches, building resilience and a growth mindset. They document iterations and reflect on what went wrong through journals, portfolios, or reports.
- **8. Outcome novelty.** Projects aim to generate new knowledge or insight. Novelty is defined broadly to include creative products, community solutions, or policy briefs, and ECURE values process innovation as well as content innovation, supporting student dissemination through posters, presentations, and digital platforms (Broussard et al., 2025).

## Why ECUREs Matter: Benefits for Students and Institutions

The case for ECURE rests on two pillars: a strong research base showing that course-based research benefits students, and the practical, scalability advantages of the expanded model itself. The course-based research literature consistently links these experiences to gains in content mastery, scientific literacy, project ownership, persistence, and graduation — outcomes that have been documented in both small and high-enrollment courses (Brownell et al., 2015; Corwin et al., 2015; Rodenbusch et al., 2016; National Academies of Sciences, Engineering, and Medicine, 2017). Undergraduate research is widely recognized as a high-impact educational practice (Kuh, 2008), and students themselves report broad gains in research skills, confidence, and career clarity after even short research experiences (Lopatto, 2007). The benefits described in the UNM materials below are consistent with that evidence.

- **Gradual confidence building.** ECUREs scaffold student learning so students engage with research incrementally, building competence and ownership without feeling overwhelmed, and become more receptive to advanced research later.
- **Cost-effective early exposure to research.** By embedding research into existing courses, institutions introduce meaningful research experiences without the high costs of standalone research programs.
- **Increased participation in advanced research.** Early exposure fosters curiosity and can lead students toward faculty-mentored projects, honors theses, or graduate study; ECUREs act as a gateway.
- **Enhanced diversity in research engagement.** Integrating research into required courses lets students who lack prior exposure — particularly those from underrepresented or underserved backgrounds — participate, diversifying who engages in advanced research later.
- **Faculty empowerment and curriculum innovation.** Starting with PREP or PARTIAL gives instructors a low-risk way to experiment with research-based teaching, often leading to greater confidence and to FULL implementations later.
- **Alignment with institutional goals.** ECUREs support retention, engagement, and high-impact practice goals, and their scalability suits a wide range of departments and course levels.
- **Development of transferable skills.** Students cultivate critical thinking, collaboration, communication, and problem-solving — competencies valued well beyond academic research.

- **Curricular sustainability and integration.** Because ECUREs live inside existing courses, research becomes a core component aligned with course outcomes rather than an add-on.

## Common Challenges and Strategies

CUREs and ECUREs do not come without challenges. Below are a few challenges and potential solutions suggested by current UNM faculty who have implemented the ECURE model in some of their courses.

- **Curricular constraints.** When syllabi are tightly packed, begin with a PREP model that integrates short, structured activities — ethics case studies, mini literature reviews — aligned with existing outcomes, rather than overhauling the curriculum.
- **Faculty workload and training.** Use professional development, peer mentoring, and design templates; consider team teaching or collaborating with experienced colleagues to share the load.
- **Resource limitations.** Lean on existing course infrastructure and low-cost activities such as data analysis, literature synthesis, or community-based projects; seek internal mini-grants or local partners. Explore the use of secondary data to reduce time and other resources spent on data collection.
- **Assessment complexity.** Use clear rubrics that assess process-oriented skills alongside content knowledge, and capture learning through reflective writing and peer evaluation.
- **Student readiness and engagement.** Scaffold with guided inquiry and incremental challenges and motivate with success stories and real-world connections.
- **Scalability across disciplines.** Highlight discipline-specific research practices, use collaborative digital tools to manage scale, and share modules across departments.
- **Sustained institutional commitment.** Advocate for ECUREs within strategic planning and accreditation, share outcome data, and recognize faculty contributions through awards or workload adjustments.

## Who Benefits — Including Students Not Pursuing Research

Not every student will initially express interest in research, but ECUREs offer benefits that extend far beyond research careers. They develop critical thinking, problem-solving, collaboration, and communication — competencies essential in virtually every profession — and they transform passive learning into active inquiry, encouraging students to ask questions, analyze information, and make evidence-based decisions.

Importantly, ECUREs prepare students to be discerning consumers of research. In a world where studies influence everything from healthcare to public policy, students must be able to judge the quality of research, distinguishing credible, peer-reviewed work from misinformation. ECUREs teach students to evaluate methodology, identify bias, and locate trustworthy sources, empowering them to make informed decisions even if they never conduct research themselves. By connecting classroom content to real-world challenges, ECUREs make learning more relevant and can reveal interests and talents students had not previously considered.

