Alternative approaches to assessment with online technologies: Integrated process and product outcomes

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Chapter 23

Alternative Approaches to Assessment with Online Technologies: Integrating Process and Product Outcomes

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Learning Objectives

1. Define the term “alternative assessment.”

2. Summarize in your own words the association between constructivism and alternative assessment.

3. Compare some of the online assessment examples in Table 1 with those presented in other chapters in this book.

4. Speculate on how the computer interface shown in Figure 1 could promote student learning.

5. Explain the assessment tasks and learning processes presented in Table 2 within the current context of world policies about learning from technology and/or recent cognitive theories of learning from multimedia, presented in other chapters in this book.

7. Summarize in your own words the future of online assessment.

Abstract

There is now a new wave of pedagogy advocating “alternative assessment” in which forms of student assessment are integrated into learning through engagement in real life contexts facilitated by online technologies. The use of the WWW in tertiary learning environments offers greater adaptability and flexibility than traditional assessment procedures as it enables the planning and design of tasks that monitor both learning processes and learning outcomes. This chapter proposes that the move towards alternative assessment paradigms has been accelerated by technology with its capacity to offer learners a broad array of authentic activities, and tasks and forums for engaging in constructivist learning.

Introduction

Authentic assessment fosters understanding of learning processes with real-life performance as opposed to a display of inert knowledge. In the constructivist learning environment of this study, assessment processes are mediated through social interaction, communication, exchange of views and collaboration so that learners become aware of, and take responsibility for, assessing their own learning processes. Examples are provided of alternative modes of assessment in a tertiary Web-based environment through the use of diverse assessment tasks enabling multiple modes of showcasing student achievement through portfolios, multimedia projects, skills demonstrations and teamwork.

If assessment defines the curriculum and encapsulates the essential learning experience in higher education, the design of educative assessment tasks could be considered to be the most important element of tertiary teaching (Angelo, 1999). Traditional university education has often operated within a “transmissive paradigm,” emphasising the transfer of knowledge from lecturer to student. The associated assessment practices would focus largely on students’ capacity to recall information and facts in a contrived situation such as an examination. Such a view of learning and assessment is not conducive to constructive, active learning where students take a proactive role in questioning, sharing ideas and applying prior knowledge to new ideas. Moreover, traditional university examinations may not test for deep conceptual understanding (Anderson, Krathwohl, Airasian, Cruikshank, Mayer, Pintrich, Raths & Wittrock, 2001). For example, an exam requiring recall of facts will encourage learners to adopt a surface approach, whereas
assessment of collaborative problem-solving or teamwork on a project will emphasise communication skills, planning and decision making and foster a deeper approach.

However, the increased emphasis of generic transferable skills has required a realignment of teaching practices with desired learning outcomes (Oliver & McLoughlin, 2001). This means that if self-regulated learning and critical skills are expected of graduates, assessment methods must foster such processes and skills. A further impetus to change is the adoption of self-paced independent learning modes and the integration of Web-based instruction for both on-campus and off-campus students. As institutions move increasingly to online delivery, there is scope for technology to support authentic assessment practices in online environments (Herrington & Herrington, 1998).

Gibbs (1992) emphasises that a focus on process, rather than content, is essential in promoting active learning and that evaluation and assessment procedures are central to these issues as students interpret the objectives of a course of study according to the demands of the assessment system. The relevance of this to educational technology is that we can use the attributes of technology to focus on process skills, while developing autonomy and independence by designing authentic assessment tasks. In addition, by making assessment a “learning event” that develops process knowledge (rather than being a one-shot examination), we bring it closer to the context of the workplace. That is where professionals are expected to have self-management skills, and be able to make judgements about their own and other’s work (Bennett, Dunne & Carrre, 2000). Indeed, the capacity of technology to foster both process skills and disciplinary understanding through authentic assessment is an area of research that is now attracting a great deal of research attention (Oliver & McLoughlin, 2001b).

