Making the Grade: The Role of Assessment in Authentic Learning

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Making the Grade: The Role of Assessment in Authentic Learning

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Abstract

Assessment is an integral component of any successful teaching effort. Research has shown that students engage with subject matter based in part on their expectations about how their achievement will be evaluated. Educators who strive to bring authentic learning experiences to their students must devise appropriate and meaningful measures to assess student learning and mastery of concepts at hand. Although some barriers must be overcome, numerous examples point to the opportunities available for effective assessment of authentic learning initiatives. These approaches to assessment are vital to ensuring that models of teaching and learning with technology see their full potential.

Every lecturer has had this experience at one time or another: You're explaining some especially intricate and fascinating aspect of your discipline when you see a hand shoot up in the back row.

"Yes?" you ask, eager to engage on a favorite topic with a bright, inquisitive mind.

"Um, do we *have* to know this? Will it be on the test?"

As far as students are concerned, there is nothing more central to the learning experience than assessment. Some learning researchers call this the backwash effect. The type of assessment students know will be coming determines when they "tune in" to a lecture and when they "tune out." Evidence from student diaries indicates that students spend less than 10 percent of their time on non-assessed academic work.[1] Ultimately, "assessment defines what students regard as important, how they spend their time, and how they come to see themselves as students and then as graduates."[2] Because students take their cues about what is important from what is being assessed, "if you want to change student learning, then change the method of assessment."[3]

This fourth in a series of white papers on authentic learning concentrates on student assessment, one of the toughest challenges facing faculty who want to adopt a mode of instruction that helps prepare students for the realities of professional practice in a technology-mediated, information-rich, and increasingly collaborative workplace. If we want learners to engage with ambiguous and complex problems, including those drawn from real life, then we need new forms of assessment that document the higher-order thinking and problem solving that students demonstrate.

Faculty hoping to change student learning must address the limitations of the current system of feedback. Instructors and learning scientists agree that the traditional feedback process is rarely good for morale. Most students experience the typical undergraduate survey course as some kind of juggernaut propelling them from one topic to another along a merciless trajectory, interrupted only by high-stakes exams. Feedback is something students commonly get "only after the lecturing on the subject is over and before moving on to the next hurdle in the syllabus."[4]

If, as learning scientists suggest, "something like 90 percent of a typical university degree depends on unseen, time-constrained written examinations, and [instructor]-marked essays and/or reports," what will a college career made up of high exam scores really tell us about a student's readiness to put knowledge into practice in creative ways?[5] Advocates of assessment reform, including mathematician George Wiggins, contend the most that can be said of a high-scoring learner is that she is a good student and will graduate with a false sense of security. Meanwhile, her instructors can only *infer* from her scores that she would be capable of using information where appropriate in a variety of unfamiliar and ambiguous real-world situations. In 1995, the National Science Education Standards (NCSE) committee published a report acknowledging the need for alternative assessment techniques so that instructors could really see and record how well learners performed on real-world learning tasks that required complex thought, creativity, and judgment. The report responded to studies from the 1980s in which it was shown that those students who demonstrate practical mastery of calculating and reasoning skills in their daily lives often fail on formal measures.

What, then, are the kinds of "tests" our students will actually encounter beyond the classroom? How can we prepare them for a career of lifelong learning? And how can we change our methods of assessment while keeping up with all the other demands on our time as researchers, instructors, and individuals? We need to rethink the way we assess student

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performance to ensure that our graduates are ready to meet the demands of the 21st-century workplace. Alternative assessment methods offer new ways of articulating what we value most about higher education; they can motivate and inspire learners to explore dimensions of themselves and the world that they might otherwise overlook. This white paper will look at what learning theory tells us about the power and importance of the assessment methods we adopt. The discussion will focus on those factors in the current educational environment that are likely to affect assessment reform efforts in the coming decade, by asking a set of strategic questions:

- What are the factors driving assessment reform today?

- What are the barriers to exploring and exploiting new assessment models?

- What are the available community resources for supporting and enabling change?

