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Evolving a Facilitation Process towards Student Centred Learning: A Case Study in Computing

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ABSTRACT

This paper discusses our experiences in moving to student centred learning. It describes the action research approach and the context for the module at Masters level in systems analysis and design. It discusses the learning materials provided as an alternative to lectures, including a book, a set of videos, courseware and a web site. The initial teaching approach dictated a pace to the students. This evolved towards students working through the material at their own pace. As the teaching approach reached a steady state, there was a discernible improvement in students' minimum marks and pass rates. Student feedback by questionnaire is analysed, concentrating on the learning materials, the teaching approach and the advantages and disadvantages. In general, students preferred the teaching approach, particularly the autonomy it provided them. Staff reflections and lessons learnt are also considered. In general, staff recognised that their time with students was more productive and that students became more self-reliant. Conclusions are drawn and general issues that emerged from the work identified.

Keywords: Student centred Learning, Action Learning

1. INTRODUCTION AND BACKGROUND

Of all instructional methods, lecturing is the most common and least effective (Felder, 1992). It has been shown that students recall 70% of the information presented in the first ten minutes of a lecture and only 20% of the information presented in the last ten minutes (McKeachie, 1986). Dale's cone shaped model (the 'Cone of Experience') (Dale, 1969) links levels of effectiveness in learning to different methods of presenting course material. It is suggested that students retain 10% of what they read, 20% of what they hear and 30% of what they see. Further, they retain much more of the material when their engagement is high, for example by doing something rather than just reading about it. Recently the scientific evidence for these particular statistics has been questioned (Work-Learning Research, 2003). Nevertheless, many would argue for students to be active learners rather than passive members of an audience (e.g. Bonwell and Eison, 1991).

Because of this, and because there are many good learning materials available in the subject areas that we teach (systems analysis and web engineering), it was decided to experiment with student centred learning. Also, there are many examples of the successful application of student centred learning in the literature (e.g. Aikin, 1981; Carrasquel, 1999) and some have reported increased performance (Gill and Holton, 2006; Poindexter, 2003). We use the term student centred learning instead of "blended learning" because of the latter's imprecise usage (e.g. Oliver and Trigwell, 2005). We base our precise usage of the term "student centred learning" on the summary of effective learners in (de la Harpe, Kulski and Radloff, 1999).

Therefore, we use the following definition of student centred learning and briefly outline the specific techniques employed to support that particular aspect of student centred learning:

- **Students are active participants in their learning.** We did not deliver any formal lectures, but provided a review lecturer *after* the tutorial.
- **Students make decisions about how they will learn.** We provided a rich variety of materials and allowed the students to choose the time and place for their learning.
- **We provide clear learning goals within a well defined learning process.** The web site defined the learning process and provided an on-line weekly diary of suggested activities and tasks. The very first lecture covered the learning philosophy, rationale, process and goals in detail.
- **Students construct new knowledge and skills by building on their current knowledge and skills.** The suggested tasks, shown in the diary part of the web site, were carefully graded and increased in complexity. We also provided extra exercises for those students wanting additional practice.
- **Students understand expectations and are encouraged to use self-assessment measures.** We made the expectation explicit in the initial lecture, on

the web-site and in all face-to-face meetings. We provided step-throughs – a specific self assessment mechanism.

- We recognise different learning styles and provide alternative materials. As mentioned above, we provided a rich variety of material (a book, web-site, videos, CASE tool, step-throughs)
- Students monitor their own learning and develop strategies for learning. The on-line diary provides an "ideal" progression path and students can use that to monitor their progress. They can also choose their own strategy and this was stressed both in the initial lecture and on-line.

This paper discusses our experiences in moving from lectures to student centred learning for a systems analysis module. It explains the teaching and learning material provided for students, the approach initially adopted and how it evolved, the reactions from the students, the effects on assessment results, the lessons learned by staff, and the particular conclusions and general issues that emerge from the work.

2. METHODOLOGY

The study followed an action research approach. Action research involves researchers planning and evaluating their own practice. Self-reflection is fed back into the practice to modify it, leading to a further round of practice and evaluation, and so on. The most prevalent description (Susman and Evered, 1978) identifies a five-phase iterative cycle: 1) diagnosing 2) action planning, 3) action taking, 4) evaluating and 5) specifying learning. This can be seen as an 'ideal type'. In practice the action research method will vary depending on the application(Oates, 2006). We found this five-phase iterative suited our purposes and have used it to evolve a process to facilitate student centred learning.