**Alternative Assessment Using Technology**

In recognition of the limitations of traditional university assessment, there is a new wave of pedagogy advocating “alternative assessment,” in which assessment is integrated into learning and fosters understanding of learning processes with real-life performance as opposed to a display of inert knowledge (Wiggins, 1998). This form of authentic assessment is solidly based on constructivism, which recognises the learner as pivotal in knowledge building. In constructivist learning environments there is social interaction, communication, exchange of views, collaboration and support for learners to take more responsibility for the learning process through learner-centred tasks (Collis & Moonen, 2001). Socio-cultural theory is based on similar assumptions, and many theorists have highlighted the importance of reciprocal understanding and transactional dialogue where knowledge is exchanged and modified in the light of peer feedback (McFarlane et al., 2000). Salient features of constructivist learning environments include an emphasis on the following aspects of the learning experience:

- **Authenticity**: Learning is located in actual contexts or real tasks
- **Group work**: Social interaction and feedback are instrumental in communication and higher-order thinking processes
• **Learner control:** Learners are active in defining and negotiating learning tasks
• **Scaffolded learning:** Learners are supported as they progress from novice learners to self-regulated experts

Approaches to assessment may combine both quantitative and qualitative measures of performance (Thelwall, 2000; Kendle & Northcote, 2000). Qualitative types of assessment may take the form of multiple choice items, online quiz tests and objective testing of discrete skills and knowledge. In such tests, there is usually a predefined “right answer” and scoring of results can be done automatically. Often, objective testing using quantitative measures of performance is summative, and administered in order to provide a profile of learner achievement. In seeking other indicators of student performance, such as the capacity to be creative, to think logically and to engage in self-regulated learning, other, more qualitative forms of assessment may be designed where students are given greater choice and opportunity to demonstrate their own understandings and solutions (King & Duke-Williams, 2001). Assessment tasks that are integrated with learning processes may use formative approaches, where the objective is less on the assessment of student knowledge and more on the provision of feedback to guide learning. Other uses of assessment may be to diagnose understanding in order to prepare students for substantive tasks involving complex skills. Educators need to be aware of the limitations of purely quantitative measures of performance. The WWW offers greater adaptability and flexibility to combine both quantitative and qualitative assessment procedures and formative indicators of student achievement (Harper et al., 2000).

It can be argued that the move towards alternative assessment paradigms has been accelerated by technology with its capacity to support a broad array of activities, tasks and modes of communication. For instance, qualitative and formative modes of assessment focus on the use of multiple tasks and multiple modes of showcasing student achievement through portfolios, multimedia projects, skills demonstrations and teamwork. A further important contribution made by technology authentic modes of assessment is the capacity to support the evaluation of learning processes, such as communication, group work and collaborative problem solving, as opposed to a narrow focus on a single outcome as an indicator of competence (Cumming & Maxwell, 1999; Morgan & O’Reilly, 1999).

Technology can be effectively used in constructivist learning environments as it affords the creation of situated learning contexts, communication channels and group work, learner control and creation of resource-based learning environments that foster higher-order cognition and self-directed learning (Schwartz et al., 2000; Birenbaum, 1999). Due to expanding research in the field, an array of online resources, tools and software is becoming available to support authentic online assessment (Jonassen, Previsch, Christy & Stravrulaki, 1999; Reeves, 2000).

The World Wide Web provides scope for the multitude of assessment tasks and approaches that showcase learner achievement in a range of process skills including:
• Collaborative learning
• Networked peer assessment
• Self-assessment and problem solving online

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Table 1 presents examples of formative, summative and diagnostic assessment using Web-based technologies, showing that a range of skills may be diagnosed and assessed in computer-based environments (Brown, Race & Bull, 1999; Bull & McKenna, 2000; Chang, 2001; Coomey & Stephenson, 2000; McConnell, 1999; Mostert & Knoetze, 2001).

