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**INTERACTIVE MULTIMEDIA TEACHING OF ACCOUNTING
INFORMATION SYSTEM (AIS) CYCLES: STUDENT PERCEPTIONS AND
VIEWS**

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If you require a demonstration version of the CD ROM, please email Trevor Stanley at t.stanley@qut.edu.au.

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ABSTRACT

This paper describes the design and development of a CD ROM intended to assist students' learning by bringing a sense of reality to the concepts studied in relation to Accounting Information Systems cycles. The educational design is underpinned by constructivist theories of learning which espouse the benefits of experiential learning in facilitating effective student learning. Three Australian companies - Warner Bros. Movie World, Golden Circle and Zupps Parts – are featured on the CD ROM to provide virtual 'experiential learning experiences' for students. An extensive evaluation of the CD ROM was conducted, involving both qualitative and quantitative methodologies, to ascertain students' perceived value of the CD ROM in assisting their learning. Results indicate that the CD ROM offered students a real life understanding of applicable concepts and that students were receptive to learning in online environments which are appropriately designed and constructed.

Key Words: Accounting Education, Technology in Education, Accounting CD ROM, Multimedia, Experiential learning

1. Introduction

This paper describes the design and development of an interactive, multimedia CD ROM called “Accounting Information Systems Cycles” and evaluates its importance in providing virtual ‘real life’ experiences to assist student learning. The CD ROM was developed to enhance the learning experiences of second level¹ accounting students studying the general ledger and reporting cycle, revenue cycle, and expenditure cycle in the disciplines of Computerized Accounting Systems and Auditing at the Queensland University of Technology (QUT) in Australia. These cycles relate to the structures, procedures, document flows and controls involved in the computer processing of financial data.

Student learning is facilitated by providing opportunities to experience concepts in the context of real world situations (Holcomb and Michaelson 1996). Whilst the University acknowledges the benefits of real world experiences such as work experience programs to facilitate effective learning, the large number of students enrolled limits these opportunities.

This paper was motivated by a desire to provide a meaningful program to all students. If the use of interactive multimedia technology can replicate the learning experiences provided in practical environments and most importantly, students value this as a learning tool, then well-designed multimedia offers a way for students to experience real world situations. This paper aims to demonstrate to accounting educators the value students place in virtual learning experiences. This is particularly important if technology is able to integrate effectively the theoretical and practical components in a way which affords all students the opportunity to participate and benefit from context rich learning environments.

The paper proceeds as follows. The first section outlines the educational theory underpinning the design and development of the CD ROM. A description of the CD ROM components is provided in the second section followed by an outline of the evaluation strategy which asked students to rate the effectiveness of the CD ROM as a tool to assist their learning. The paper concludes by outlining key findings within the scope and limitations of the study, and suggests areas for further research.

¹ This is the equivalent of a Junior in the US college educational system

2. Educational Theory

Accounting graduates are increasingly required to demonstrate strong practical skills underpinned by sound theoretical principles. Clearly both formal and situated learning activities are instrumental in developing appropriately skilled graduates. Unfortunately, it seems that traditional forms of accounting education do not necessarily bridge the gap between the classroom and the real world (Holcomb and Michaelson 1996; 279).

The differences between knowledge required in the work place and knowledge gained from learning experiences in institutions such as universities are well documented (Holcomb and Michaelson 1996). Herrington and Oliver (2000; 23) argue that the emphasis in formal educational institutions is on extracting essential principles, concepts and facts, and teaching them in an abstract and decontextualised form. They argue that much of the abstract knowledge taught in schools and universities is not retrievable in real-life, problem-solving contexts because traditional approaches to teaching ignore the interdependence of situation and cognition. When learning and context are separated, knowledge itself is seen by learners as the final product rather than as a tool to be used dynamically to solve problems (Herrington and Oliver 2000; 23). However, Herrington and Oliver (2000) suggest that appropriate and effective pedagogic techniques and practices are developed to foster meaningful learning and not that formal instruction be abandoned in favour of context-dependent strategies that are learned “on the job”.