In the study reported here we followed an action research approach in that we identified drawbacks of a teaching approach using lectures, planned how we could teach systems analysis with few lectures, carried out our plan, reflected on it and on the students' responses to it, modified it, carried out our modified plan and reflected upon what could be learnt from our experience. We discuss both the practical outcomes of the work and also our learning outcomes, indicating where further research is needed.

Like the majority of action research studies, this study is based in the interpretivist philosophical paradigm. In the positivist research paradigm the validity of a study is predicated on the degree to which its findings are generalisable to different people, settings and times, and depends on the degree to which the research samples are representative. Interpretivists, however, accept the uniqueness of contexts, individuals and the individuals' constructions, making identical findings in other contexts less likely. Interpretivist researchers give a sufficiently 'thick' (detailed) description so that the *readers* can judge whether their own situation of interest has similar features, meaning that the findings could be relevant there too. Rather than 'proof' in the positivist sense, interpretive researchers aim for 'plausibility'. They are similar to lawyers in a court. Both interpretive researchers and lawyers have to make arguments and convince their audience (readers or the jury) that their descriptions, explanations and interpretations are plausible and supported by evidence (data). (For further discussion of interpretivism and how it differs from positivism see, for example, Guba and Lincoln, 1994; Walsham, 1995). In this paper we discuss our modules, students, teaching materials and student-centred learning approach. We do not claim that our students are representative of all students, nor do we assert that our findings are generalisable to other settings. Instead we provide a detailed description of the process and practical achievements, offer plausible interpretations of the data and reflect on our learning outcomes. Readers are invited to reflect upon whether their own situations bear similarities to ours, so that our findings might also be applicable to them. We do provide a table of quantitative data which might be viewed as being inconsistent with the interpretivist approach but we believe that it adds some useful insights into the research.

3. THE LEARNING CONTEXT

Our approach was tried initially in the academic year 2000/1 on a module 'Development of IT Systems' on the MSc in Information Technology. The module ran for one semester, in parallel with other modules, with three hours class contact per week. There were forty students on this masters course, all of whom had graduated in other disciplines e.g. business studies, history, textiles. Most of the students were studying full-time, but three were part-time. Given the relatively small number of students (for a UK university), and their likely maturity, this seemed an ideal opportunity to try student centred learning. The module involved developing the students' skills in analysing problems and developing systems analysis models using structured methods (for an overview of the topics covered see Figure 1). The module was assessed by a one-week full-time case study where the students worked in groups on a practical systems analysis problem. The practical nature of the module indicated that student centred teaching would be an appropriate approach. The approach has been developed and refined each year in successive action research cycles.

3.1 Module Aims

As stated earlier, the module involved developing the students' skills in analysing problems and developing systems analysis models. Since this was a masters class, the aims went further than merely developing the students' practical skills. Additional aims included :

> "... use the development lifecycles as vehicles for discussing development issues such as risk, competition and investment cost as well technical issues and usability."
>
> "present contemporary architecture issues such as distributed and portable computing system, as a vehicle for discussion of creativity and development of new functionality.

The intended learning outcomes included:

"apply verification and configuration management

to phase-dependent life-cycle products"

"understand and be able to articulate issues about the design of distributed systems"

The assessment for the module is the case study mentioned earlier and within that we expect students to be able to discuss the issues identified within the aims and learning outcomes. In the UK, M level descriptors have more recently been used as a technique to define learning objectives and these often stress the clarity of reasoning and the ability to discuss the link between theory and practice. In particular the Quality Assurance Agency for Higher Education (QAA, 2001) defines relevant descriptors for modules like this one:

"to evaluate methodologies and develop critiques of them"

"continue to advance their knowledge and understanding, and to develop new skills to a high level"

We will reflect back on these aims and objectives in the reflections section.

3.2 Learning Materials

The main learning materials for the module were:

- A textbook in the subject (Griffiths, 1998).
- A web site developed to support the module.
- A set of videos developed with funding from the UK government's Department of Trade and Industry (Griffiths and Lockyer, 1992).
- A software tool, ASCENT (Lockyer and Griffiths, 1989), available to the students to support their diagramming. This CASE (Computer-Aided Software Engineering) tool was developed with our university colleagues and has been used with many students at home and abroad over a number of years. It enables the students to 'draw' on a computer screen the main diagrams used in systems analysis; checks that the diagrams follow the appropriate 'rules'; and runs consistency and completeness checks on the diagrams.
- Courseware on systems analysis (W.I.S.D.E.N.) that emerged from a national Teaching and Learning Technology Programme (TLTP) project in which our university was a partner.
- A selection of other recommended books and web sites (e.g. Dennis and Wixom, 2000; Robinson and Prior, 1995; Yourdon, 1989; Avison and Fitzgerald, 1995; Wiley, 2002).