In short, ECUREs are not only about preparing students for research; they are about preparing students to be thoughtful, adaptable, and informed contributors to society — a goal that serves every student in your classroom.

## Steps to Building Your ECURE Section

This is the practical heart of the handbook. The sequence below was created by UNM instructors who implemented the ECURE model (Figure 2). It walks you from your first decision — which level to implement — through teaching and continuous improvement.

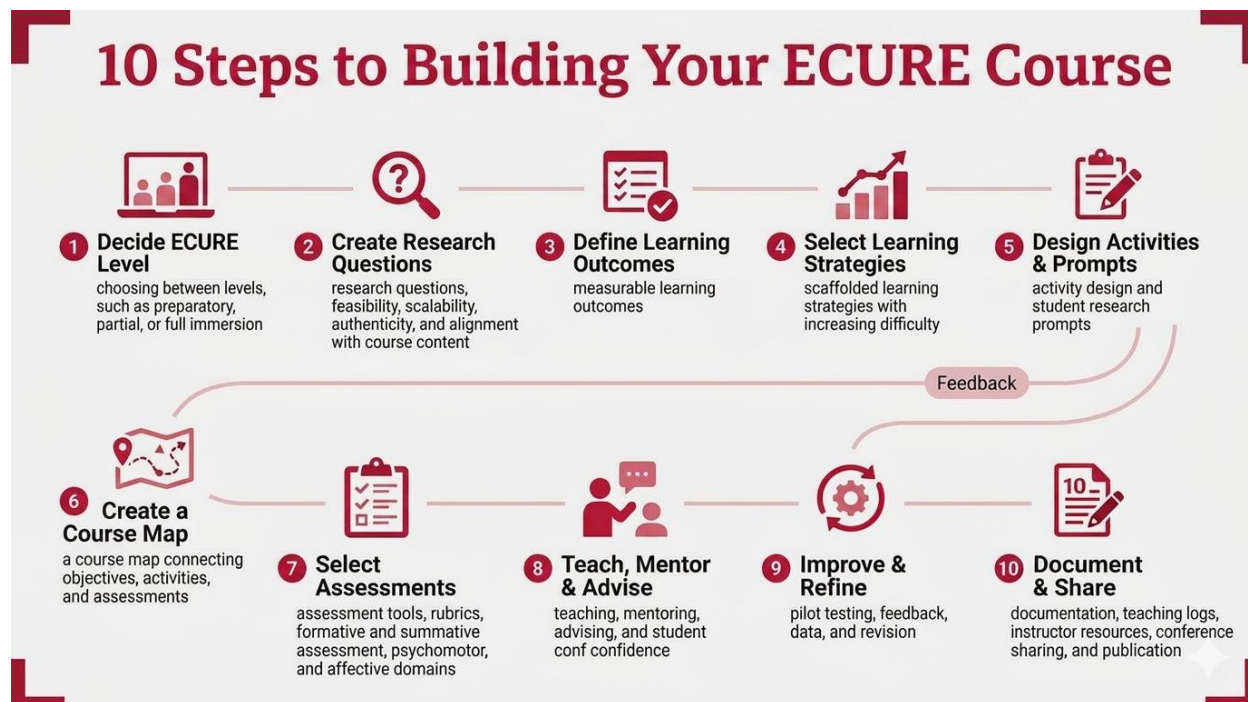


Figure 2. Steps to Building Your ECURE Section.

### Step 1 — Decide the level of ECURE implementation

Decide whether you will implement preparatory, partial, or full immersion, guided in part by course level. Refer to the Common Challenges and Strategies section above to help think through three levels for your course. For instance, high levels of curricular constraint and resource limitations may point towards PREP as the best option, while Student Readiness and Engagement in an upper division course may point towards FULL. You can change the level during the semester by monitoring how students respond, but doing so will require modifying the steps that follow.