The design of the CD ROM is based on constructivist theories which facilitate learning by encouraging students to engage actively in learning and construct meaning for themselves. Herrington and Oliver (2000) suggest that situated learning is a constructivist approach which offers students an opportunity to contextualize knowledge gained in formal learning environments. Collins’ (1988; 2) definition of the concept is “the notion of learning knowledge and skills in contexts that reflect the way that knowledge will be useful in real life”. In accounting, this approach has the potential to better equip students with the skills required of them in employment.

Herrington and Oliver (2000; 24) suggest that “a critical aspect of the situated learning model is the notion of the apprentice observing a community of practice”. The strategy involves students attending workplaces as learners where they are able to

watch, and preferably participate in activities to help augment the theories learned earlier in formal learning settings. Lave and Wenger (1991; 110) describe this as “legitimate peripheral participation”. Kirk and MacDonald (1998) suggest that this participation enables students to piece together the culture of the group and what it means to be a member, enabling them to learn the language and stories of a community of practice, and how to speak both within and about the practice.

In acknowledging the benefits of situated learning, many universities attempt to incorporate some form of work experience in their educational programs. However, large classes reduce the feasibility of this practice. Computer based learning offers a viable alternative, particularly those that offer simulated and interactive opportunities to learn, and Oliver and Herrington (2000; 179) argue that situated learning environments are well supported in a web-based environment by the information and communication capabilities of technology. The CD ROM was developed to overcome problems associated with the logistics of organising active or work based learning activities for large numbers of students.

3. CD ROM design principles

The CD ROM architecture is based around three real world case studies. In addition, it contains substantial theoretical content to support the students’ practical application. The CD ROM allows for independent self-directed learning rather than group based collaborative work, and focuses on the application of key theories and practices. The design principle was to create an authentic learning environment based on key theories underpinning the accounting cycles. The content has immediate relevance for students working through the case studies and avoids problems of many computer based learning environments such as the use of inappropriate, incorrect and outdated content, and the lack of authentic learning environments (Rosenberg 2001; 42).

The design incorporates many of the constituent elements of situated learning contexts identified by Oliver and Herrington (2000; 187). These included **authentic contexts** which reflect the way knowledge is used in real-life; **authentic learning activities** which facilitate real-world relevance; **access to expert performances and**

the modelling of processes where students observe and participate ostensibly in real-life episodes, guided by the practice of professionals; **multiple roles and perspectives** which allow for breadth and depth of knowledge; **reflection to enable abstractions to be formed** and facilitated by tasks and contexts with high degrees of authenticity and enabling students to return to any element of the program as desired; **coaching and scaffolding by the teacher at critical times**, although inherent in the design of the CD ROM, students also benefited by the lecturer's demonstration and use of the CD ROM during lectures; and **authentic assessment of learning** by providing tasks for students based on real situations which also integrates feedback to enable students to determine the extent of their knowledge.

Another important principle directing the design of the CD ROM is that content is structured in an integrated but non-linear fashion. Students control where they commence and finish their study, affording a high level of reuse of the resource. The non-linear structure was facilitated in part by including an overview facility to assist students' orientation within the package. To ensure an integrated learning approach, the theoretical material supporting the video based case studies is structured according to concepts described in Reigeluth and Stein's (1983) "elaboration theory of instruction" which espouses an epitome, the presentation of various levels of elaborations (see later), and ends with a summariser and terminal epitome.

As the CD ROM is not based on a specific set of lessons, the elaboration theory cannot be fully implemented. Instead, key concepts of Reigeluth and Stein's theory are employed. For example, the overview feature on the CD ROM clarifies the relationship between individual conceptual components. In the bottom section of Figure 1, the epitome is the Accounting Information System. The primary level elaboration involves the six cycles that comprise an accounting information system. The secondary level elaboration includes the eight elements that comprise each of the cycles. This structure gives a common theme to the learning. The elements that comprise the cycle are common to all. No matter which cycle the student is studying, they can relate it to the accounting information system above, and within each of these cycles.