It is useful to give a little more detail about the web site here, so that the student feedback described below can be better understood, and because it offers an example of how web-based technology can be used to support learning in ways which go beyond the mere provision of electronic notes. The web site is delivered via our department's intranet. At the top level, it shows the various techniques that are covered (see Figure 1).

First, the theory is introduced. This is usually done by a video clip, but sometimes text is used if video is not appropriate. The video clips were captured and edited from the set of videos included in the learning materials. Next, a worked example is 'stepped through' (see Figure 3) and the student is set a similar exercise to do. Then a solution to the exercise is 'stepped through' and finally a summary or conclusion about the topic is given.

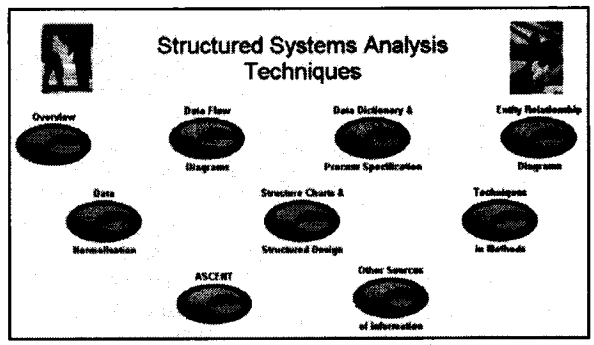

Figure 1: Top level of web site

At the lower levels a standard pattern is followed for each technique (see Figure 2).

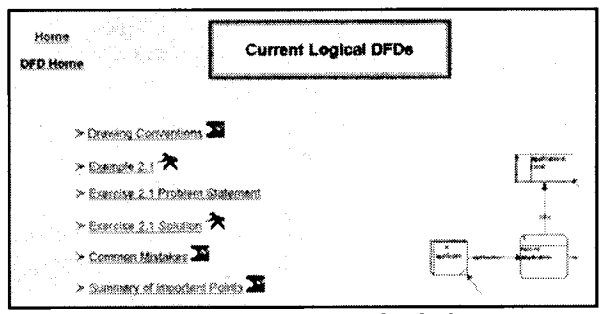

Figure 2: Second level of web site

Step-throughs are a technique that emerged from our previous research (Lockyer and Hoggarth, 1996). Often in systems analysis, students are required to develop diagrams to model the information provided in a piece of text. Step-throughs show dynamically the gradual build up of a diagram, highlighting parts of the text that caused particular diagram elements to be drawn, and giving comments about the new elements in arrowed bubbles on the diagram itself (see Figure 3). They can be developed directly from ASCENT, or other drawing tools can be used to develop step-throughs in the same style. Both methods were used in the creation of step-throughs for our web site.

4. TEACHING APPROACH

Our teaching approach was described in detail to the students in the first week of their course, via an introductory meeting. They were told that few or no lectures would be delivered to support the course, but that printed and web-based learning materials were available. There were no lectures after the first meeting on the first trial of this approach. The weekly learning pattern was clearly explained. The primary sources were to be used to look at the theory and examples before attempting the practical work. If the students had difficulties which they might normally bring to lectures, solutions to the