### Step 2 — Create research questions and scenarios

Designing a research question or activity is a significant task. Create research questions carefully, considering: the level of the course; students' fund of knowledge (what students bring from their backgrounds — prior education, family and work experiences, geography, and other demographics); and the level of ECURE implementation. Preparatory implementation typically requires preset questions with stepwise instructions; full implementation allows students to develop their own questions; partial implementation can involve students in specific components, such as designing follow-up experiments based on earlier conclusions. Also evaluate:

- **Feasibility** — timeframe, course level, availability of resources, and safety concerns (especially for lab work or site visits).
- **Scalability** — important when designing projects for large classes.
- **Authenticity** — the originality of the question should align with the implementation level; PREP or PARTIAL may not require a novel question, but FULL needs an authentic project.
- **Course content and objectives** — the activity should be relevant to the subject and aligned with the topics covered.

### Step 3 — Define learning outcomes

Define discipline- and course-specific learning outcomes appropriate to your course level. Outcomes must be measurable, well-defined, and within the scope of the level. They are usually written from the students' perspective and begin with an action verb — perform, classify, define, outline, measure (Figure 3) — so students know what they will be able to accomplish on successful completion.

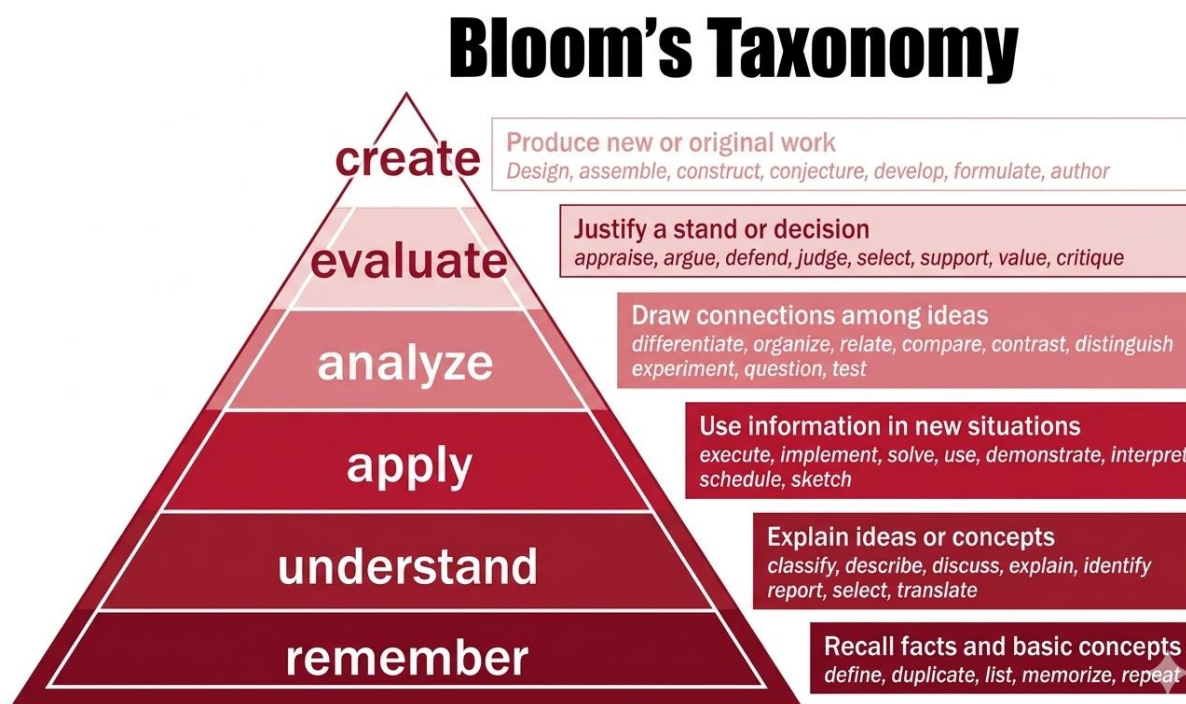


Figure 3. Bloom's Taxonomy Action Verbs (Salisbury University)

### Step 4 — Select learning strategies

Select learning strategies that align with your learning outcomes. Include strategies of varying difficulty — easy, moderate, and challenging — and a variety of approaches to balance them. Design activities that provide scaffolding toward the project's overall goal.

## **Step 5 — Design research activities and prepare research prompts**

Once you have research questions, outcomes, and strategies, design the activities and prepare prompts to guide students through them. A preparatory-level lab activity may require a stepwise procedure for performing the experiment and analyzing data, while a brief description of the research question may be sufficient for a full-level implementation. Clearly define the level of student engagement and your expectations in each prompt. Writing prompts for the whole series of activities during planning supports a smooth semester, though you can revise prompts as you go.