Driving Change

A range of factors contribute to the voices calling for new methods of assessment that challenge educators and learners to focus on knowledge that can be applied in real-world situations. Among these factors are economic conditions, new scholarship on learning, and a student population with new expectations of educational institutions.

Changing Economy

In their 2006 report to Secretary of Education Margaret Spellings, members of the Commission on the Future of Higher Education recommended certain goals for reform, among them "a higher-education system that gives Americans the workplace skills they need to adapt to a rapidly changing economy,"[6] particularly one in which our graduates are in direct competition with highly qualified knowledge workers from other countries. According to the commission, the value and relevance of instruction in U.S. postsecondary institutions is in question, given the demands of the new marketplace: "Employers complain that many college graduates are not prepared for the workplace and lack the new set of skills necessary for successful employment and continuous career development.[7]

Traditional models of assessment can exacerbate the problem by delaying development of independent thinking. The typical structure of lectures and exams may simply prolong the time during which a learner continues to think like a student rather than an apprentice practitioner.[8] Does this approach underserve our students in an increasingly fast-paced, information-intensive, and entrepreneurial age where contextual learning skills, just-in-time problem-solving, and personal adaptability are essential? These are the exigencies that drove the University of Washington's College of Engineering, for example, to rethink its entire curriculum and develop new learning activities to help students "start thinking about civil engineering holistically and to revisit and structure their knowledge in anticipation of professional practice."[9]

Changing View of Learning

Learning scientists confirm that it is relatively simple to test for subject matter content recall and difficult to assess independent critical thinking and creativity. They are equally convinced that the primary learning objective of higher education ought to be the development of those habits of mind most difficult and time-consuming to measure. According to the latest research in cognition and learning, colleges and universities should be focusing on "long-term knowledge retention and transfer" of knowledge.[10] Yet if we continue to insist on high reliability—tests that result in quantifiable progress and reportable scores—whole areas of

the preferred curriculum will be underrepresented in examinations, particularly those areas where originality and collaborative negotiation are likely to come into play.[11]

At the same time, recent studies of student achievement in large-enrollment lower-division courses are calling into question long-standing assumptions about the value of content coverage. Simply put, there is mounting evidence that *less is more*. Covering vast amounts of material may actually *impede* understanding and lower student achievement scores. For example, studies of students in freshman biology courses for nonmajors, where content coverage is decreased and active learning exercises increased, show that their achievement scores and attitudes toward science are statistically better than those of biology majors enrolled in courses where content coverage is stressed at the expense of *context* and participation.[12] Similarly, collaborators from the University of Akron's College of Education and its Department of Geology studied two large sections (140–180 students) of the same Earth Science course. One instructor followed a traditional lecture format, while the other cut back on content coverage in order to incorporate inquiry-based, active learning methods involving students working in groups during class sessions. When students in both sections were given the same exams, those in the inquiry-based learning group outperformed their counterparts. On short-answer interpretation questions that involved analysis, synthesis, or evaluation, the differences in performance were most dramatic. The average score for students in the inquiry-based learning section was 7 percent higher, despite the fact that these students had been exposed to less direct content coverage.[13]

Changing Student Attitudes

Assessment research has long critiqued traditional testing instruments for providing inadequate or superficial feedback to students.[14] Both in the United States and abroad, undergraduates have begun to view themselves as "learning consumers" with expectations to be met in their education. Not only do learners want to know the criteria by which they will be judged, but they also want processes in place to help them improve and develop, guided by clear, practical, and specific feedback. These "consumer learners" are demanding increased transparency from instructors. They want to be let in on the instructor's thinking process, asking why the course was designed in this fashion, what the instructor is trying to accomplish, why the learning activities are relevant, and what the criteria are for judging student success. Without quality feedback on past performance, there is no basis on which to repair misconceptions or improve understanding.