Table 1. Examples of online and computer-based assessment

<table>
<thead>
<tr>
<th>Type</th>
<th>Approach</th>
<th>Example of Skills Assessed</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Bulletin board tasks</td>
<td>Formative</td>
<td>Interpersonal skills, collaboration, peer review and evaluation, interpersonal skills</td>
</tr>
<tr>
<td>• Electronic journal</td>
<td>Diagnostic, formative</td>
<td>Reflection</td>
</tr>
<tr>
<td>• Drag and drop items</td>
<td>Summative</td>
<td>Recall and application of concepts</td>
</tr>
<tr>
<td>• Mini-test</td>
<td>Summative</td>
<td>Synthesis and application of concepts</td>
</tr>
<tr>
<td>• Multiple choice</td>
<td>Formative &amp; summative</td>
<td>Depends on types of questions</td>
</tr>
<tr>
<td>• Multiple response</td>
<td>Formative &amp; summative</td>
<td>Comprehension, analysis and synthesis</td>
</tr>
<tr>
<td>• Open access random tests</td>
<td>Formative, diagnostic &amp; summative</td>
<td>Comprehension, analysis, synthesis, review of concepts</td>
</tr>
<tr>
<td>• Practice test</td>
<td>Diagnostic</td>
<td>Self-directed learning</td>
</tr>
<tr>
<td>• Peer assessment</td>
<td>Formative &amp; summative</td>
<td>Collaboration, reflection, metacognition</td>
</tr>
<tr>
<td>• Pre-test</td>
<td>Diagnostic</td>
<td>Depends on questions</td>
</tr>
<tr>
<td>• Portfolio</td>
<td>Formative &amp; summative</td>
<td>Lifelong learning, self-direction, metacognition, project management</td>
</tr>
<tr>
<td>• Quiz</td>
<td>Formative and summative</td>
<td>A range of cognitive skills depending on the questions asked</td>
</tr>
<tr>
<td>• Question bank final quiz</td>
<td>Summative</td>
<td>A range of cognitive skills depending on the questions asked</td>
</tr>
<tr>
<td>• Revision quiz</td>
<td>Formative</td>
<td>A range of cognitive skills depending on the questions asked</td>
</tr>
<tr>
<td>• Reflective log</td>
<td>Formative</td>
<td>Metacognition, self-evaluation, self-monitoring</td>
</tr>
<tr>
<td>• Self-assessment</td>
<td>Formative</td>
<td>Self-evaluation, self-monitoring</td>
</tr>
<tr>
<td>• Short answer</td>
<td>Formative, summative</td>
<td>Application and transfer of knowledge</td>
</tr>
<tr>
<td>• Simulation and role play</td>
<td>Formative and summative</td>
<td>Higher-order thinking</td>
</tr>
</tbody>
</table>
Examples of tools and assessment practices involving these examples can be found in Brown et al. (1999) and the CAA Web site at: http://www.lboro.ac.uk/service/ltd/flicaa/conf2001/

**Online Learning Supports: Examples**

The following examples are based on an online learning environment created to help promote Web-design skills for students in a tertiary setting using authentic Web-based assessment. Students work in teams to prepare a project plan, project specification and Web site that meets the requirements of an industry client. The online component provides access to course notes, syllabus, assessment processes, access to previous projects as well as group communication facilities such as e-mail, bulletin boards and problem-solving tasks. The interface used in the course to promote the student-learning process is shown in Figure 1.

The focus of the course is to promote independent learning, peer and self-assessment using online resources, peer support and collaboration, which help promote the development of professional skills and process knowledge. Also, as part of an authentic learning task, students share their knowledge with peers, and work in teams to create multimedia products that meet industry specifications. The course objectives are closely linked to the professional competencies required for multimedia development in the industry and integrated authentic assessment tasks where learners develop multimedia products in a team environment, thus replicating the skills required of them in the workplace. A salient feature of the assessment tasks was the focus on learning processes, rather than mastery of content as this matched the orientation of the course towards process skills development (Table 2).