## **Step 6 — Create a course map**

A course map summarizes the overall picture of the course, outlining learning objectives, activities, and assessments for both you and your students. After identifying outcomes, activities, and assessment tools, develop the map and revise it as you plan. (Example course maps appear later in this handbook.)

## **Step 7 — Select assessment tools and develop assessments**

Match assessment tools to students' research outcomes. The three basic assessment domains are cognitive, psychomotor, and affective; covering these improves the overall quality of the course. Include a mix of summative and formative assessments targeting different skills, and use low-stakes formative assessments to support metacognition. Create a rubric for each assessment to aid grading and clarify expectations; rubrics can be revised at any time. Weekly assignments can scaffold a final assessment — for example, weekly lab reports building toward a final report, or weekly quizzes scaffolding an exam.

## **Step 8 — Teach, mentor, and advise**

Teaching is the core step. Like any course, an ECURE course requires clear instructions and guidance at all levels. Well-defined goals and activities from the planning phase ensure a smoother semester and build student confidence. Mentoring and advising throughout the course help undergraduates understand research, and the experience can inform their future career decisions.

## **Step 9 — Improve and refine**

Pilot the course or activities first with a limited scope. Evaluate the implementation through performance data and student feedback surveys (for example, pre-, mid-, and end-of-semester surveys). Analyzing this data lets you revise the course, activities, or assessments to improve the learning experience.

## **Step 10 — Document and share**

Maintain a teaching log of your ECURE journey — accomplishments, failures, and areas to improve. Consider creating an instructor information sheet, and share your experience with peers through conference presentations or journal articles.

## Designing Research Activities for Each Level

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With your level chosen and outcomes drafted, the next task is designing the activities themselves. The summaries below capture the purpose, sample structures, and assessment ideas for PREP, PARTIAL, and FULL activities; the templates can be lifted directly into your course design.

### PREP Activity Design

ECURE PREP activities introduce students to the practices and mindsets of research in a low-stakes, highly supported way. PREP helps students try out pieces of the research process — asking questions, exploring real data, interpreting patterns, or reflecting on uncertainty — without the pressure of a full-semester project. A PREP activity gives students a structured introduction to research-like thinking, so they begin to see themselves as emerging researchers who can navigate uncertainty and connect course concepts to real-world contexts.

#### *Suggested learning outcomes and sample structures include:*

- **Formulate and refine a question** related to course content, a dataset, or a community context; explore and interpret data, texts, or artifacts using basic disciplinary methods; collaborate with peers; communicate preliminary findings; and reflect on iteration and growth.
- **Collaborative research mini-project.** Small teams receive a common prompt, dataset, or local issue, generate one focused question, examine a subset of data, and produce a short research snapshot (one slide, paragraph, or annotated figure).
- **Data exploration and hypothesis generation.** Students identify patterns, trends, or anomalies in a real dataset, draft possible explanations, and outline what additional data would be needed to test one.
- **Iterative design cycle.** Students draft a basic protocol, survey, or coding scheme, receive focused feedback, then revise and explain what changed and why.

### PARTIAL Activity Design

ECURE PARTIAL activities provide a more substantial research experience that still fits within an existing course. Students complete several connected stages of a research project using existing data, archival sources, or curated materials — typically developing a researchable question, applying at least one disciplinary method, analyzing results, and communicating findings in a concise product. The aim is to deepen students' understanding of how research is conducted in your field while strengthening their confidence with methods, evidence, and collaborative inquiry. Many instructors spread PARTIAL activities across several weeks with checkpoints.

#### *Representative structures include:*

- **Guided team research project using existing data.** Teams develop a focused question, submit a short proposal, carry out an analysis with a provided method or tool, and prepare a research brief or poster reporting their question, approach, findings, and at least one limitation.

- **Multi-source case study analysis.** Students analyze a set of related sources using a structured framework, record evidence in a shared matrix, and synthesize a short comparative analysis for a target audience.
- **Iterative method or model application.** Students apply a method to a subset of data, receive feedback, revise, re-run a portion of the analysis, and submit a memo explaining what changed and what they learned.

## FULL Activity Design

ECURE FULL activities immerse students in a comprehensive, authentic research experience. Students develop researchable questions, design or adapt methods, collect or generate data when feasible, analyze results, and share findings with a professional, academic, or applied audience. FULL experiences typically span several weeks, include multiple rounds of feedback and revision that mirror professional practice, and conclude with a polished product such as a research paper, poster, presentation, or technical report. They are best applied in mid- to upper-division courses where students have foundational disciplinary knowledge, with structured checkpoints and scaffolded evaluation to support success.