Dealing with the Barriers

As Lewis Elton and B. Johnston point out, "antithetical pressures" are at the heart of the assessment debate in higher education. Institutions must deal with large numbers of students, making traditional test-based—also known as "summative"—assessment systems attractive. Yet colleges and universities must contend with opposing pressures to "make assessments formative and developmental."[15]

In the mid-1990s, authentic assessment emerged as an antidote to reliance on standardized reading tests in public K–12 schools. School districts and teachers were urged to adopt outcome-based forms of assessment (often linked with portfolios and performance tests) that would demonstrate what children really learn by evaluating what they do in actual or simulated applied situations. At the time, a host of books appeared that described the advantages of performance assessments while acknowledging the problems in areas of scoring, validity, instruction versus accountability, time constraints, costs, and teacher resistance.[16]

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Faculty Resistance

Laudable as authentic assessment goals may be, they are difficult to implement, particularly for time-constrained faculty. The typical undergraduate instructor—pulled in so many directions by noninstructional duties and responsibilities—will likely worry that preparing and evaluating authentic learning tasks will increase his workload.[17] Most faculty assume that changing their instructional methods to accommodate open-ended challenges and real-world problem-solving activities will prove onerous in any number of ways:

- Time-intensive to manage, monitor, and coordinate

- Challenging to grade in a consistent manner

- Susceptible to a more subjective (and potentially biased) approach to grading

- Demanding additional instruction, orienting students to unfamiliar tasks such as emulating professional writing or presentations

- Difficult to implement in large-enrollment courses

Faculty resistance is present even where extraordinary levels of faculty support are made possible by foundation funding, as is the case with the University of California, Berkeley's multiyear initiative to expand the range of research opportunities available to undergraduates. Beth Dupuis, who as UC Berkeley's associate university librarian for educational initiatives is leading the project, made sure to provide faculty with an assessment consultant who would work with them on the design of their assignments, including the development, implementation, and analysis of various assessment measures. Faculty fellows were encouraged to design a custom transformational assessment approach for their courses, but they were reluctant to comb through the literature on assessment unassisted and were most engaged when consultants presented them with templates—sample syllabi, assignments, and assessments developed by other faculty, regardless of discipline. From Dupuis's perspective, "the nuances that make for an effective assignment and assessment are often not the elements that are evidenced by simply looking at the artifacts, and few [faculty] write about the pedagogical factors they considered when creating those materials."[18]

Under-Researched Assessment

Even if faculty were disposed to spend hours studying the assessment literature, their efforts might not be rewarded because the literature on assessment may do more to obstruct than to facilitate change. Problems with definitions might be one reason that the pace of change has been so slow. Learning theory tends to provide a great deal of advice when it comes to the *design* of activities through which students can demonstrate understanding and competency. But what may be even more important is practical advice on how to actually *assess the quality* of a student's performance quickly and reliably. Too often, the literature on authentic or performance assessment broaches the topic of quality only to return once again to the issue of task design. We are given a wide range of suggestions when it comes to appropriate activities—research portfolios, mock trials, poster sessions, and so on. But once students perform the required tasks, professors are largely left to their own devices when it comes to measuring student achievement and providing meaningful feedback.[19] Table 1[20] identifies some of the challenges, where traditional assessment is compared to authentic assessment as described in the most general of terms.

Table 1. Traditional vs. Authentic Assessment Methods

Traditional Assessment	Authentic Assessment
Generally relies on forced-choice, written measures	Promotes integration of various written and performance measures
Relies on proxy measures of student learning to represent target skills	Relies on direct measures of target skills
Encourages memorization of correct answers	Encourages divergent thinking in generating possible answers
Goal is to measure acquisition of knowledge	Goal is to enhance development of meaningful skills
Curriculum directs assessment	Assessment directs curriculum
Emphasis on developing a body of knowledge	Emphasis on ensuring proficiency at real-world tasks
Promotes "what" knowledge	Promotes "how" knowledge
Provides a one-time snapshot of student understanding	Provides an examination of learning over time
Emphasizes competition	Emphasizes cooperation
Targets simplistic skills or tasks in a concrete, singular fashion	Prepares students for ambiguities and exceptions that are found in realistic problem settings
Priority on summative outcomes or product	Priority on the learning sequence or process

