CCLI Evaluation Planning Webinar

Building Evaluation Capacity

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Webinar Agenda

- Welcome and opening remarks
- Goals of the Webinar
- Introduction to the Webinar and CCLI
- Evaluation plan presentation
- Participant survey
- Closing remarks
- Additional resources

Goals of the Webinar

- Encourage PIs to consult and work collaboratively with someone with evaluation expertise early in the proposal preparation
- Introduce some key concepts in evaluation and provide guidance for preparing the evaluation plan

Introduction to the Webinar

- Webinar protocol
  - 20-25 minute blocks including 10 minutes of Q&A after each evaluation plan component presentation
  - Submit questions to team using Q&A feature
- Worksheet and Checklist
  - Use Worksheet to record evaluation ideas
  - Consult Evaluation Plan Checklist for suggestions for evaluation plan content
  - http://oerl.sri.com/ccli_resources.html

CCLI Program Context

- Program goal: Excellence in science, technology, engineering, and math (STEM) education at the undergraduate level
- Focus is on developing improved curriculum and classroom/laboratory practices
- Strategies include creating materials, developing faculty skills, designing and implementing innovations, assessing students, and evaluating STEM educational practice

Phase I
Proposals and Evaluation

- Exploratory and targeted in scope
- Evaluation activities are constrained by time and budget for awards
- Evaluation plans should be realistic, credible, and coherent

Additional Considerations

- Utilizing an “external” evaluator (either external to project or institution)
- Evaluation budgets can be varied, ranging from 5 to 15% of grant
- Length of evaluation plan within proposal

Purposes of CCLI Phase I Evaluations

- To provide formative feedback to facilitate project refinements
- To describe initial implementation activities, successes, and challenges
- To monitor status of project activities (e.g., development of materials, workshops)
- To document project outcomes (What happened?)
- To collect evidence of project success

Suggested content for a Phase I CCLI evaluation plan

Major Components of an Evaluation Plan

1. Project Description
2. Evaluation Overview
3. Evaluation Design
4. Data Analysis Plan

Suggested content for a Phase I CCLI evaluation plan

Major Components of an Evaluation Plan

1. Project Description (not focus of Webinar)
2. Evaluation Overview
3. Evaluation Design
4. Data Analysis Plan

Evaluation Overview

- Provides an organizing framework for evaluation plan
- Evaluation overview elements
  - Goals and objectives of evaluation
  - Evaluation questions
  - Evaluator credibility

Suggested content for a Phase I CCLI evaluation plan

Evaluation Overview - Elements

- Goals and objectives of evaluation
- Evaluation questions
- Evaluator credibility

Description of illustrative case

- Green Engineering Course
  - Project involves creating and testing materials and teaching practices that support interdisciplinary design experiences within a capstone design course
  - Intended outcomes include increased student knowledge of green engineering principles and design ability, and student and faculty interdisciplinary collaboration skills

Evaluation Overview – Goals and Objectives of Evaluation

- Goals are broad descriptions of an intended outcome
- Objectives are specific, targeted descriptions of an intended outcome
- Evaluation goals and objectives are linked to the project goals and objectives
- Evaluation goals and objectives should be realistic

Evaluation Overview –
Goals and Objectives of Evaluation

Example. Green Engineering Course

The overall goal of this evaluation will be to examine the usability and the potential effectiveness of the teaching and learning materials developed to support interdisciplinary collaboration. The proposed evaluation will focus on the implementation and the impact of the teaching and learning materials in fostering collaboration. The evaluation has the following objectives:

- Document the conditions and practices that support strong project implementation
- Examine the extent to which teaching and learning materials promote positive learning outcomes for students
- Examine the extent to which faculty advisors' interdisciplinary collaboration skills are affected by working as a project advisor

Evaluation Overview –

Goals and Objectives of Evaluation

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Evaluation Overview –

Goals and Objectives of Evaluation

Example. Green Engineering Course

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Suggested content for a Phase I CCLI evaluation plan

Evaluation Overview - Elements

- Goals and objectives of evaluation
- Evaluation questions
- Evaluator credibility

Evaluation Overview – Evaluation Questions

- Are the questions aligned with project goals and evaluation purposes?
- Will the questions posed satisfy project stakeholders?
- Are the questions realistic and testable?
  - Time frame of project
  - Available data sources and instruments
  - Constrained design choices

Evaluation Overview –
Evaluation Questions

Example. Green Engineering Course

Evaluation questions to be addressed are the following:

- Has the project been implemented according to plan?
- To what extent are the learning and teaching materials adaptable and usable within the capstone course sequence?
- To what extent do the learning materials and the capstone course affect the relevant student outcomes?
- What is the impact of the project on the interdisciplinary collaboration skills of the faculty advisors?

