Evaluation of blended learning: analysis of qualitative data

Ansie Harding, University of Pretoria, South Africa,
Dan Kaczynski, University of West Florida, USA
Leigh Wood, University of Technology, Sydney
Aharding@up.ac.za dkaczyns@uwf.edu Leigh.Wood@uts.edu.au

Introduction

When we implement changes in learning, such as blended learning, we wish to judge the impact of the reform. Evaluation is a process by which we make judgments about the worth of an educational development. The difference in learning is subtle and deep and may be unexpected by those implementing the changes. Ways to explore these deep processes in learning include interviews, observations and open-ended questionnaires targeting all concerned in the process such as students, teaching, administration and technical staff. This generates a mass of qualitative data that many are unaccustomed to analysing.

This paper will discuss the process of evaluation; give an example of evaluation and show how to analyse qualitative data. We will discuss the use of the software tool NVivo to assist with the analysis. Papers that use results of qualitative analysis of student learning in mathematics and statistics include Petocz and Reid, (2001); Petocz and Reid, (2003); Reid, Petocz, Smith, Wood and Dortins (2003). These papers show that students in classes have qualitatively different ways of experiencing mathematics and statistics and that this affects their learning. Kaczynski and Kelly, (2004) describe a course that incorporates qualitative methodologies and analysis.

Blended learning

Blended learning is a mixture of online and face-to-face learning using a variety of learning resources and communications options available to students and lecturers. In other words, blended learning mixes e-learning with other more traditional types of learning. By practicing blended learning the conveniences of online courses are gained without the loss of face-to-face contact. In so doing a learning environment is created that is richer than either a traditional face-to-face environment or a fully online environment.

Students are free to choose their preferred learning style to some extent though some components may be compulsory. Lecturers use blended learning because they perceive that students may not be able to cope with a fully online course, because they wish to introduce students to technology or because they wish to offer extra support to weaker students (Raj and Abdallah 2005). Others are using blended learning to reduce the face-to-face component of the teaching so that part-time students and those with family responsibilities have better access to learning. For many universities the move to blended learning is for financial and staffing reasons.

With such a diversity of reasons for introducing blended learning what do we evaluate? Is it the cost effectiveness, the practical benefits for particular groups of students, the attitudes of the students or the improvement in learning? In this paper we will take a pragmatic approach to evaluation and we will focus on *learning*.

A structure and an example

A structure to evaluate the extent of blending in mathematics courses through visualising, developed by Harding, Engelbrecht, Lazenby and le Roux (2005), makes use of a radar chart. Six radials are identified each with a question to quantify a measure:

Dynamics and Access: What is the frequency of access necessary for success in the course?
1 – once per term **2** – once per month **3** – once per week **4** – 2-3 times a week **5** – daily
Assessment: How much of the assessment is done online?
1 – little **2** – almost half of it **3** – more than half of it **4** – most of it **5** – all of it
Communication: How much of the communication happens online?
1 – little **2** – almost half of it **3** – more than half of it **4** – most of it **5** – all of it **Content:** How much of the course content is available online?
1 each for book, course information, course administration, lecture notes, study objectives, with a maximum score of 5.
Richness: How many enriching components does the online part of the course have?
1 each for a computer algebra system, graphics, java applets, slide presentations, video clips, and sound clips; in effect, more than text communication, with a maximum score of 5 components.
Independence: How independent is success in the course from face-to-face contact?
1 – Fully contact lecture and tutorial driven; website an add-on
2 – Contact lectures but web-based tutorials or assessment
3 – Limited regular contact
4 – Sporadic contact
5 – No face-to-face contact

The area of the radial diagram gives an indication of the *extent* of blending that takes place. It does not mean the larger the area the more blended the course is but it does indicate areas where no blending takes place. In fact, a convex shape, partially filling the chart area points to a well-blended course.

The first three radials, dynamics, assessment, and communication could be grouped under a heading *interaction*. In the radial diagram they are to the top. If a radial diagram is top heavy it indicates more interaction via the web. The second three radials, content, richness, and independence could be grouped under the heading *material*. Radial diagrams of courses with content provided on the web will, therefore, be heavier towards the bottom.

As an example we look at how the features of blended learning are used in a calculus course at the University of Pretoria (Harding, Engelbrecht, Lazenby and le Roux, 2005). These are represented in a radar chart (Figure 1). The shaded area represents the amount and dimensions of the blended learning that takes place.

The course does not run fully online, it is presented for residential students but runs without formal lectures. Students need to access the website at least 2-3 times per week, more than half of the assessment is done online, communication happens mostly online but also during selective contact sessions. Success in the course is dependent on sporadic face-to-face contact. As can be seen from the radar chart, this particular course lacks richness and could be supplemented by additional multimedia material.