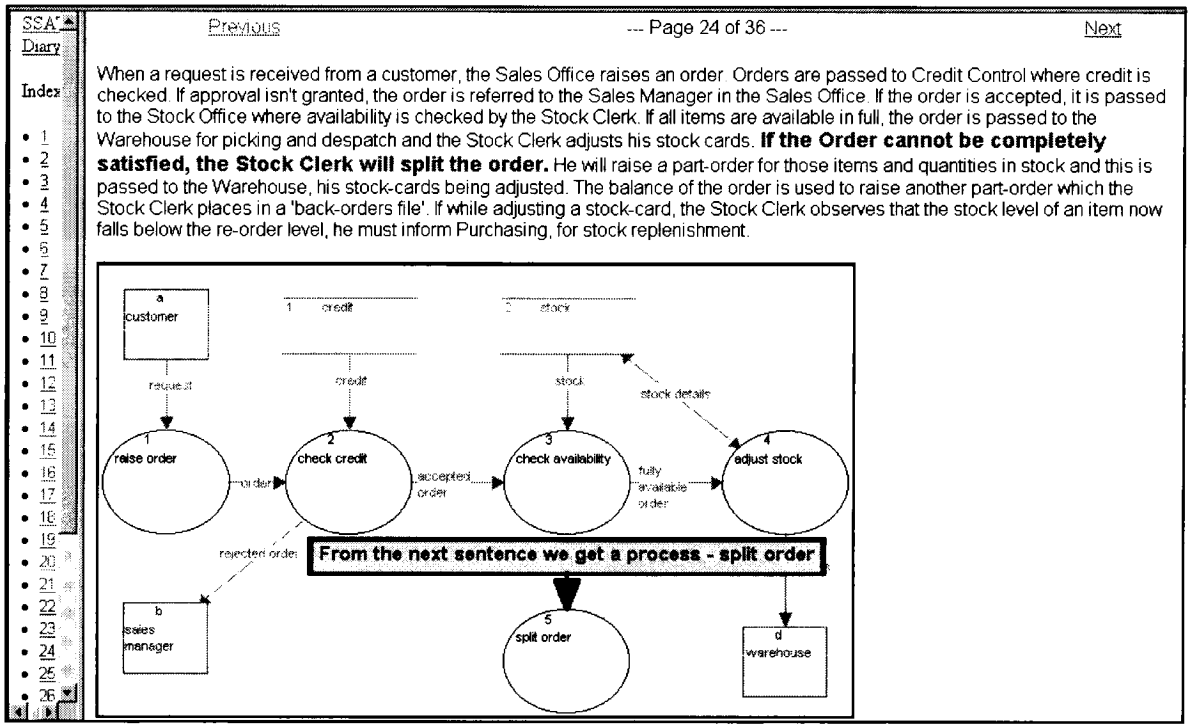

Figure 3: A Step-through

exercises were available (in all primary sources). We also encouraged informal contact (e.g. e-mail, coming to our offices).

The students were expected to attend a weekly one-hour lab-based practical session where a tutor would be available. It was stressed that attendance at these practical sessions was very important. They would be used:

- to give feedback to each student on their progress or attempt at the exercise,
- to give an extra, optional exercise,
- to give direction for the next week, and
- for the students to get practice in using a software tool while help was available (ASCENT).

Following the weekly contact with their tutors, students were expected to reflect on the feedback and direction that they had been given and look at any summaries or conclusions about the topic before repeating the pattern for the next week's topic.

Early reflections on the process indicated very quickly that not all students were going at the pace that we had set. A few were going faster, most were going at the set pace, but a significant minority were going slower. Reasons for this included students with illness problems, part-time students with work-based pressures, students who learnt more slowly and students choosing to devote more energy at that time to other parts of their course. This was entirely consistent with the student-centred learning approach that we were taking. We amended our approach by telling the students that it was not necessary to go at the pace that we had set, and that a better philosophy might be that work had to be finished by the time it was needed for the assessment. Actually, many students did continue to go at the pace that we had set at the start, but other students became more relaxed and open about their progress and difficulties.

5. RESULTS

5.1 Student Feedback

In order to learn more about the students' reactions, we asked them to complete a questionnaire towards the end of the module and return it to us anonymously. The questionnaire was handed out in a class and retrieved at a later time. We stressed that we wanted them to tell us the truth and not just what they thought we wanted to hear. Thirty-two were returned in 2000/1 (out of a population of 40). On the questionnaire we asked questions about the learning materials, the web site, the student centred teaching approach and the advantages and disadvantages that the students perceived with such an approach. There were 11 questions in total. Most of these requested definite answers (e.g. Yes/No, which teaching materials used), but could be qualified by comments. Four questions were more open. These asked students why they used particular teaching materials, the advantages and disadvantages they saw in the teaching style and for any general comments. Their responses are summarised in Table 1 and discussed below.

The same questionnaire was not used in consequent years because the department adopted a standard module evaluation questionnaire. This formal departmental questionnaire was supported by informal group based discussions. The feedback in the subsequent years resulted in enhancements to the tools and material but no significant changes to the process.

	Masters students (Development of IT Systems)
Number of students	40
Number of responses	32
Used printed materials only	0
Used web only	0
Used web site more than printed materials	2 (6%)
Ratio of use of printed materials: web material	70:30 (average)
Preferred this student-centred approach	25 (78%)
Perceived advantages	Autonomy Taught self-reliance Better understanding
Perceived disadvantages	Motivation Less interaction & feedback Felt lost

Table 1. Student Feedback

5.2 Learning Materials

All students used the book and the web site; none used solely the book or solely the web site. We asked them to estimate the percentage that they used each. Only two students used the web site more than the book. Of the remainder, the split varied from 50:50 to 90:10 (book:website), with an average roughly at 70:30. A summary of these finding is shown in Figure 4.