The upper section of Figure 1 shows that an accounting information system is only one such system in an organization. Another epitome is therefore established, namely the Information System. The primary level elaboration shows that in an organization there can be five different types of information systems, the most common being the Management Information System. The secondary level elaboration indicates that the Management Information System comprises four main subsystems – marketing, accounting, human resources and operations. The two epitomes can then be joined to show the complete picture and to demonstrate to students how all the components work in relation to each other. No matter where the student is located in the CD ROM, they can always refer back to this structure to see the overall picture.

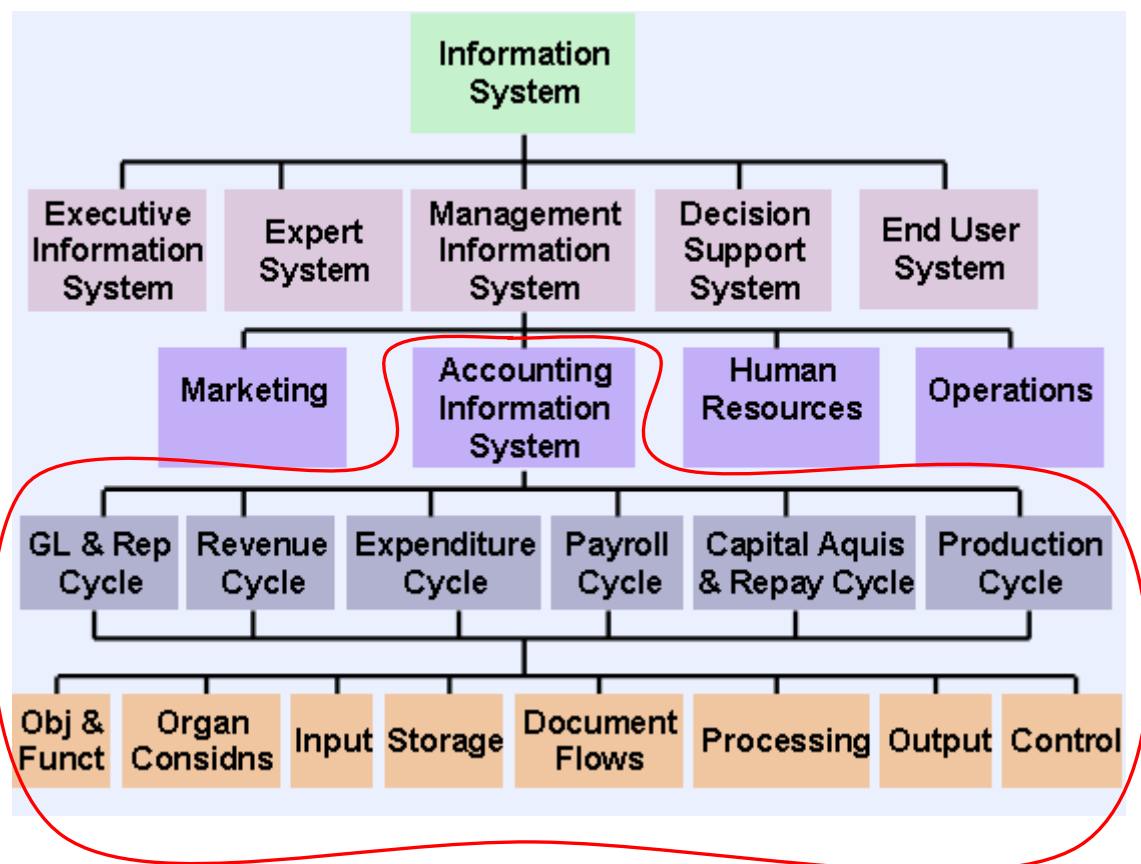


Figure 1 The conceptual structure for the CD ROM

3.1 Description of the CD ROM

The CD ROM content focuses specifically on Accounting Information System Cycles, particularly the general ledger and reporting cycle, revenue cycle, and expenditure cycle. These cycles relate to the structures, procedures, document flows and controls involved in the computer processing of financial data rather than the debits and credits of accounting. Figure 2 shows the main menu for the CD ROM.