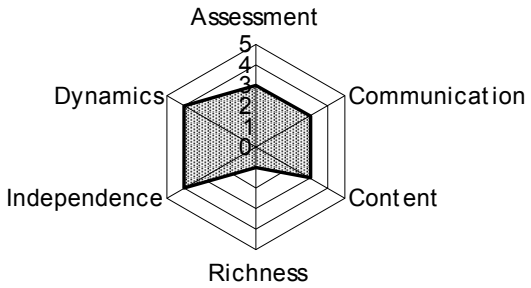

Figure 1. Radar chart for blended learning for the University of Pretoria courses

The radial diagram is a useful way to consider dimensions of blended learning in a subject or curriculum. In the following section we will discuss the evaluation of blended learning and then return to this example to discuss the evaluation process.

Using qualitative data for evaluation

Evaluation of learning can be done by outside experts (in the same vein as auditors) or by the practitioners using a variety of tools. It can be done through all stages of the curriculum design and implementation. Often it is not done at all. Oliver (2000) gives an overview of the methodologies used for evaluation and (p. 2) states:

> Within the evaluation community, a new philosophy has emerged that eschews firm commitments to any one paradigm in favour of a focus on pragmatism. Rather than having a theoretical underpinning of its own, it involves a more post-modern view that acknowledges that different theoretical underpinnings exist, and adopts each when required by context and audience.

He describes how many evaluations use informal methods that provide people with the information they require to make decisions. This is similar to action research methods where practitioners carry out the evaluation and reflect on the process. This process of evaluation as reflective practice is the pragmatic evaluation philosophy we adopt in this paper.

We also consider evaluation that uses qualitative data. This is for several reasons. Firstly, Uniserve participants are from the quantitative disciplines and so are familiar with quantitative analysis and secondly, in evaluating learning, statistically significant differences may not be seen. Good teaching in whatever format will result in learning (Engelbrecht and Harding 2003; Engelbrecht and Harding 2004) and it may not be possible to find significant differences between groups. Any differences may be *qualitative* rather than quantitative.

Qualitative methodologies use a range of data sources. Here we will concentrate on data derived from focus groups, interviews and open-ended questionnaires. These sources reflect the experience of the participants in the learning process and, taking our pragmatic paradigm, are the easiest for a lecturer to collect and analyse. Wood (2005) presents an overview of conducting interviews and focus groups with a short list of practical references.

These data sources result in a mass of data. A one hour interview or focus group can take 7 hours to transcribe and result in 10 000 words. If you have 200 students and each writes 20 words in response to an open ended question you can end up with 4000 words. It is no wonder that quantitative results of evaluations are reported more frequently than qualitative!

We have found that the software tool NVivo (QSR International, 2005) is a great support in the investigation of the data. NVivo is an Australian software package designed to assist with the analysis of qualitative data, in the same way that SPSS, SAS and Minitab assist with quantitative data. To quote from the QSR website ‘Working with rich text documents, NVivo is designed for researchers who need to combine subtle coding with qualitative linking, shaping, searching and

modelling.' It is useful for typed data such as transcripts from interviews, focus groups and open-ended questionnaires. It will support any qualitative methodology. For our pragmatic evaluator, it is particularly useful for data that result from online surveys because the comments are already typed – though the spelling may be suspect.

Using this qualitative data analysis package we can:

- Find all occurrences of a keyword and identify which participants stated these words.
- Search for keywords and request the amount of spread (that is how many words either side of the keyword).
- Code for themes and identify the participants who stated those themes.
- Group themes into models.
- Link participants to demographic data and other attributes.

Qualitative analysis of themes of participants that have been generated without imposing the ideas of the evaluator can give us new and different information about our use of blended learning. The following section describes the evaluation of the use of blended learning in the calculus subject at the University of Pretoria in South Africa. Here the lecturers have used an external evaluator to conduct the focus groups.

Evaluation of a blended learning subject

We return to the example of the calculus course presented at the University of Pretoria for which the radar chart above is given and we report on two qualitative means of evaluating the blended learning environment.

Focus groups. Two focus group sessions were held with students either enrolled for a blended course or having completed at least one such course. An independent interviewer from the Department of Psychology conducted the focus group interviews and none of the course lecturers were present at any of the interviews. Students were selected randomly to take part in these sessions, resulting in two sessions consisting of twelve and eleven students respectively. Both groups were fair in representing language preferences, race and gender.

In evaluating this blended learning model students pointed to the flexibility that the online component offers as a major advantage. The any time/anywhere approach allows them to work whenever it suits them best and when they can perform most productively.

Although the online assessment offers immediate feedback, appreciated by all students, most of them are less satisfied with the lack of personal attention when a problem is experienced and the delayed response that e-mail offers. For this reason they appreciated the weekly contact sessions as an opportunity of posing face-to-face questions.