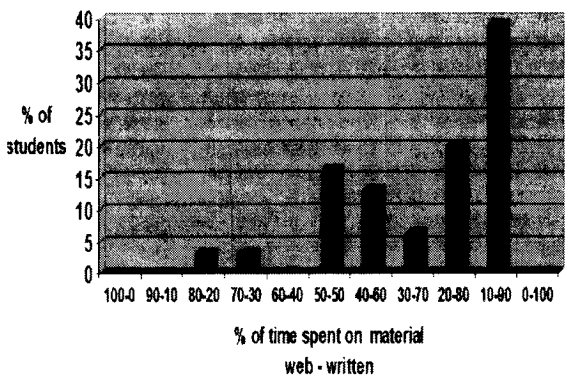

Figure 4: Percentage of time spent on web site compared to the written material.

The main reason cited for using the printed materials more than the web was availability and access. It is possible that since 2001 general acceptance of the web has now made its use more popular and normal for students than it was then.

We investigated the students' use of the various multimedia learning materials in greater detail. Most students used the web site for the step-throughs. They found that style of stepping through a worked example or exercise solution much better than a book where you often needed to be turning pages to look at figures described in the text. All students except one said that they liked the step-throughs and could easily navigate the web site.

Only four students used the videos. The main reason cited was lack of availability. Only two copies of the video series were available to the students: one in the department and one in the University library. The difficulties in obtaining the videos and finding somewhere to look at them were too great for most. Also, the videos left them with no hard copy for future reference.

Almost half of the students (15) did not look at the video clips on the web site at all. This was because of practical problems. Some forgot or did not have headphones to listen to the sound in the laboratories. Some wanted to watch the video clips at home and were put off because the clips were embedded in the web site in such a way that they downloaded rather than streamed. This was acceptable on an intranet where the clips downloaded in seconds, but at home it would have taken minutes to download a single clip and it was not worth the wait. There was no technical problem with streaming the video clips, and it was an improvement to the web site that was made for future classes.

Of the students that *did* look at the video clips, 8 liked them and 9 did not. Some liked the variation, while others criticised the quality (which was unfortunately inevitable with current technology).

5.3 Teaching Approach

Twenty-five students (78%) said that they preferred the student centred approach that we had used to the traditional approach based on lectures and tutorials that they had encountered in their earlier studies and elsewhere on the course. Seven of them (22%) said that they would have been happier if the approach had included at least some lectures. Other researchers (e.g. Gill and Holton, 2006; Poindexter, 2003) have also reported positive student responses to the introduction of student centred or self-paced approaches.

5.4 Advantages and Disadvantages

The main advantage that the students saw in this alternative approach was autonomy. They liked the freedom to go at their own pace, in their own time and at their own place. They also felt that it taught them self-reliance, particularly time management and motivation, which they saw as important in the outside world. Several students commented that the approach 'made them feel like postgraduate students', which was pleasing.

Several students commented that they thought that they had come to a better understanding of the material by approaching it in the way that they did. They also thought that attempting some practical work before coming to the laboratory-based practical allowed them to concentrate on the problem areas and difficulties with us. This was contrasted with the approach where they came to the practical having done nothing and had just worked out what they needed help with when the practical was ending.

There were also some disadvantages with the approach that were raised by students. While some students raised motivation as an advantage, it was also raised as a disadvantage by others, or even by the same students. We interviewed some of the students informally about this afterwards. They said that they thought self-reliance was

important, that they should learn to motivate themselves and that they were glad that they had the opportunity, but that it was very difficult and in some ways they wished that someone else had been doing it for them. They also felt that there was less interaction and feedback because they were only in a room with us once a week from the outset. One or two said that they felt 'abandoned' or 'lost' at the start of the module.

Cycle	Year	Approach
1	2000-1	Initial Student Centred Learning Approach
2	2001-2	Streamed Video Clips
3	2002-3	Review Lectures
4	2003-4 and 2004-5	Interactive Review Lectures Extra Exercises and Solutions

Table 2. Action Research Cycles

5.5 Subsequent Action Research Cycles

Table 2 shows the approaches that were used and added in successive annual action research cycles. The initial Student Centred Learning approach was introduced in academic year 2000-1. Following the feedback from the students, the web site was improved for 2001/2 to include video clips that could be streamed as well as downloaded. The video clips were used more as a result, but the students still complained of feeling lost at times.

For the next cycle, 2002/3, we introduced a 'review' lecture each week. This was a short lecture that reviewed the previous week's practical exercise by walking through a possible solution and discussing it with the class. During the year we became more proficient at making the session interactive rather than just going through a solution as a lecture. This was in line with our movement towards student-centred learning.