### *Common structures include:*

- **Research proposal to final report.** Students submit a proposal, integrate peer and instructor feedback, implement the plan, and prepare a final report or paper plus a presentation or poster.
- **Applied community or stakeholder project.** Students identify a stakeholder or problem, develop an applied question, conduct fieldwork or secondary analysis, and deliver an applied product to a real or simulated stakeholder panel.
- **Iterative method development and research publication.** Students propose an advanced method, run a pilot, revise and repeat the analysis, and prepare a manuscript formatted for a disciplinary conference or journal, submitted to a simulated peer review.

## Sample Rubric for a PREP Deliverable

**Table 4. Sample analytic rubric for a PREP research deliverable (Proficient = 3, Developing = 2, Emerging = 1).**

Criterion	3 — Proficient	2 — Developing	1 — Emerging
Authenticity & relevance	Addresses a real disciplinary or community question or dataset.	Partially connected to a broader research or community context.	Limited relevance or contrived focus.
Use of evidence or method	Approach is systematic and clearly explained; evidence supports claims.	Some inconsistencies in method or connection to evidence.	Method unclear or weak alignment between evidence and claims.
Collaboration & process	Product reflects active, equitable participation.	Moderate collaboration; contributions somewhat uneven.	Minimal or clearly unbalanced collaboration.
Communication of findings	Clear, organized, appropriately formatted; conclusions follow from evidence.	Generally clear but missing depth or key details.	Unclear, disorganized, or weakly supported.

A practical scoring note from the templates: assign 1–3 points per criterion and adjust totals to fit the weight of the activity (roughly 12–20 points for PREP, 50–100 for PARTIAL, and 150–200 for FULL). Rubrics can be delivered through Canvas SpeedGrader or as printable checklists.

## Assessment and Feedback in ECURE Courses

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Assessment in an ECURE course evaluates student work and gives you evidence about whether the research experience is working. The UNM assessment guidance, summarized here, is closely aligned with the published guidance on assessing CUREs, which recommends starting from your intended learning outcomes, then selecting or building instruments that align to them and evaluating the results critically (Shortlidge & Brownell, 2016).

Assessment can be formative or summative, and spans four domains: cognitive, psychomotor, affective, and metacognitive. Plan assessments in accordance with your learning outcomes. For the outcome “carry out a literature search for the lab question,” for example, a cognitive assessment could be a literature review graded with a rubric, a metacognitive assessment could ask students to describe how they conducted the search, and a psychomotor assessment could be a demonstration of a technique used in the literature.

### Aligning Assessments with the Research Experience

Each assessment type should reinforce ECURE activities such as a research proposal, data analysis, or reflection. The same activity can be scaled by immersion level, as shown in Table 5.

**Table 5. Examples of adapting assessments by depth of ECURE engagement.**

Activity type	Lighter (PREP / 1–2 weeks)	Fuller (FULL)
Research proposal	Brief outline with two sources	Detailed proposal with annotated bibliography
Data analysis	Simple dataset interpretation	Comprehensive analysis with visualization
Reflection	One-page reflection	Weekly reflective journal

### Useful Assessment Approaches

- **Pre- and post-tests for learning gains.** Administering a test before and after a learning period lets you compute learning gains. Validated concept inventories exist for many STEM fields; for a specific skill, a custom pre/post instrument may work best.
- **Progress checks during the semester.** A quick mid-semester “skill check” — for example, asking students to demonstrate a research or lab technique for a grade against a rubric — monitors progress, though this may be unnecessary for a short PREP activity.
- **Assessing across learning domains.** Conceptual assessments target knowledge and understanding; psychomotor assessments target physical skills and technique; affective assessments target attitudes, values, and engagement; and metacognitive assessments target planning, monitoring, and evaluating one's own learning.

## Feedback, Rubrics, and Metacognition

Use rubrics for transparency and consistency. Analytic rubrics break performance into separately scored criteria and are best for detailed feedback; holistic rubrics give a single overall score for quick grading; single-point rubrics state one level of expected performance with space for comments and suit formative feedback; and checklist rubrics use completed/not-completed indicators for tasks requiring specific steps. Incorporate peer-review sessions and provide timely instructor comments to support metacognition.