Suggested content for a Phase I CCLI evaluation plan

Evaluation Overview - Elements

- Goals and objectives of evaluation
- Evaluation questions
- Evaluator credibility

Evaluation Overview – Evaluator Credibility

- Relevant experience in…
  - Subject matter expertise
  - Industry
  - Development of material and products
  - Institutional context
  - Evaluation of similar projects

Evaluation Overview – Evaluator Credibility

Example. Green Engineering Course

Professor Jones, a senior faculty member from the Mechanical Engineering Department at the university, will serve as an internal evaluator and lead the evaluation of student small-group inquiry experiences, student engagement in the course, the conditions that support successful collaborative design experiences. Professor Jones has 14 years of teaching and research experience at the university, and has actively engaged in course and curriculum development. He has developed senior-level capstone design courses, engineering materials, measurements and instrumentation, mechanical systems, and microcontrollers. He gained experience in outcome-based assessment by participating in the Gateway Coalition and facilitating ABET 2000 accreditation while Undergraduate Coordinator.

Evaluation Overview –

Evaluator Credibility

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Suggested content for a Phase I CCLI evaluation plan

Major Components of an Evaluation Plan

1. Project Description
2. Evaluation Overview
3. Evaluation Design
4. Data Analysis Plan

Evaluation Design – Elements

- Design overview
- Participants
- Project monitoring
- Implementation monitoring
- Documentation of project outcomes
- Instrumentation
- Data collection procedures and schedule

Suggested content for a Phase I CCLI evaluation plan

Evaluation Design – Elements

- Design overview
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Evaluation Design – Design Overview

- Summary of design (methodology, data collection activities, kinds of instruments)

Evaluation Design – Design Overview

- Summary of design (methodology, data collection activities, kinds of instruments)
- Emphasize the linkage between methodologies and evaluation questions

Evaluation Design – Design Overview

Example. Green Engineering Course

Table 1. Summary of Project Evaluation Design

Evaluation Questions	Outcome Measures	Data source(s)	Proposed Method(s)	Schedule
1. To what extent are the learning and teaching materials flexible and usable by faculty in the capstone course sequence?	Usefulness of materials	Faculty teaching course	• Teaching logs and observations • Structured interviews	• During course • End-of-course
2. To what extent do the learning materials and the capstone course affect the relevant student outcomes?	Design ability	Students	• Portfolio analysis • Grading of student products and presentations	• End-of-course • End-of-course
	Knowledge of green engineering principles		• Standardized assessment • Grading of final design by interdisciplinary team	• Pre-post course • End-of-course
	Meta-knowledge of interdisciplinary collaboration		• Written assessment • Observation of collaborative activities • Student focus groups	• Pre-post course • During course
3. What is the impact of this project on the interdisciplinary collaboration skills of faculty advisors?	Interdisciplinary collaboration skills	Faculty advisors	• Standardized assessment	• Pre-post course

Suggested content for a Phase I CCLI evaluation plan

Evaluation Design – Elements

- Design overview
- Participants
- Project monitoring
- Implementation monitoring
- Documentation of project outcomes
- Instrumentation
- Data collection procedures and schedule

Evaluation Design – Participants

- Describe participants and how they were selected
- Approximate number of participants to be included in each group

Evaluation Design – Participants

Example. Green Engineering Course

Participants

The faculty sample participating in the study will include two teaching faculty and six project advisors. Approximately 40 senior-level engineering students from the two sections of the engineering capstone design course will constitute the student sample.