The final adjustments that we made, for the cycle beginning 2003/4, was to use interactive review lectures (in the style that we had evolved during the previous year) from the outset. We also added some additional exercises and solutions to allow the students more attempts at different techniques and to see more scenarios and solutions. This has worked well, as we report in the next section.

Apart from the video enhancements mentioned above and the enhancements and extensions to the step-throughs and examples, we did not make any significant effort in trying to resolve the issues of some students not using some of the teaching material. We felt that this was a consequence of the student centred approach combined with the richness of material provided and therefore was not of concern.

6. REFLECTIONS AND LESSONS LEARNT

In this section we reflect upon the outcomes from our action research: practical outcomes based on the students results in the module assessments, and research outcomes in terms of learning about the process of using student-centred learning.

6.1 Assessment of Students

Table 3 sets out the assessment averages and standard deviations for each year of the action research for the students. (Note that in the UK a mark> 60% is considered a good performance; only the very best students will gain a mark of >70%.) It also shows the number of students that failed the module (those that scored less than 40%) and the minimum and maximum mark for each year.

	2000/1 N=40	2001/2 N=35	2002/3 N=33	2003/4 N=28	2004/5 N=19
Average	61.3	57.9	61.1	57.9	64.3
Std Deviation	10.5	11.2	9.0	8.5	11.5
Failures	1	2	2	0	0
Min Mark	29	36	30	42	50
Max Mark	79	74	73	73	81

Table 3. Assessment Statistics

There is little pattern to the assessment averages and our conclusion is that it rises and falls from year to year depending on the calibre of that year's student cohort . We feel that the same is true for the maximum marks. The standard deviations appeared to be falling steadily until 2003/4, but reached a high in the following year, so we are unable to draw any conclusions in that area.

However, the minimum marks and number of failures do indicate a possible trend. The teaching materials and method did not reach a steady state until 2003/4. In this and the following year there are significant rises in the minimum mark and there were no failures in either year. We do not feel that this is attributable to the nature of the cohort in either case as, in our judgement as experienced teachers, there were some poor students in both years, much like other years. Others report similar results. Gill and Holton (Gill and Holton, 2006) report a drop in failure rate from 19% to 13% in a self-paced programming course. Poindexter (Poindexter, 2003) reports a drop in failure rate from 17% to 4%. This makes it less likely that our results are an isolated occurrence.

To summarise, no discernible improvement in the cohorts' average mark, standard deviation or maximum mark can be claimed for our student centred learning approach, but there is an improvement in the minimum mark and pass rate.

6.2 Learning Materials

The amount of time needed to develop learning materials should not be underestimated. For example, material for the book and videos developed over a number of years and it took two months to develop the web site to support the module. It would be easy to draw the conclusion that, because of the effort involved in developing the learning materials, student centred learning is not a viable approach. We do not think that this is a valid conclusion, though, for two reasons. First, the learning materials can be used for a number of different modules and for several years with minor maintenance. Second, it is not necessary to develop a range of learning materials with this degree of sophistication to support the approach. It could work with a set of good, word processed lecture notes.

In our case we produced our own learning materials for the students. However, many universities have staff dedicated to producing learning materials. Personal

observations during visits to various UK universities suggest that this seems to be most successful where the staff are located in the academic unit rather than in the university central services. If faculty from the academic unit are seconded to this activity, they have some understanding of the subject matter and context in which the teaching takes place, and are more committed to producing materials for their direct colleagues. We would welcome more formal research into the most effective means of developing learning materials.

6.3 Teaching approach

University administrators often see the use of student centred learning as a means of reducing staff-student contact time. While these approaches can reduce formal contact time, we found that the extra development effort and the increase in informal contact does not lead to savings in staff workloads. In our case, the reduction in the lecture time was replaced with a significant amount of time spent on supporting activities. In particular:

Enhancing the materials involved the development of extended examples, more step-throughs and the development of streaming videos instead of the uploaded ones available initially.

A slight increase in the time spent answering email. A few students did use email more often than previously but the increase was not significant.

The need to provide "office hours" to allow students to drop in for advice. We need to provide a defined period each week when the teacher would be available for consultation in their office. This was used by students on a regularly basis.

Others have noted an increase in staff workload to deliver a student centred course (Carrasquel, 1999).

However, we felt that the contact time was more productive and we enjoyed teaching the module in this way much more than the conventional lecture-based approach used previously. The majority of the students also preferred student centred learning to lecture-based teaching and recognised that they had developed self-reliance, particularly time management and motivation.