Realizing the Opportunities

Given the complex nature of assessment, it is not surprising that the subject remains under-researched, while the available resources (guides, templates, best practices) seem underdeveloped and disjointed. One small, but necessary, step forward in realizing the existing opportunities for change might be to leave behind the rhetoric, sift through the studies, and identify a set of specific tips and techniques that instructors can use to help them assess student performance on authentic learning tasks. Rather than reiterate the generic advantages and disadvantages of alternative assessment strategies, let's focus on a few methods that are beginning to find favor among faculty across the disciplinary spectrum.

Evaluating Individual Work

Students have traditionally been graded on individual performance, and this structure remains valuable for many learning exercises. That said, different assessment methods are more or less appropriate for different kinds of authentic learning projects.

Rubrics

The word *rubric* derives from the Latin *rubrica*, or "red," and relates to red print used to direct or redirect readers' attention to text of special importance. Today's grading rubric is essentially a set of scoring guidelines that are disclosed to students—or, in many cases, actively developed in collaboration with students. A good rubric identifies the criteria by which work will be judged and describes the difference between excellent and weaker work.

When an instructor accompanies an open-ended challenge with an effective rubric, the instructor is actively directing the learner's attention toward potential solutions that are more reasonable than others. Often the rubric will come into play most dramatically during authentic learning experiences at the critical moment when students realize there is no one "right answer" to the challenge before them. They confront the limits of their conditioned responses, question what the instructor wants, and recognize for the first time that they really have no idea how to deliver a high-quality response in an ambiguous, real-world dilemma.

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What would such a response consist of? The rubric helps redirect their attention to the concerns that matter most when choosing the most reasonable solution and the strongest argument among many possibilities.[21]

One noteworthy example of institutional commitment to assessment through effective rubric design is the Critical Thinking Project at Washington State University, a collaboration between WSU's Center for Teaching, Learning, and Technology, its General Education Program, and its Writing Program. The Critical and Integrative Thinking Rubric completed in 2006 identifies seven key performance criteria for assessing student writing across the curriculum:

- Identifies and summarizes (and appropriately reformulates) the problem, question, or issue
- Identifies and considers the influence of context (cultural/social, educational, technological, political, scientific, economic, ethical, or experiential) and assumptions
- Develops, presents, and communicates individual perspective, hypothesis, or position
- Presents, assesses, and analyzes appropriate supporting data/evidence
- Integrates issue using other disciplinary perspectives and positions (to qualify analysis)
- Identifies and assesses conclusions, implications, and consequences
- Communicates effectively

WSU instructors from a variety of disciplines have evaluated a wide range of assignments by adapting and adjusting these seven dimensions to the specific demands and values of their field.[22]

Peer Assessments

When instructors require classmates to evaluate one another, it not only distributes the workload of evaluation across the learning community but also offers students the opportunity to think critically about the process of evaluation itself. Learners might be asked to reach a class consensus on what constitutes satisfactory and exemplary performance on a variety of tasks. They may be presented with evaluation alternatives and asked to weigh the usefulness and limitations of various assessment instruments (checklists, rating scales, written analysis, and so on). Students become aware of the ways in which feedback is defined by the instrument selected.

Effective peer assessment strategies always devote time to familiarizing students with the key objectives of each assignment and how those objectives align with the core values of the discipline. Students can be introduced to a review processes common within the field and presented with models of exemplary feedback to help them develop as evaluators and self-assessors. Mechanisms should be put in place to ensure that peer assessment is not unduly influenced by peer pressure and that learners appreciate the constructive or "formative" nature of critique.