Another aspect of the blended learning model under discussion and viewed favourably by students is the co-operative learning component. Students do assignments and projects in groups. (Engelbrecht and Harding 2002). When experiencing problems students seek assistance within the group while only approaching the lecturer as a last resort. Students are able to rate themselves in comparison to the performance of the group.

The impact of the blended course on their personal development, and in particular towards their 'academic maturity', emanated strongly from the focus group discussions. The following aspects emerged:

- Blended learning fosters self-reliance; much more time is spent on trying exercises independently before consulting; they learn to trust their own judgment more.

- Students, in becoming more independent in their learning, acquire the skill of time management; they seem to be able to adjust their study schedule according to the nature of the work and according to their own pace
- Students perceive the blended learning environment as one that requires more responsibility. Quoting one student: 'You have to go every day and check and make sure you are up to date by choice instead of receiving everything the lecturer gives you.'
- The blended learning model cultivates self-discipline. Students work more regularly by actively engaging in scheduled online exercises, in contrast to the false sense of achievement offered by attending classes and taking notes whilst not later reviewing these notes.

On the negative side, students do not take kindly to technical hitches such as server problems or errors in posted solutions. They also complain about sometimes experiencing learning as a lonely activity.

Questionnaires. A questionnaire, both open and closed-form, was issued to evaluate the assessment component of the blended learning model under discussion. Both paper and online assessment modes were used. Term tests and examinations consisted of a paper component as well as an online component. (Engelbrecht and Harding 2004) The majority (56.6%) stated that they prefer online assessment component, 21.7% preferred paper assessment component and 21.7% of the students had no particular preference. Although the majority of the students preferred online testing, almost half of the students either prefer paper tests or a combination of the two modes of assessment. Reasons given for an online preference include the absence of examination stress, immediate feedback and availability of the results, suitability for formative assessment, flexibility of the online environment and the virtue of being exposed to modern technology: 'I prefer to see my results immediately so I can see if I need to further study the weeks work or I am 'up to date'.' (student 23031434)

Reasons given for paper assessment include a dislike for the rigid way of marking in online assessment, little opportunity for partial credit and the difficulty of adapting to an unfamiliar way of testing: 'I think better when I sit and write, then I see what I think.' Students who like the blended assessment approach, see the advantages of both modes:

> With both computer and written tests we can get 'the best of both worlds' having equal usage of both.
> Both are equally acceptable. I enjoy the computer modules more but find the written section more practical since you not always have a computer with you...
> Both have advantages and disadvantages, you can guess and sometimes get something right not knowing anything and on the other hand on paper you can get marks for steps so it balances, however doing both simultaneously has a much better effect.

It is important to note that blended learning as such does not facilitate independent learning. It is the inherent structure of the learning model that makes it a successful tool for use. Without the structure provided by this model (deadlines, weekly quizzes and continuing assessment) the learning would prove to be no more effective than traditional contact lectures.

Both the focus groups as well as the questionnaires provided valuable information regarding the blended approach of this particular course. The finding that self-reliance, time management, responsibility and self-discipline result from this blended learning approach was welcomed. The extent to which students develop into mature learners is suited to qualitative but not quantitative evaluations. Skills such as time management etc cannot be easily quantified, yet emerged strongly as products of blended learning during focus group interviews.

Whereas knowledge can be assessed quantitatively, affective issues such as assessment preferences and reasons for these are more difficult to determine quantitatively and yet, these are

often the driving forces behind success in learning. Assessment is an indication of what has been learned and qualitative evaluation is the channel through which opinions can be freely expressed, often invaluable for improving a learning model.

From these qualitative interviews and questionnaires a number of changes to the bended teaching model resulted. Attention was given to improve the use of partial credit in the online assessment component. The issue of lack of personal contact was addressed by introducing a chat room session. Extra care was taken to avoid technical glitches and errors in solutions.

Conclusion

Making judgements about teaching changes is important if we wish to convince our colleagues, students and ourselves of the worth of the innovation. Often the changes are subtle and may be unexpected. Open ended questionnaires and interviews that result in qualitative data give us the ideas of the participants in the learning and teaching process without imposing the ideas of the evaluator. This kind of data may uncover attitudes and opinions not shown in a closed form survey. You are more likely to get radical views expressed. Often responses to open-ended questions are not analysed. This paper has demonstrated that there are tools available to help investigate qualitative data and that these insights are useful for curriculum design.

Qualitative methods are particularly useful if you are not sure what to expect; when your teaching changes are radical or when the student group changes. The data provide powerful evidence for the reflective practitioner to change their teaching. Though we have concentrated on qualitative data in this paper, many lecturers are finding the blend of quantitative and qualitative data give them the most assistance in making curriculum decisions. We should blend the evaluation as we blend the learning.

If we are to succeed with blended learning, we need to do more than implement learning changes. We need to make judgments about the worth of the reforms so that we will provide our students with the best possible outcomes.

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