6.4 Benefits and Drawbacks

This approach might not work for all people and all situations. In many ways teaching style is a personal issue and it is difficult to succeed with a style to which that you are not committed or do not feel comfortable. However, student centred approaches should be tried more. Most academic staff would agree that they are trying to develop autonomous and independent learners, but often the rhetoric does not match the practice. Courses with traditional lectures and practicals through all years are common. It is often only in small amounts of case study and project work that the learner moves away from this model. We recommend that teaching methods are monitored across modules and an attempt made to introduce some student centred learning in the first year of undergraduate courses. This should increase throughout the remaining years of the course.

Students expect and need regular contact with their tutors. Some of our students felt that there was less interaction and feedback than they had expected, and one or two felt 'abandoned' or 'lost' at the start of the module. We have to recognise that a lecture to a large group of students is cheaper than a series of practical sessions with small groups of students and does provide students with the perception of contact with the academic staff. We recognise a tension between the desire to expand university participation and the desire to use innovative teaching approaches based on student-centred active learning: that is, a tension between efficiency and effectiveness.

One response to address the issue of some students feeling 'abandoned' at the start of the module would be to have the students in study groups. Students would operate in groups of four or five to study, meeting outside of formal contact to discuss the work and support each other, and would then meet the lecturer as a group. Although this was proposed to the students, it was resisted because they did not know each other at the start of the module. Students might be more receptive to study groups if they were given structured opportunities at the beginning of the module to form them. This would also help to prepare them for the assessment, which is based on group work. Our current approach did not give them the opportunity to form well functioning groups prior to the assessment. Others have emphasised the importance of peer support systems in self-paced courses (e.g. Gill and Holton, 2006).

Model answers were available to students in the book and videos, and on the website. Although this provides support to some students, others read the answer without attempting their own solution. Reading is thought to be far less effective for student learning than experiential work. A better approach might be to make the model solutions available only after the students have had sufficient time to attempt their own solutions. This could be done by uploading solutions to the website as the course progresses, or by using a computer-based learning environment, such as Blackboard, which allows the tutor to set a date when material can be publicly viewed.

6.5 M-level activity.

It is worth reflecting on the M-level aims and objectives and how the students' activities aligned with them and how our teaching method supported the aims and objectives.

The first relevant descriptor was "to evaluate methodologies and develop critiques of them". Our aligned aim was to "continue to advance their knowledge and understanding, and to develop new skills to a high level" and "... use the development lifecycles as vehicles for discussing development issues such as risk, competition and investment cost as well technical issues and usability.". We found that the student centred learning increased the time the students devoted to advancing their knowledge and discussing alternatives. This was particular noticeable in the practical sessions when students would often spend a significant amount of the practical time discussing their use of the techniques and alternative approaches.

This would often lead to group discussions where the other aims and objectives and associated M-level descriptors could be discussed. This produced a much more lively and informed discussion because it originated from the students' own activities.

7. CONCLUSIONS AND FURTHER WORK

This paper has discussed our action research into our own practice as academics when we moved to student centred teaching for a systems analysis module. We have explained the teaching and learning material that we provided, the approach that we initially adopted and how it evolved, the reactions from the students, assessment outcomes and lessons learned.

A number of advantages have emerged from using a student centred learning approach.

- Student minimum marks have improved
- Student failure rates have fallen
- Students preferred the student centred approach
- Students preferred the increased autonomy i.e. that they could study at their own pace, in their own time, at their own place
- Students welcomed the opportunity to practice self-reliance, particularly time management and motivation
- Some students felt that they had come to a better understanding of the material, which is borne out by the improved minimum mark and the lower failure rates
- Staff found contact time with students more productive
- Staff preferred the student centred approach

Given that our approach evolved over a number of years through four cycles of action research, most disadvantages have been successfully addressed. The one that remains is that a few students still feel 'lost' at the start of the module. In future, we intend to address this by the introduction of study groups. It is undeniably true, however, that a minority of students will always prefer a more formal approach.

A number of general issues and conclusions have also emerged from our work.

Student situations are changing and a student centred approach is often helpful to their circumstances

The success of student centred learning does not rely on sophisticated learning materials

Research needs to be carried out into different models of producing learning materials

Student centred learning can reduce student contact time but will not reduce staff teaching workload

Student centred learning approaches should be planned across modules covering complete years and degree courses

We started this paper by relating that lecturing is thought to be the most common and yet the least effective of all instructional methods (Felder, 1992). We have experimented with student centred teaching and have found that there are many benefits in adopting such an approach for staff and students.