Support metacognition explicitly. Prompt planning, monitoring, and evaluating with reflective questions such as “What is your plan for approaching this problem?”, “How do you know your solution is correct?”, and “What would you do differently next time?” Embed reflection in rubrics, and give feedback that focuses on thinking processes, not only the final product.

## Validity, Reliability, and Tools

To develop an assessment tool, define its purpose, generate a topic list, describe the learning outcomes, choose a format, write the items, examine validity, pilot-test, and refine. Ensure inter-rater reliability by calibrating rubric scoring among instructors, and use pilot testing to confirm clarity and fairness. Useful technologies include learning management systems such as Canvas or Moodle for quizzes and rubrics, online forms for quick surveys, originality-checking tools, and collaborative platforms for group activities.

### **Quick-start checklist:**

- ***identify your ECURE objectives (inquiry, research literacy, metacognition)***
- ***align assessments with your student learning outcomes***
- ***select assessment types (proposal, analysis, reflection)***
- ***adapt for course length using the matrix above***
- ***integrate feedback loops***
- ***use technology for scalability***
- ***validate the reliability and validity of your assessments***

## How to Adapt your UNM Syllabus for ECURE

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Your syllabus is where the ECURE design becomes official and visible to students. The UNM ECURE syllabus template specifies the minimum components a syllabus should include; below, each component is listed with guidance on the ECURE-specific elements to add.

The course syllabus serves as a description and plan for a course and should provide a clear picture of its academic scope, nature, integrity, and rigor. Include all of the following components in your preferred template or format.

- **Course identification.** Course title; course number (list both undergraduate and graduate numbers for dual-listed courses); course credits; instructor name, email, office location, phone, and office hours; class meeting days, time, location, and term.
- **Course description.** At minimum, the UNM catalog description; alternatively, describe the content, purpose, and what a learner can expect.

- **Course goals.** Broad, general statements aligned to programmatic, departmental, or accreditation goals. Add an ECURE sub-goal tied to the research elements you expect students to learn or practice.
- **Student learning outcomes.** Achievable, measurable skills, knowledge, and attitudes students should master, written for the learner using action verbs.
- **Textbooks, supplies, materials, equipment, and technology.** Required and recommended materials, plus any technology students must access and its technical requirements (for example, a required laptop for in-class research exercises).
- **Course requirements.** All assessments contributing to the course score — exams, portfolios, participation, papers, oral reports, group projects, assignments — with point or percentage values; list undergraduate and graduate requirements separately for dual-listed courses.
- **Learning strategies.** A description of the activities you design for students to engage research elements — literature search, experimental design, data analysis, or a research project — framed as scaffolded research activities aligned with ECURE principles to develop inquiry and research-literacy skills.

The template also provides two appendices worth completing as you design: an appendix that maps your ECURE goals and outcomes to the specific research elements students will practice, and an appendix detailing the course requirements and how each is assessed.

**Table 6. Example course map excerpt: ENVS 322L, Life in the Earth System (UNM).**

Learning goal	Learning objective(s)	Evidence from key activities
Critically evaluate potential outcomes of current environmental and biodiversity changes.	Apply an understanding of Earth-life interactions to predict and evaluate outcomes of current global change; recommend solutions for negative outcomes.	Independent project; climate-change debate; letter to a lawmaker.
Think like a scientist: be competent in research practices and critical evaluation of information.	Extend critical analysis to everyday life, including hypothesis generation and testing, and data evaluation and interpretation.	Discussion-board posts; extra-credit opportunities.

A full set of UNM ECURE example syllabi and a syllabus template are available through the UNM Undergraduate Research, Arts & Design Network.

## Examples of ECURE Implementation

Nothing makes the model concrete like seeing it in real UNM courses. The examples below — two each for PREP, PARTIAL, and FULL — are drawn from UNM instructors' own ECURE implementations. For each, note the course and level, what students actually do, the research elements engaged, and what makes it that level of immersion. Greater detail and additional UNM examples (in engineering, biology, and linguistics) appear in the source materials and the UNM ECURE site (<https://urad.unm.edu/faculty-staff/ecure.html>).

## PREP Examples

### PREP Example 1 — POLS 2110, Introduction to Comparative Politics

What students do: In the unit on democratic decline and authoritarianism, students work in teams to write political-behavior survey questions — for example, items intended to identify antidemocratic or authoritarian attitudes. The instructor folds their questions into a survey that already contains scholar-vetted measures, students take it, and the class then discusses what makes a good survey question and the challenges of measuring antidemocratic attitudes. Other activities have students devise coding rules for instances of state violence and run a card-and-candy simulation of an authoritarian regime to explore game theory.