*Figure 1. Interface for online learning environment*
This environment supports social and cognitive aspects of assessment and makes the process transparent, formative and integrative. Real-life problems are mostly multidimensional, and a range of assessment tasks that provide learners with multiple opportunities for learning. Additionally, the skills needed to work effectively in a team are crucial within this environment, and therefore the assessment of both group and individual efforts are part of the assessment system (Figure 2).

Taking into account the principles for alternative assessment proposed by Wiggins (1998), examples can be provided that demonstrate how assessment practices enable a range of learning outcomes and competencies to be fostered, scaffolded and assessed online while supporting learning and enabling multiple indicators of performance.

**Intra-Team Self- and Peer–Assessment**

To help gain commitment at the beginning of semester, students in this course are required to complete a “student contract.” The contract outlines students’ major responsibilities needed for developing the teams’ Web site and an estimate of time needed for each task over the 15 weeks (Figure 3).

During the semester, students self-assess their own work using the online application. They consider how effective they have been at completing tasks and use the online self-assessment form (Figure 4) to rate their success. This is complemented with comments giving reasons and reflections on high and low performance.

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**Table 2. The assessment tasks and associated learning processes**

<table>
<thead>
<tr>
<th>Assessment Task</th>
<th>Learning Processes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Web-based product development</td>
<td>Team work, planning, decision making project management</td>
</tr>
</tbody>
</table>
| Peer assessment of problem solving | • Higher-order thinking and analysis  
• Development of criteria for assessment  
• Giving feedback to peers  
• Reflection on feedback leading to revision of ideas |
| Search, analyse and apply relevant knowledge by finding resource to support solutions to a range of real-life problems | • Information retrieval  
• Analysis  
• Reorganising information  
• Synthesising into a coherent solution |

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Figure 2. Student assessment process in a collaborative peer learning online

Figure 3. Sample student contract

<table>
<thead>
<tr>
<th>Ass 1</th>
<th>Weekly Activities</th>
<th>25</th>
<th>read and contribute to the weekly tasks and submissions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ass 2</td>
<td>Project Proposal</td>
<td>32</td>
<td>Executive summary, major objectives, scope, content overview</td>
</tr>
<tr>
<td></td>
<td>Design Specifications</td>
<td>10</td>
<td>To oversee the specifications to ensure everything has been addressed</td>
</tr>
<tr>
<td></td>
<td>PM Procedures</td>
<td>16</td>
<td>Reflect on how I have met the commitments that I proposed in the beginning and how it turned out</td>
</tr>
<tr>
<td>Ass 3</td>
<td>Production</td>
<td>10</td>
<td>Again to oversee that quality issues have been met and overall requirements have been addressed</td>
</tr>
<tr>
<td></td>
<td>Final Report</td>
<td>32</td>
<td>All information to be collated and put into presentation format ready for submission. Ensure all areas have been addressed.</td>
</tr>
<tr>
<td></td>
<td>PM Procedures</td>
<td>16</td>
<td>A final reflection of how I performed within the group, and how I thought this unit went, what I could have done differently and how we worked as a team</td>
</tr>
</tbody>
</table>

| Total | 142 |

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Students are required to complete self-assessment before completing the peer assessment (Figure 5). In this way, both peers and tutors have more information to draw conclusions from when assessing peer performance.

Tutor-led peer assessment sessions are then used to moderate student marks based on these reports. This provides an authentic learning experience, as students who have not been contributing to a satisfactory level are asked to justify their contributions, and may have marks sacrificed that are distributed to the rest of the team.
Inter-Team Self- and Peer–Assessment

Recent research in assessment shows that teachers are beginning to develop more purposeful environments to assess higher order thinking skills and to gather both qualitative and quantitative data as supporting evidence (Kendle & Northcote, 2000). Figure 6 depicts an example of a Web-based system that provides the infrastructure for a learning activity whereby learners are organised into small groups, within their larger class workshop cohort. The online learning environment provides the following functionalities through a “Conference Centre”:

- A weekly problem is presented in the “in-tray”
- Students work in teams to create a group solution
- Once a group has posted its solution, three other solutions are randomly allocated to each team to assess, and comment on (peer assessment)
- Tutors add their marks to provide an overall mark for each problem solution
- After the tutors assess their teams, the best solutions are displayed and students can review these
- If students want to, they can then make comments on bulletin boards about the allocated marks and comments posted by tutors or other teams; and
- The online system maintains a record of the marks obtained by each group.