8. REFERENCES

Aikin, J.O. (1981), "A self-paced first course in computer science," ACM SIGCSE Bulletin, Proceedings of the Twelfth SIGCSE Technical Symposium on Computer Science Education, SIGCSE '81, 13(1), pp. 78-85.

Avison, D. E., and Fitzgerald, G. (1995) Information Systems Development: Methodologies, Techniques and Tools, 2nd edition. McGraw-Hill, London.

Bonwell, C. C., and Eison, J. A. (1999), Active Learning: Creating Excitement in the Classroom, ASHE-ERIC Higher Education Report No. 1, George Washington University.

Carrasquel, J. (1999), "Teaching CS1 on-line: The good, the bad and the ugly," Proceedings of the Thirtieth SIGCSE Technical Symposium on Computer Science Education, SIGCSE '99, 31(1), pp. 212-216.

Dale, E. (1969), Audio Visual Methods in Teaching, 3rd edition. Holt, Rinehart, Winston, New York.

Dennis, A., and Wixom, B. H. (2000), Systems Analysis and Design. Wiley, Chichester.

de la Harpe, B., Kulski, M. and Radloff, A. (1999), "How best to document the quality of our teaching and our students' learning?" In K. Martin, N. Stanley and N. Davison (Eds), Teaching in the Disciplines/ Learning in Context, Proceedings of the 8th Annual Teaching Learning Forum, The University of Western Australia, February, pp. 108-113.

Felder, R. (1992), "How about a quick one?" Chemical Engineering Education, Vol. 26, No. 1, pp. 18-19.

Gill, T.G. and Holton C.F. (2006), "A self-paced introductory programming course," Journal of Information Technology Education, Vol 5, pp. 95-105.

Griffiths, G. (1998), The Essence of Structured Systems Analysis Techniques. Prentice Hall, London.

Griffiths, G., & Lockyer, M. A. (1992), Structured Methods and CASE Tools. UK Department of Trade & Industry, Warwick.

Guba, E. G., & Lincoln, Y. S. (1994). "Competing paradigms in qualitative research" In N. K. Denzin & Y. S. Lincoln (Eds.), Handbook of Qualitative Research, pp. 105-117, Sage Publications, Thousand Oaks, Calif.

Lockyer, M. A. & Griffiths, G. (1989), "ALSETT - Towards an educational IPSE", Software Engineering Journal, Vol. 4, No. 4, pp. 203-7.

Lockyer, M. A. & Hoggarth, G. (1996), "CASE and methods guidance", Software Engineering Journal, Vol. 11, No. 3, pp. 141-7.

McKeachie, W. J. (1986), Teaching Tips. D.C. Heath & Co, Lexington, MA.

MISQ. (2004). Special issue on action research. MIS Quarterly, 28(3).

Oates, B. J. (2006). Researching Information Systems and Computing. Sage, London.

Oliver M. and Trigwell K., (2005), "Can 'Blended Learning' Be Redeemed?", E-Learning, Volume 2, Number 1, pp. 17-26.

Poindexter, S. (2003), "Assessing active alternatives for teaching programming", Journal of Information Technology Education, Vol 2, pp. 257-265.

QAA (2001), "The framework for higher education qualifications in England, Wales and Northern Ireland - January 2001" at http://www.qaa.ac.uk/academicinfrastructure/FHEQ/EWNI/default.asp

Robinson, B. and Prior, M. (1995), Systems Analysis Techniques. Thomson, London.

Susman, G. I., and Evered, R. D. (1978), "An assessment of the scientific merits of action research," Administrative Science Quarterly, Vol. 23, December, pp. 582-603.

Walsham, G. (1995), "The emergence of interpretivism in IS

research", Information Systems Research, 6(4), pp. 376-394.

Wiley (2004), Web Site for Dennis and Wixom's 'Systems Analysis & Design: An Applied Approach', Retrieved May 27, 2004, from http://wiley.com/college/info/dennis241008/resources/index.html

Work-Learning Research (2004), Bogus Research Uncovered, Retrieved May 27, 2004, from http://www.work-learning.com/chigraph.htm

Yourdon, E. (1989), Modern Structured Analysis. Yourdon Press/Prentice-Hall, Englewood Cliffs, N.J.

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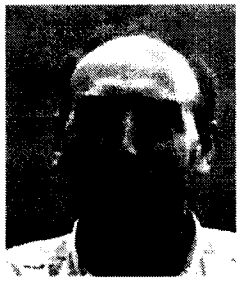

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