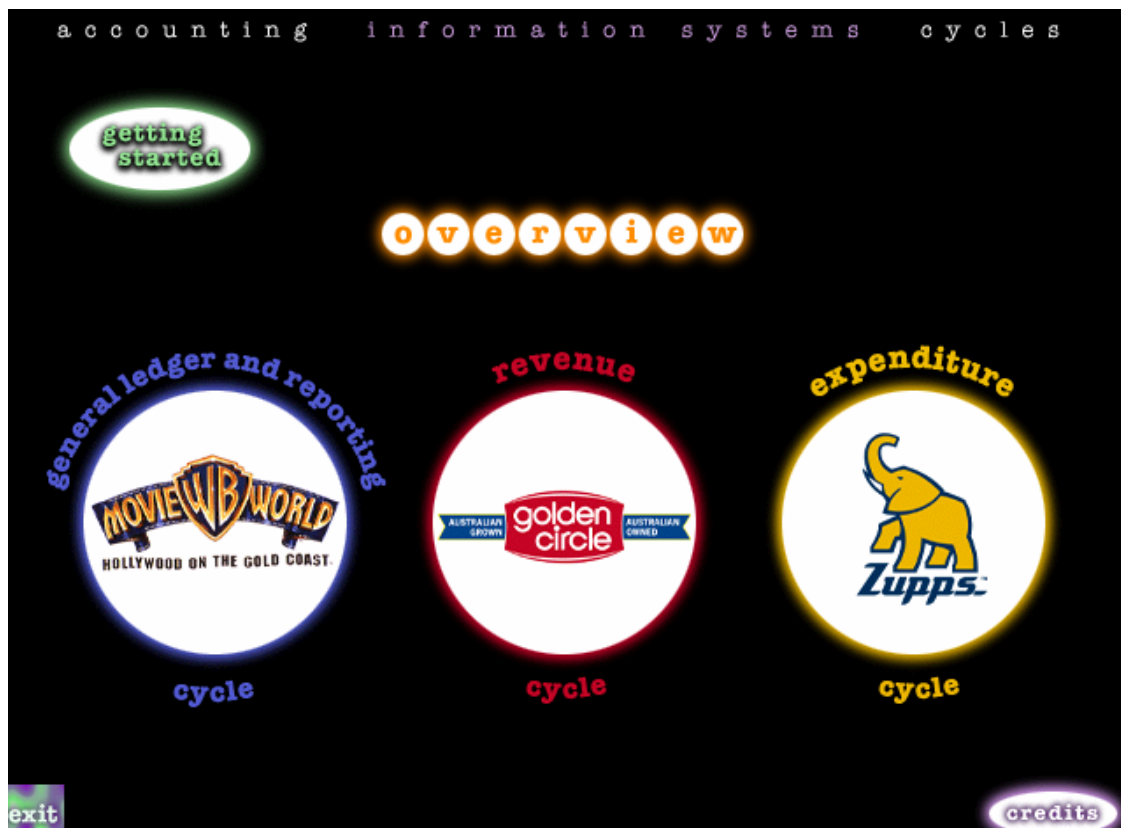


Figure 2 Main Menu

Having entered the main menu, students select a study option from three cycles. Each cycle is represented by a different Australian company: Warner Bros. Movie World, Golden Circle and Zupps Parts. To facilitate authenticity, the logos featured are legitimate logos used by the companies in their marketing, as are the jingles that are also played as part of the introduction to each cycle. Figure 3 shows the next menu if the revenue cycle is chosen.

