REVISING THE VISION: LEARNING ABOUT LEARNING WITH COMPUTER-BASED ASSESSMENT.

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Visions of an assessment method that is learning-oriented, time-efficient, with automated-marking and data collecting techniques are seductive in a post-compulsory world of increasing work with decreasing workers. In this paper, the authors describe how their design of computer-based assessment (CBA) in an Education course integrated student learning, student assessment and evaluative research. An essential aspect of this design was to incorporate an extended formative assessment period where students developed a range of strategies to maximize their learning performance in the summative CBA. As students learnt to learn, the authors were learning about learning and a shared vision of a learning community emerged.

Introduction

In this paper, the results of a project investigating the effects of a computer-based assessment (CBA) innovation on student learning are reported. The assessment was the result of course evaluation data in an English curriculum subject where some students indicated a lack of confidence in their knowledge of grammar. Our dilemma as the teaching team was how to add another topic to an already overcrowded curriculum and make it responsive to individual student learning needs where a range of grammar knowledge was represented across the group.

In addition, we were mindful of the teaching/assessing load already carried by sessional staff. However, through a Faculty initiative, we had recently introduced web-based delivery for on-line learning in our courses and were still exploring the potentials of this new medium. As educators and researchers, we felt the need to better understand the impact of on-line learning for our students. We had little experience in this area and felt the need for evaluative research to provide evidence of learning for our students. Consequently, the impetus of identified student learning needs in the area of grammar, the introduction of technology and a small research grant offered a possible solution to our dilemma.

In 2001, the English teaching team, in collaboration with the Griffith University Flexible Learning Access services (FLAS) designed a computer-based assessment task as a pass/fail item for students to complete as part of the requirements in completing the course. In spite of ongoing problems with the technology, the students evaluated the task as an effective learning experience. The course forum became a ‘venting forum’ as students grappled with the technology and content. The teaching team observed with
interest the contrasting negative experiences and consequent frustrations the students reported with the technology and the positive learning experiences and consequent confidence they described with the grammar content. This became an incentive for us to investigate these experiences on student learning in a project that was undertaken first semester, 2002.

**Background**

Our motivation for incorporating CBA in a course that also had a major research-based written case-study assessment task was pedagogically led, not technologically driven (Bull, 1999). If a new assessment item was to be introduced, we believed it had to be designed as a learning opportunity that was scaffolded in ways that ensured students felt supported. For this to be achieved, learning objectives, teaching strategies, and assessment tasks had to be aligned to support a student-centered learning approach in the course (Biggs, 1999). Furthermore, it was important for the learning to be monitored and researched. A ‘responsive, formative evaluation approach’ to the research was undertaken to allow the teaching team to act on data as they were collected throughout the semester.

In designing a CBA task, certain principles underpinned our view of learning. We recognised learning as being socially and individually constructed on the basis of experience (Steinberg, 1989). Therefore, an essential objective in the design of this computer-based assessment was to include learning opportunities for students that were collaborative and tailored to their learning needs. We knew that a diverse range of knowledge and experiences in the area of grammar existed across the student cohort. We had over 300 students with an age range covering approximately 30 years. CBA provided opportunities to meet individual needs through flexibility, formative, individualised feedback and targeted teaching support. In an effort to address the social aspects of learning, a forum was established that enabled student discussion about their understanding of grammar and their CBA experiences.

**Flexibility**

The use of technology to facilitate learning is dependent on factors such as student attitude, access and reliability (Bryer & Fletcher, 2001) and the design of programs (Andrewartha & Wilmut, 2001; Cuthbert, 2002; McLoughlin, 1999). Effects of technology on attitudes are well documented in the literature (Fletcher, Bartlett, Bryer, & Bowie, 2000; Rieber, 1992). However, underlying factors that contribute to changed attitudes need further explication (Boeij & Greasley, 1999; Fletcher, Kearney & Bartlett, 2002). Our CBA was designed to maximise flexibility enabling students to access the quiz at home, in the university computer labs, 24 hours a day using web-based Blackboard portal. We hoped ease of access would encourage students to use the formative feature of the quiz as often as they felt necessary in preparation for the summative assessment. Furthermore, students were encouraged to take advantage of this flexibility in the hope that computer anxiety (Worthington and Zhao, 1999) would be
alleviated through familiarity and self-paced learning. The design of the quiz was based on a multiple-choice format that was consistent in presentation to allow students to establish learning routines (Bulgren & Scanlon 1997) developing confidence in the process.