Why it is PREP: students learn how research is conducted — measurement, coding, and study design — and reflect on uncertainty, but do not carry out an original study. The instructor's own advice: with PREP, less is usually more, and students respond most to hands-on activities and to meeting real scholars.

### PREP Example 2 — GEOG 1115, Maps and GIScience

What students do: A research-literacy, performance-based assessment asks students to design an investigation — for instance, how to map the distribution and change of horned lizards at Petroglyph National Monument from 2000 to 2020 and relate it to adjacent development — specifying the geographic data types, methods, analysis, and visualization they would use, then peer-reviewing a classmate's plan. A companion activity teaches students to craft workable research questions against five criteria (substance, social significance, neutrality, answerability with evidence, and appropriate scope).

Why it is PREP: students practice the thinking of research — question formation, project design, and critique — in a structured, low-stakes way, without collecting and analyzing original data themselves.

## PARTIAL Examples

### PARTIAL Example 1 — CHEM 1215L / 1225L, General Chemistry I & II for STEM Majors

What students do: Across a sequence of design labs, students complete background reading that functions as a literature search, construct a measurable hypothesis, design the experiment collaboratively through guided questions, test procedures for feasibility, collect and analyze their own data, troubleshoot unexpected problems, and communicate results in lab reports and presentations — all while practicing lab ethics and proper citation. Assessment includes pre/post concept-inventory tests, hands-on skill checks, a multi-station practical exam, weekly quizzes, lab reports, and a presentation.

Why it is PARTIAL: the course engages most research elements — background gathering, hypothesis, design, evidence, iteration, communication, and ethics — but, as the instructor notes, the one element it does not fully reach at the freshman level is outcome novelty, which is what keeps it short of FULL.

### PARTIAL Example 2 — LING 2151, Language of Advertising

What students do: Students read a popular-press account of a linguistics study of advertising language, lift the hypothesis and methodology, and replicate it on a smaller scale with variables of their own interest. They write a report that recaps the prior research, motivates their direction,

describes the methodology, presents the data, and reflects on the findings; a poster is an option. On later passes, students read the original academic articles, supported by a video on how to read a linguistics article.

Why it is PARTIAL: students engage several connected research stages — question, method, data, interpretation — using an existing study as scaffolding, rather than originating and completing a fully independent project.

## **FULL Examples**

### **FULL Example 1 — ENVS 322L, Life in the Earth System**

What students do: Students complete a scaffolded research experience in two parts. First, they practice the entire analytical workflow on playful “made-up” data — a campus scavenger hunt to GPS “shadow lobo” statues, collecting environmental data to build an ecological niche model of suitable habitat. Then they apply the same methods to an independent project: choosing a real terrestrial species, downloading and processing large occurrence and environmental datasets in GIS, modeling current suitable habitat, and projecting it to future climate scenarios. They draw on primary literature to form an informed hypothesis and present their results to the class for peer evaluation.

Why it is FULL: students carry an authentic question through every stage — background, hypothesis, data, analysis, interpretation, and dissemination — producing genuinely novel, project-specific results.

### **FULL Example 2 — POLS 2140, Introduction to Political Analysis**

What students do: Working independently and in teams, students identify political topics that matter to them, find aligned variables in course-provided datasets, develop hypotheses, explore their variables in R, conduct bivariate hypothesis testing and multivariate OLS regression, interpret their results, and write op-ed-style team analyses. The research is scaffolded into four short, directed, feedback-rich assignments that build toward the final analysis, supplemented by an open-note midterm with a collaborative review.

Why it is FULL: students design and complete an original quantitative analysis end to end, generating and interpreting their own findings — a complete, authentic research cycle adapted to a large lower-division class.

## **Other Important Considerations**

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A few cross-cutting issues will shape how well your ECURE section works and whether it lasts beyond one semester. None is unique to UNM, but each is worth planning for.