Research Portfolios

Portfolio assignments are being used across the undergraduate curriculum as part of a formative assessment strategy—a strategy that emphasizes the process of knowledge construction over the final (summative) product. Following the lead of graduate programs where portfolios have long been a mainstay (in education, clinical psychology, design, and

architecture), undergraduate educators are turning to the portfolio as an appropriate mechanism for monitoring student progress on extended, multifaceted projects requiring higher-order thinking skills. The portfolio assignment has the advantage, as well, of being an authentic learning experience in and of itself, replicating many of the reporting processes that occur in real-world situations where workers are required to evaluate various problem-solving approaches and justify their final choices. Depending on the educational context and task requirements, portfolios can take the form of an electronic text, a digital recording, an artistic production, a clinical journal, or any number of other appropriate media formats. Evidence can be included in the portfolio that demonstrates the learner's proficiency on a number of tasks representing achievement:

- Communicate concepts accurately

- Write effectively using graphics as support

- Relate principal concepts to real-world applications

- Reflect on personal learning processes

- Practice the professional presentation conventions of the discipline

- Conduct effective self-assessment

- Think critically while assembling and synthesizing pertinent ideas and information

Finally, to ensure the effectiveness of the portfolio as an evaluation strategy, instructors should set clear guidelines from the start as to how frequently students are expected to add work to their portfolios and explanations for each milestone, including the learning objectives it is intended to address. Instructors might consider requiring that each piece of evidence of student achievement be accompanied by both a written rationale and a self-reflective paragraph. Each item of evidence in the portfolio should be scored according to a scheme that has been distributed to students at the start of the course.[23]

Evaluating Group Work

Assignments that involve significant group work often come closer to the dynamics of real-world practice than those that challenge students to work on projects independently. Doubtless, students will take these team-based tasks more seriously if they receive a grade, yet instructors often find themselves uncomfortable or unprepared when it comes to evaluating group work.[24] Should all members of the team receive the same final evaluation, or should distinctions be made, and if so, how? Can individual contributions be separated out from the collective performance? And what about variations in critical time management and interpersonal skills? How can an instructor tell whether a student is pulling his own weight or simply going along for the ride?

When instructors value open-ended inquiry and wish to leave teams to their own devices in solving complex problems, they hope to facilitate—rather than monitor—the ensuing peer interactions. In these cases, one way of gathering evidence about the contributions and collaboration skills of individual students is to ask teammates to assess one another. In effect, this turns the grading of a group task into yet another group task. Instructors can distribute a grading rubric like the one described in Table 2[25] to help groups evaluate the participation of individual members.

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Table 2. Group Participation Rubric

Criteria	Distinguished	Proficient	Basic	Unacceptable
Workload	Did a full share of the work—or more; knows what needs to be done and does it; volunteers to help others.	Did an equal share of the work; does work when asked; works hard most of the time.	Did almost as much work as others; seldom asks for help.	Did less work than others; doesn't get caught up after absence; doesn't ask for help.
Getting Organized	Took the initiative proposing meeting times and getting group organized.	Worked agreeably with partner(s) concerning times and places to meet.	Could be coaxed into meeting with other partner(s).	Did not meet partner(s) at agreed times and places.
Participation in Discussions	Provided many good ideas for the unit development; inspired others; clearly communicated desires, ideas, personal needs, and feelings.	Participated in discussions; shared feelings and thoughts.	Listened mainly; on some occasions, made suggestions.	Seemed bored with conversations about the unit; rarely spoke up, and ideas were off the mark.
Meeting Deadlines	Completed assigned work ahead of time.	Completed assigned work on time.	Needed some reminding; work was late but it didn't impact grade.	Needed much reminding; work was late and it did impact quality of work or grade.
Showing up for Meetings Score	Showed up for meetings punctually, sometimes ahead of time.	Showed up for meetings on time.	Showed up late, but it wasn't a big problem for completing work.	No show or extremely late; feeble or no excuse offered.
Providing Feedback Score	Habitually provides dignified, clear, and respectful feedback.	Gave feedback that did not offend.	Provided some feedback; sometimes hurt feelings of others with feedback or made irrelevant comments.	Was openly rude when giving feedback.
Receiving Feedback Score	Graciously accepted feedback.	Accepted feedback.	Reluctantly accepted feedback.	Refused to listen to feedback.