Formative feedback

Formative assessment was diagnostic (Boston, 2002) providing students with opportunities to make judgments about their performance and learning needs. As students worked through the quiz, they were given feedback that was immediate and focused. This had the potential to direct future learning, motivate students to investigate other resources and develop strategic ways to refine understandings (Bull, 1999). Feedback was linked to the incorrect responses given by students in the quiz and directed them to prescribed texts for the course or content delivered in lectures.

Scaffolded learning

An essential part of the assessment design was integrated support using formative CBA as a stimulus for learning. Clarification of grammar content was provided through online discussion, traditional lecture and tutorial content and source materials. A forum was established to facilitate clarification and sharing of students’ developing understandings of grammar. Peer support is currently used with much success in Australian universities (McInnis & Hartley, 2000) and a forum offered students opportunities to support each other and share their learning throughout the formative assessment period. The teaching team monitored the content and responded online or in lectures and tutorials. Further support was available through two texts on grammar. The first text was a commercially produced book that mainly focused on functional grammar (Knapp & Watkins, 1999). The second was a text adapted by a member of the teaching team to address traditional grammar concepts (Fletcher, 2001).

Evaluation

There continues to be an ongoing call for the need to evaluate the effects of technology on student learning outcomes (Bull, 1999, Flagg, 1990). Oliver (1999) characterised evaluation “as the process by which people make judgements about value and worth. However, in the context of learning technology, this judgement process is complex and often controversial”. We adopted a utilisation-focused evaluation approach (Patton, 1997) where evaluation was viewed as a collaborative process of building mutual understanding for all participants. Integrated in the design of the CBA was automated data collection. During the formative phase of the assessment, ongoing monitoring of the learning environment enabled us to monitor student responses to questions and respond to problems as they developed.

Design
In 2002, the teaching team was awarded a teaching grant to better understand students’ perceptions of computer-based assessment and its effects on their learning. Over 300 students in their second year of teacher education participated in formative and summative CBA during first semester this year. The course was undertaken across two campuses where students had access to face-to-face and on-line course delivery. Over 200 multiple-choice items on traditional and functional grammar were written. The program was designed to randomly select 40 items from the pool at each logon for students to answer. Logon was by student enrolment number and individual password.

A formative assessment period of four weeks was allocated where students were able to attempt the quiz as often as they wished. When they submitted their attempt, they received two forms of feedback. First they were given a score identifying their correct responses out of 40. Second, they were given topics with reference information that was related to their incorrect responses.

Formative evaluation was conducted during the formative assessment phase of the course. In this project, evaluating the use of technology and student learning was multi-focused (Alexander, McKenzie, Geissinger, 1998). Therefore, our approach used an eclectic-Mixed Methods-Pragmatic Paradigm. (See ASCILITE CUTSD Project, available at http://cleo.murdoch.edu.au/projects/cutsd99/).

Results

Data collection in the form of surveys, interviews, forum discussions and CBA statistical information provided rich sources of information. Qualitative data were analysed for common and repeated themes that provided insight into the survey items. Statistical analyses involved pre- and post-comparison of percentage responses in survey data. Results are reported using descriptive data identifying students’ perceptions of Computer-based assessment, and its effect on learning approaches.

Effects of Computer-based assessment

During the formative phase of the assessment, technology problems with the software resulted in increased stress and frustration for both the teaching team and students. The forum provided an avenue for all to exchange experiences. As part of the formative evaluation process, the teaching team reacted promptly to student problems with the technology, often referring technical problems back to FLAS. The following forum entries were typical examples of student reported problems and our response:

Date: Wed Apr 24 2002 10:15 am  
Subject: Technical Difficulties
Hey when i try to enter the quiz the following msg is coming up:
Fatal error: Cannot break/continue 1 levels in
/opt/apache_new/htdocs/grammar/index.php on line 174followed by another error message and I haven’t been able to get into the quiz for the past five minutes. Difficulties-it's happened a few times so i was wondering if anyone else is experiencing the same problem????
Date: Fri Apr 26 2002 11:11 am
Subject: Technical Difficulties

Hi Maria,

FL&AS is aware of both the errors and how annoying it is for you when it is important that you get access.

The "fatal error" and the "Oracle" error that you and your colleagues have been finding have been driving us crazy too, as they are intermittent errors.

We have contacted the ITS folk who we liaise with for these servers and they are trying to locate the error at their end. Unfortunately when we can't make it happen regularly it becomes much harder to trace. In the meantime, I suggest you try to clear your browser's memory of the error page, to stop it displaying it. Here's how you can do this:

While the technological problems were ongoing and continued to be a major source of difficulty throughout the project, students recognised that the benefits of the CBA compensated for the inconvenience, frustration and unreliability of the technology. Their evaluation of technology as a useful learning tool changed from a 21% positive response in the pre-survey data to 34% positive response in the post-data.