Suggested content for a Phase I CCLI evaluation plan

Evaluation Design – Elements

- Design overview
- Participants
- Project monitoring
- Implementation monitoring
- Documentation of project outcomes
- Instrumentation
- Data collection procedures and schedule

Evaluation Design –

Project Monitoring

- Documentation of project activities
- Example project activities
  - Production of curricula materials
  - Development of faculty workshop
  - Installation of equipment

Suggested content for a Phase I CCLI evaluation plan

Evaluation Design – Elements

- Design overview
- Participants
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Evaluation Design –

Implementation Monitoring

1. Provide real-time formative information to developers to inform project refinements

Evaluation Design –

Implementation Monitoring

1. Provide real-time formative information to developers to inform project refinements
2. Document implementation stories for reporting including conditions that support and hinder implementation

Evaluation Design –

Implementation Monitoring

1. Provide real-time formative information to developers to inform project refinements
2. Document implementation stories for reporting including conditions that support and hinder implementation
3. Collect data that will help with the interpretation of results about project effects on students and faculty
   - E.g., To examine the relationship between the extent to which materials or equipment were used and project effects

Evaluation Design –

Implementation Monitoring

Example. Green Engineering Course

Faculty will maintain ongoing teaching logs during the course to document implementation concerns with course materials and activities, supplemented by classroom observations by Professor Rockland and a graduate assistant. Additional information on implementation challenges and the utility of the teaching materials will be obtained through structured faculty interviews conducted by Professor Rockland during the implementation year.

Suggested content for a Phase I CCLI evaluation plan

Evaluation Design – Elements

- Design overview
- Participants
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Evaluation Design –

Documentation of Project Outcomes

- Plan to document anticipated and unanticipated project outcomes

Evaluation Design –

Documentation of Project Outcomes

- Possible project outcome measures
  - Products developed (number and quality)
    - Course materials and revisions
    - Training modules
  - Usage
    - Materials and equipment
    - Instructional techniques
  - Knowledge and skills
    - Learning content
    - Collaboration skills
    - Retention, graduation
  - Attitudes and engagement

Evaluation Design –

Documentation of Project Outcomes

If interested in how a project effects students and faculty (e.g., knowledge, use of instructional strategy, attitudes toward science)

- Identify best designs <u>within constraints of time and resources</u>

Evaluation Design –

Documentation of Project Outcomes

- Identify best designs within constraints of time and resources

  3 frequently used designs

  1. Single-group post outcome design – Collecting data on participants' outcomes after the course or unit

Evaluation Design –

Documentation of Project Outcomes

- Identify best designs within constraints of time and resources

3 frequently used designs

1. Single-group post outcome design – Collecting data on participants' outcomes after the course or unit
2. Single-group pre-post outcome design – Collecting data on participants' outcomes before and after course or unit

Evaluation Design –

Documentation of Project Outcomes

- Identify best designs within constraints of time and resources

3 frequently used designs

1. Single-group post outcome design – Collect data on participants' outcomes after the course or unit
2. Single-group pre-post outcome design – Collect data on participants' outcomes before and after course or unit
3. Comparison group design – Collect data on participants' outcomes in study and matched comparison groups (This is called a control group design if participants randomly assigned to groups)

Evaluation Design –

Documentation of Project Outcomes

- Identify best designs within constraints of time and resources

  3 frequently used designs

  1. Single-group post outcome design - Measuring participants' outcomes after the course or unit
  2. Single-group pre-post outcome design - Measuring participants' outcomes before and after course or unit
  3. Comparison group design - Measuring participants' outcomes in study and matched comparison groups (This is called a control group design if participants randomly assigned to groups)

- Collect multiple outcome measures

Evaluation Design – Documentation of Project Outcomes

- Considerations for designs to examine project effects on participants
  - Acknowledge limitations of designs used to assess project effects on students and faculty
  - Strength of claims about project effects will depend on your ability to rule out alternative explanations for results
  - Phase I projects - Collecting preliminary and suggestive evidence of project effects to be examined more rigorously in Phase II study

Evaluation Design –

Documentation of Project Outcomes

Example. Green Engineering Course

Illustration of **single group pre-post outcome** design

Green Engineering Principles: A single-group pre-post design will be used to assess gains in student knowledge of green engineering principles. Pre and post assessments of the students' knowledge of green engineering principles will be based on a standardized knowledge test at the beginning and end of the Course. A review of student teams' final designs by an interdisciplinary team of faculty also will provide supplemental data on student abilities.