Adopting a more quantitative approach than the one described in Table 2, the University of Technology, Sydney (Australia) provides a generic grading template (as shown in Figure 1[26]) for instructors to use or modify when assigning a group project. Students complete an assessment of everyone's contribution to the exercise, including their own. They provide a mark ranging from +2 above the group mark to -2 below the group mark for each group member. The sum total of these marks should equal zero for each row.

Figure 1. Peer Group Assessment Template

Criteria	Name	Name	Name	Name	Name	Total
Commitment to group goals						
Level of participation						
Quality of work produced						
Meeting deadlines						
Work together as a group						
Total						

With this range of assessment strategies at their disposal, what must instructors ask themselves before settling on the best assessment tool for their purposes? To address that

question, we must first put that choice in its proper context. The assessment tool must be matched appropriately to the learning activity. Let's consider four of the most popular methods for integrating real-world practice into the traditional undergraduate experience:

- Case studies or problem-based learning
- Literature reviews
- Investigative project-based learning
- Simulation and role-play

If an instructor were to adopt any one of these methods, what special considerations would need to be taken into account when choosing an assessment tool? Are there ways of matching the particular teaching method with the best assessment tool? Educators must recognize that each teaching method presents a different set of assessment issues that need to be considered carefully, as described below.[27]

Case Studies/Problem-Based Learning

Examples

- National Center for Case Study Teaching in Science at the University of Buffalo, State University of New York, http://ublib.buffalo.edu/libraries/projects/cases/case.html
- U.K. Centre for Materials Education, "Teaching Materials Using Case Studies," http://www.materials.ac.uk/guides/casestudies.asp
- "Starting Point: What is Investigative Case-Based Learning?" http://serc.carleton.edu/introgeo/icbl/what.html

Activities

- *Introductory-level students:* Instructor walks learners through stages of a relevant case "ripped from the headlines," providing general principles at work and having students identify specific instances of that principle in the case materials at hand.
- *Intermediate-level students:* Students are thrown in the middle of things without any framing. They must generate principles and questions from the specifics, working either as individuals or in groups, with networked access to real data, remote instruments, or real-world stakeholders.

Learning Objectives (General Evaluation Criteria)

- Presents a coherent account of the case, with well-summarized information and explicit thought processes.
- Connections drawn and decisions made are based on clear rationale/theory.
- Presents clear links between all parts of the study, with a logical progression of ideas.
- Supporting information is from a range of relevant sources.
- Implications and consequences of conclusions reached are expressed and supported.

Assessment Issues to Consider

- Learners should be made aware of learning objectives upfront (particularly beginning students, who may find the technique unfamiliar).
- Because it can be difficult to isolate and assess individual contributions to joint efforts, mechanisms for monitoring and tracking individual work should be considered.

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Assessment Tools to Consider

- Grading rubric for assessing comprehension, creativity, and presentation based on key objectives and specific qualities/skills under development

- Instructors may insert the following steps[28] into a checklist, rubric, or anecdotal record template to record student information:

  1. Reflect on what you know about the issues

  2. Research the issue

  3. State the challenges and explore alternatives

  4. Determine your decision and set personal goal

  5. Design and apply action plan

  6. Evaluate progress and revise as needed

- Peer assessment for group problem solving—for example, group participation rubric for peer evaluation of collaboration and interpersonal skills

Literature Reviews

Example

- "Assessment Rubric/Criteria for Literature Review," http://edweb.sdsu.edu/Courses/Ed690DR/grading/literaturereviewrubrique.html

Activities

- Summarize and examine important ideas and contributions in the history of the discipline

- Critically evaluate journal articles describing important research studies

- Results reported in written form, in poster form, or as multimedia presentations

- Opportunity for students to engage with primary sources/real data and experts in the disciplines

- Group-based literature review assignments—an opportunity for students to develop collaboration and cooperation skills as they relate to professional practice

Learning Objectives (General Evaluation Criteria)

- Demonstrates understanding of the main features and uses of writing in the field (for example, accurately summarizes the work of others in an effort to provide the context for the presentation of one's own ideas)

- Knows how to use existing literature to help solve a problem, win support, or determine what further research needs to be conducted

- Appropriately adapts writing to the general expectations of readers in the field

- Makes effective use of technologies commonly used for research and writing in the field

- Displays knowledge of the conventions of evidence, format, usage, and documentation in the field

Assessment Issues to Consider

- Time must be taken to teach students how to conduct a review.