Students’ positive beliefs about technology as a learning tool appear to be associated with a strong sense throughout the sample that it prepared them effectively for the summative quiz and they reported increased confidence in their ability to talk with confidence about grammar. Percentage responses are reported below:

![Bar chart showing student perceptions of the effectiveness of CBA as a tool for learning grammar.](chart.png)

Figure 1: Student perceptions of the effectiveness of CBA as a tool for learning grammar
The following student’s forum posting distinguished the value of CBA as a formative and summative learning tool. This view was generally representative of student comments:

Date: Wed May 15 2002 8:35 am

Technology is a useful learning tool but not a useful summative or mastery-based assessment tool. I think when used as these two assessment forms, students are inevitably directed towards finding the simplest, most effective means to manipulate the system. However, as an independent learning tool it is excellent. An excellent way to learn is to recognise what you don't know and be directed where you might find it. Please continue to use it as a formative learning tool but do not use it as summative or mastery assessment. I do not believe these quizzes effectively assessed our understanding or mastery.

There was clear evidence of students’ evolving confidence in their ability to talk about grammar in both the forum and interview data. Forum postings developed from simple questions about defining terms to complex reasoning about their understandings of grammatical concepts. There were ongoing and complex conversations about such topics as modal verbs, adjuncts and adverbs; gerunds; modality and nominalisation. Students related their questions to a variety of sources including lecture input, tutorial discussions, textbooks and the CBA questions they encountered in the quiz. We saw an emerging confidence in their own understandings as they challenged the quiz answers and the feedback they received. The following posting exemplifies this:

Is anyone else having difficulty interpreting the questions and/ or some of the choices? Have you come across the one that asks which of the following best describes a in "He found the book under the table"? and the one A pronoun and another which of the following best describes you in 'the curriculum is a wonderful opportunity to test out what you have learned about learning'?

Also, could someone please enlighten me with regard to Mood. GB p.2 puts the word Mood under functional with no other explanation and opposite under traditional grammar defines it as declarative, interrogative, imperative. The traditional grammar books I have show mood as subjunctive, indicative and imperative. K & W index reveals no mention of mood and I have not come across it elsewhere in K&W. I also have no idea what this question is asking "Which of the following is not related to the field of discourse?"

And what the hell does this question mean. In functional grammar, modal verbs have the function of...establishing obligation with participants...describing noun groups....establishing a process....establishing circumstances related to the process. CLEAR AS MUD! I am clear about the truth/negation bit and mental verbs and modal adjuncts where they become adverbs modifying the verb but this question/answers confounds me.

My understanding of a gerund is that once the ing participles is nominalised (acts as a noun) as in I like golf & fishing it acts as a noun therefore the answer should be NOUN not (verbal)noun. None of my grammar books (or K&W use the term verbal noun)

Please correct me if I am wrong. I've been known to be wrong before.

PLEASE HELP!!!!!! before I tear the rest of my hair out.
As educators, we delighted and learnt much through these responses. Our students were taking control of their learning, alerting us to the inefficiencies of the CBA feedback and finding incorrect answers in the multiple choice questions. It was a process that was generally moderated by good-humour and collaboration where the common goal was facilitating learning. Students appeared willing to accept human error because of our commitment to them as learners. We responded to their problems quickly and invited them to offer ways we could improve our efforts in helping them to learn.

They appreciated the flexibility CBA offered them as learners. Three areas were thematic in the data. First, students’ identified flexibility in terms of time and second in terms of place: “At home you can choose a time to do the quiz that suits yourself”. Third, they appreciated the choice of working individually or in groups: “I prefer to work as an individual rather than in a group, however at home I had the benefit of my partner - the only person I trust to work in a group with - who provided support and helped me try to get the best mark possible”.

In conclusion, these data suggest that CBA was an effective tool in facilitating student learning. A characteristic theme in accounting for this was the students’ recognition of the role choice played in their approach to the task and our genuine efforts to work with them. They determined how best to use the formative CBA to guide their learning of grammar. They assumed responsibility for their learning and worked with the teaching team as issues emerged. The teaching team learnt with the students. Together we grappled with technology, complex questions and specific student learning needs. The following comment was one of the final postings on the forums:

**Date:** Mon Jun 17 2002 6:25 pm

*I would just like to compliment all the staff involved in teaching English ED 2. This is the first subject that I have encountered in three years at uni where there has clearly been ongoing communication between tutorial staff throughout the semester. It seems incredible but this is extremely rare and really helps there to be a consistency and quality across learning within the tutorials...... I also appreciate the frequency and promptness with which messages have been communicated to the students on the website. Once again (with no hidden agenda!!!) thank you for your professional approach to the course.*

**REFERENCES**