Suggested content for a Phase I CCLI evaluation plan

Evaluation Design – Elements

- Design overview
- Participants
- Project monitoring
- Implementation monitoring
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Evaluation Design – Instrumentation

- Qualitative Instruments (e.g., interview, focus group, and observation protocols)
- Quantitative Instruments (e.g., surveys standardized tests, scoring rubric)
- Use of archival and administrative data to collect background and outcome data on participants

Evaluation Design – Instrumentation

- Off-the-shelf, adapted, and newly developed instruments
- Reliability (i.e., yields similar responses when participants retested or assessed by different raters)
- Validity (i.e., measures the intended outcome accurately)
- Pilot testing of instruments
- Resource: Online Evaluation Resource Library (http://oerl.sri.com/)

Evaluation Design – Instrumentation

Example. Green Engineering Course

- **Technical qualities of students' designs**. Professor Jones will develop a rubric that will be used to assess student design portfolios on a series of measures based on the EPA's 9 principles of green engineering (http://epa.gov/oppt/greenengineering/pubs). A holistic rubric will be used to give an overall technical quality score on a 5-point scale. Professor Jones has used a similar rubric as part of a systematic scoring procedure and has achieved interrater reliabilities of .76 (Jones et al., 1999).

Evaluation Design – Instrumentation

Example. Green Engineering Course

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Suggested content for a Phase I CCLI evaluation plan

Evaluation Design – Elements

- Design overview
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- Project monitoring
- Implementation monitoring
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- Instrumentation
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Evaluation Design – Data collection procedures and schedule

- Select data collection methods that address evaluation questions and achieve high response rates within project constraints
- Describe timing of data collection activities

Evaluation Design –
Data collection procedures and schedule

Example. Green Engineering Course

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3.What is the impact of this project on the interdisciplinary collaboration skills of faculty advisors?	Interdisciplinary collaboration skills	Faculty advisors	• Standardized assessment	• Pre-post course

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Data Analysis Plan - Elements

- Overview of key analyses linked to evaluation questions

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- Overview of key analyses linked to evaluation questions
- Description of qualitative and quantitative analyses
  - Identification of specific statistical or qualitative analysis techniques (e.g., ANOVA, content analysis)
- Description of qualitative and quantitative data integration (if appropriate)

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Data Analysis Plan

- Description of qualitative and quantitative analyses
  - Qualitative analyses
    - Describe coding, interpretation, and synthesis procedures

Data Analysis Plan

- Description of qualitative and quantitative analyses
  - Qualitative analyses
    - Describe coding, interpretation, and synthesis procedures
  - Quantitative analysis
    - If proposing use of inferential statistics (e.g., *t* test, correlation, regression)
      - Identify method and procedure
      - Technical Note: Use of small samples reduces the likelihood of finding statistically significant relationships or differences

Data Analysis Plan

Example. Green Engineering Course

Illustration of proposed quantitative analyses

The pre- and posttest data will be analyzed using repeated-measures ANOVA to examine changes in student knowledge of green engineering principles and interdisciplinary collaboration in the capstone course sequence. A similar analysis will be conducted of faculty pre and post surveys for interdisciplinary collaboration. Because of the small size of the student and faculty samples involved, we will not be able estimate statistically reliable gains in student and faculty outcomes. The level of student design ability will be assessed through external panel reviews of student portfolios, using procedures and rubrics developed by Hagman and Bucyk. These data will be supplemented by data on student grades provided by instructors. Finally, a mixed-methods analysis will be conducted to assess the usability of the materials using descriptive statistics from a frequency analysis of faculty logs and findings from a qualitative analysis of structured faculty interviews.

Data Analysis Plan

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Wrap Up I

- Participant Survey
  - http://www.surveymonkey.com/ccli
- Closing Remarks

Wrap Up II

- Available workshop materials and additional resources
  - http://oerl.sri.com/ccli_resources.html
  - Workshop presentation slides
  - Audio recording of workshop
  - Evaluation Planning Worksheet
  - Suggested Checklist to help with plan preparation
  - General evaluation design references