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- Students should have access to journal articles appropriate to their current level of expertise.

- Ensure that students engaged in collaborative literature reviews are not competing for scarce resources.

Assessment Tools to Consider

- Research portfolio for assembling the products and reflecting on the process of interacting with primary and secondary sources

- Grading rubric for assessing research portfolio materials based on key objectives and quality measurements

Investigative Projects

Examples

- Guided inquiry project for undergraduate geomorphology course,
  http://nagt.org/files/nagt/jge/abstracts/Field_v51n2p255.pdf

- The Center for Authentic Science Practice in Education,
  http://www.purdue.edu/dp/caspie/CASPiE_Implementation.pdf

Activities

- Projects are focused on questions that drive students to encounter central concepts and principles, resulting in transferable skills.

- Projects involve students in constructive investigation.

- Projects are composed of incremental tasks for which students are evaluated, providing formative feedback throughout the sustained exercise.

- Projects introduce students to research methodology.

- Student performance can take the form of electronic text, a digital recording, or an artistic production or design.

Learning Objectives (General Evaluation Criteria)

- Demonstrates ability to apply theories being taught in lectures to real-life scenarios

- Demonstrates awareness of the rhetorical context (for example, presentation of product addresses intended real-world stakeholders and real-world criteria for success)

- If work is team-based, must meet established standards for effective group participation

Assessment Issues to Consider

- Need to develop meaningful assessment criteria to maintain consistency.

- Must make clear to students in a written description of the group task the extent to which they will be assessed on what they do (process) and on what they produce (product).

- Especially where the group members are mixed in their abilities, the instructor may need to indicate what he values about the input of group members—effort, achievement, or a mix of both.

- Time must be invested in establishing ground rules for student team coordination and assessment criteria for identifying and evaluating individual participation/contribution.

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- Be aware of possible subtle conflicts. If the aim of the exercise is that students learn to collaborate, make sure the assessment does not set them in competition for scarce resources.

Assessment Tools to Consider

- A research portfolio that collects works (written reports, multimedia presentations, statistical analyses, design and planning documents, storyboards, meeting minutes, and so on) and student reflections will demonstrate their growth through out the process.

Simulations and Role-Play

Examples

- "Assessing [Role-Play] Project-Based Learning," http://www.aishe.org/readings/2005-2/chapter10.pdf

- In-Class Simulation Games: Assessing Student Learning, http://jite.org/documents/Vol2/v2p001-013-59.pdf

Activities

- In-class and online simulations or role-plays allow students to practice real-life decision making and conflict resolution with minimal risks.

- The simulation should imitate real-world processes.

Learning Objectives (General Evaluation Criteria)

- Demonstrates ability to formulate questions and find answers to them

- Shows evidence of individual initiative

- Draws on references to learning prior to or related to this experience

- Works in a systematic manner to produce outcomes

Assessment Issues to Consider

- Need to develop meaningful assessment criteria to maintain consistency.

- Learners often find it difficult to understand the objectives of a simulation if they have not been briefed in advance.

Assessment Tools to Consider

- Research portfolio with evidence of the following:[29] planning, organization, interpretation, inference, analysis, application, prediction, and evaluation

The summary above references just a sampling of online resources where instructors can find tips and techniques for evaluating student work in ways that reinforce the formative nature of learning. While faculty may be reluctant to dig deeply into learning theory, they tend to respond positively to campus consultants who are willing to distill that literature into practical guidelines. Campus centers for teaching and learning are the natural partners in this enterprise, along with schools of education and university librarians. Online collections of effective lesson plans, sample case studies from a variety of disciplines, repositories of best practices, and other community-based resources—coupled with the on-campus assistance of teaching and learning consultants—will go a long way toward enabling systemic and sustainable change.