Within this environment students develop skills by working in teams, reviewing others solutions, and creating logical answers as they seek to provide solutions to problems. They are required to submit solutions at a specific time during the week, and then evaluate.

Figure 6. Intra-team peer assessment
each other’s solutions by ranking them. The first step however, requires students to self-evaluate their own solutions (Figure 7). This brings about sharing of ideas, resources, and offering reciprocal support and creating social relationships, which helps students to work in teams. McConnell’s (1999) features of an online community can be seen in the design of the whole environment in the following ways:

- Openness in the educational process
- Self-determination in learning
- A supportive learning environment

Figure 7. Post solution and self-assessment (inter-team)

Figure 8. Allocating teams for inter-team peer assessment
Figure 9. Assessing other students’ solutions

- A real purpose in the peer assessment process
- Assessment of ongoing learning processes

After students submit their solutions and assign a self-assessment mark, the online application randomly allocates three other teams for them to assess (Figure 8). Teams are then required to assess these three solutions by allocating a grade and a comment of 80-100 words outlining “Good and Bad Points.” These are made confidentially to allow teams to freely express their views (Figure 8). There is sound theoretical support for this form of online assessment environment (Segers & Dochy, 2001):

- The peer-based learning environment encourages learners to reflect on the information and ideas and to articulate their views (McLoughlin & Luca, 2000).
- Students learn from the communication and interaction with their peers in the problem solving processes (Jonassen et al., 1999);
The scope for communication and collaboration provides for meaningful interac-
tions and purposeful engagement in the learning process (McConnell, 2000).

At the end of each assessment, there are three different marks available for students to reflect on: self-assessment, peer assessment and tutor assessment (Figure 10).

**Conclusion: Creating Authentic Assessment Online**

Computer-based assessment may suffer an “image problem” as some assume it is capable only of summative testing using multiple choice tests derived from item-banks. Increasingly, computer-based assessment is enabling innovative approaches to formative...
assessment that “close the gap between actual and desired levels of performance” (Sheingold & Frederikson, 1994). A number of factors can be cited concerning the potential value of networked learning environments and computer based assessment. Current software development and the interactive capabilities of the Web enable the creation of procedural, conceptual, cognitive and collaborative assessment tasks and support student expression of prior knowledge, experience and learning in personally meaningful ways.

The Future of Online Assessment

Already, both in terms of pedagogy, implementation, and administration, computer delivered assessment is outstripping conventional forms of assessment and in the word of Bennett (2001) is “reinventing assessment.” What is the evidence for this? Certainly, online assessment is capable of greater flexibility, cost-effectiveness and time-savings. It has been these attributes that have made it appealing in an age of competitive higher education funding and resource constraints. Current online designs can support group and individual feedback, self-testing by students, flexibility and the diagnosis of misconceptions so that early intervention can be planned. The added benefit of computer-based assessment is it motivational and self-regulatory in nature. By allowing students to test their own knowledge and understanding, they can decide when, where, and how often to take a test, ensuring preparedness for learning.

In summary, the communicative and collaborative attributes of online environments and new software for designing tests, quiz items, and range of tasks that can be created exemplify a reinvention of traditional pedagogy and assessment in several ways. First, the integration of learning and assessment is possible in these environments by offering learners multiple avenues to demonstrate achievement, offer feedback and develop both the processes and outcomes of learning. Second, online settings for learning provide access to resources, peers and a range of authentic tasks within a social context where discussion and critical analysis are central. In new assessment approaches, what is most important is to extend, foster and showcase the competencies required for real-life practice. In this chapter, examples have been provided of learner-centered tasks that capitalise on social and interactive settings of the Web to provide authentic assessment opportunities and multiple indicators of learner performance.

References