### **Building Buy-In and Institutional Support**

ECUREs succeed more reliably when they are supported rather than improvised. Faculty who develop and teach course-based research consistently report needing time, recognition, and community to do it well, and they benefit from departmental encouragement and shared resources (Shortlidge et al., 2016). When you propose an ECURE section, frame it in the language your department already values — retention, equity, high-impact practices, and accreditation — and where possible attach it to existing strategic priorities (Kuh, 2008; National Academies of Sciences, Engineering, and Medicine, 2017). Even a modest internal mini-grant

or a course-design stipend can make the difference between a one-time experiment and a sustained offering.

## Scaling to Large and Lower-Division Courses

One of ECURE's central promises is reaching the large general education courses where most students are enrolled. Research embedded in high-enrollment courses can produce the same gains in scientific thinking and data interpretation as smaller settings when it is well designed (Bangera & Brownell, 2014; Brownell et al., 2015). To scale, lean on the design moves UNM instructors already use: provide curated or existing datasets, scaffold the project into short graded checkpoints, use teams and structured peer review to multiply feedback, and rely on rubrics and the learning-management system to keep grading manageable.

## Equity and Inclusion

Because ECUREs are embedded in required courses, they reach students who may not be able to opt into out-of-class research — which is precisely why they can broaden participation in research for women, underrepresented minority students, working students, and first-generation students (Hurtado et al., 2009; Finley & McNair, 2013; Bangera & Brownell, 2014; Carpi et al., 2017). Two design choices protect that potential: connect projects to questions and communities students recognize (drawing on their fund of knowledge), and make the research process explicit rather than assumed, so students who arrive with less prior exposure are not quietly disadvantaged.

## Supporting Teaching Assistants and Peer Facilitators

If your course uses teaching assistants or peer learning facilitators, they need preparation specific to facilitating inquiry, not just grading. Brief them on the difference between guiding students through genuine uncertainty and giving away answers, share the rubrics in advance, and calibrate scoring together so feedback is consistent across sections.

## Sustaining and Sharing Your Work

Treat your first ECURE section as a pilot. Keep a teaching log, gather student feedback at a few points in the semester, and revise before scaling up. When something works, share it: course-based research has a vibrant community of practice and an open collection of vetted examples and assessment instruments through resources such as CUREnet (Dolan, n.d.). Publishing or presenting your design contributes to that community and strengthens the case for ECURE at UNM.

## Frequently Asked Questions

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***How is ECURE different from a traditional CURE?*** A traditional CURE asks a whole class to complete an authentic research project meeting all five CURE dimensions. ECURE keeps that as its FULL level but adds two lighter levels — PREP and PARTIAL — so instructors can engage students in research at the depth that fits their course, discipline, and class size. In short, ECURE makes research a dial, not a switch.

***Do I need a research lab, grant, or course release to run an ECURE section?*** No. PREP and PARTIAL are specifically designed to work within existing courses using existing data,

literature, and class time. Many UNM examples run in ordinary lecture and lab sections with no special infrastructure.

**Which level should I start with?** Match the level to your course level and your students' readiness. A 1000-level general education course can be a good fit for PREP; intermediate courses with some instructional support suit PARTIAL; and upper-division courses with smaller sections and foundational knowledge suit FULL. When in doubt, start lighter — you can always deepen later.

**Can I change levels partway through the semester?** Yes. The framework is explicitly designed to let you scale back from FULL to PARTIAL (or up, if students are ready) by monitoring how the class responds. Just be aware that changing levels means revisiting your activities, prompts, and assessments.

**Does ECURE work outside STEM?** Yes. While much of the CURE literature comes from the life sciences, ECURE is discipline-agnostic, and UNM examples span political science, linguistics, geography, chemistry, and earth sciences. What counts as “research,” “data,” and “dissemination” simply takes the form your discipline uses.

**How do I grade open-ended research work fairly?** Use analytic rubrics that score process skills — question quality, method, interpretation, collaboration, communication — alongside content and lean on low-stakes formative checkpoints and peer review. Sample rubrics for each level appear earlier in this handbook.

**What if a student's project “fails”?** In authentic research, unexpected or negative results are normal and valuable. Build failure and iteration into the design and the rubric — grade the reasoning, documentation, and revision, not whether the hypothesis was confirmed. Students often report that experiencing and working through failure is what made the course feel like real science.

**Where can I find more help and examples?** See the UNM Undergraduate Research, Arts & Design Network ECURE pages for implementation presentations, example syllabi, and the cohort report (Schroeder et al., 2023; University of New Mexico, n.d.), and the broader CUREnet collection for cross-institutional examples and assessment tools (Dolan, n.d.).

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