Enabling Change

Across the higher education community, we see pockets of experimentation that may well coalesce into a broader movement over time. The following is a partial list of promising projects, programs, and online resources devoted to the assessment of student performance in authentic learning situations:

General Assessment Guidance

Authentic Assessment Toolkit: This website, created by Jon Mueller at North Central College in Naperville, Illinois, provides rubrics and standards for measuring and improving student understanding. Note the article "How Do You Create Authentic Assessments?" http://jonathan.mueller.faculty.noctrl.edu/toolbox/.

Authentic Science Practice (assessment tools provided)

The Center for Authentic Science Practice in Education (CASPiE): The National Science Foundation, Chemistry Division, funded this center, dedicated to providing research experiences to younger undergraduate science students. A collaboration between Purdue University, the University of Illinois at Chicago, Ball State University, and Northeastern Illinois University, the CASPiE model uses real research to teach students the fundamental skills of science as well as the process of discovery. Instructors are encouraged to use the CASPiE implementation guidebooks to implement CASPiE-developed instructional research modules that take advantage of CASPiE-networked resources, including remote instrumentation. The CASPiE method adopts peer-led team learning techniques, laboratory experiments (based on student access to remote instruments they can calibrate and authentic data they can download and interpret), and appropriate strategies for assessing student research projects. Information on grading rubrics and plans for integrating authentic assessment into the CASPiE project can be found at http://www.purdue.edu/dp/caspie/teaching.html.

The National Center for Case Study Teaching in Science "Case Studies in Science" (University of Buffalo): Teaching notes and assessment suggestions accompany each lesson plan in this digital repository of case studies, which are part of the National Science Digital Library collection, available at http://ublib.buffalo.edu/libraries/projects/cases/case.html. The center promotes the case method of teaching science, with particular focus on undergraduate education. Cases in the collection are accompanied by teaching notes. Many of the sample lessons adopt an interrupted, progressive format, asking students to stop at periodic intervals, frame hypotheses, and then reject those hypothesis and form new ones as data are revealed.

"Starting Point: Teaching Entry Level Geoscience," Carleton College Science Education Resource Center: Launched in 2003 with the support of a two-year grant from the NSF National Science Digital Library, Starting Point is dedicated to integrating alternative educational approaches—interactive lectures, game-based learning, investigative case-based learning, studio teaching, peer review, role-playing, student research, and others—into everyday instruction. Although the project's objective is primarily to provide an online hub for faculty and graduate students teaching entry-level courses in geo- and environmental sciences, information on assessment techniques for postsecondary instructors in every subject domain is also available on the project website at http://serc.carleton.edu/introgeo/index.html.

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Assessment Applications/Tools

iPeer Evaluation Web Application: Developed by the Faculty of Applied Science at the University of British Columbia, this web-based application offers instructors a student feedback system for managing student groups during the peer review process, plus an easy, intuitive way of creating assignments and custom rubrics. It is available for free download at http://ipeer.apsc.ubc.ca/home/.

Calibrated Peer Review (CPR): Developed by UCLA, CPR is a web-based program that helps faculty assign frequent student writing exercises, even in large classes with limited instructional resources. Available at http://cpr.molsci.ucla.edu/ to all registered users, the program teaches students how to evaluate one another's work by helping students assess and adjust their performance as peer reviewers. Additional tools allow instructors to customize assignments and monitor student progress.

Conclusion

What will it take to transform the undergraduate learning experience? A deeper, more sustained conversation between learning researchers and educators. A critical mass of online resources that support experimentation in the classroom. A host of technological tools, including intelligent tutors, offering students personalized, immediate feedback and helping learners to evaluate themselves. The days of the walled-off classroom are giving way to change—a change driven by students looking for practical meaning in an open-ended world.

Endnotes

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