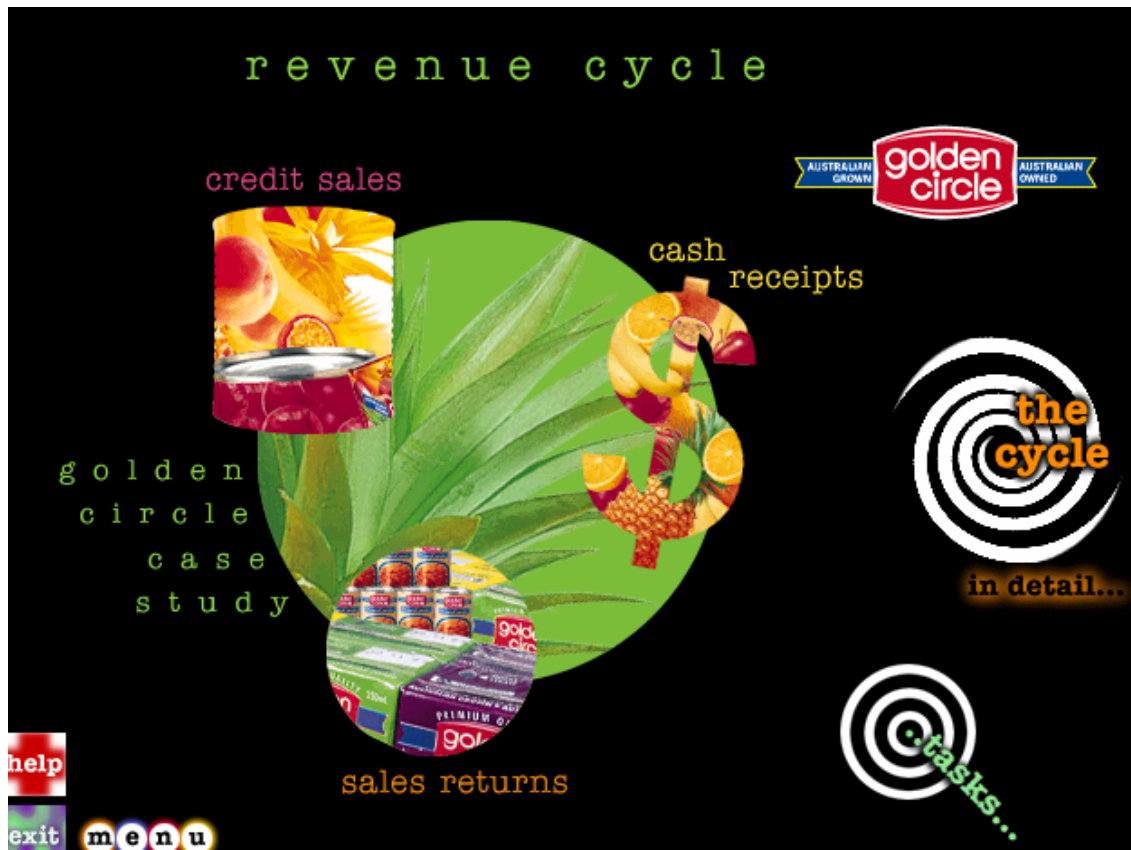


Figure 3 Revenue Cycle showing the main processes of credit sales, cash receipts and sales returns in the middle of the screen

Each cycle then contains four main parts:

1. A **case study** which uses video segments of real life processes to demonstrate the accounting processes used by the organizations; in the general ledger and reporting cycle, Warner Bros. Movie World is used to illustrate the processes involved in the sale of tickets, the purchase of a car and adjusting for depreciation on plant and equipment. The expenditure cycle features Zupps Parts to illustrate the processes involved in credit purchases, cash payments and purchases returns. Golden Circle is used in the revenue cycle to illustrate the processes involved in credit sales, cash receipts and sales returns as shown in Figure 3. Should a student wish to study the process involved in credit sales at Golden Circle, they would click on the “credit sales” icon illustrated in Figure 3. The student is then able to choose from several different video segments showing the credit sale process at Golden Circle which features components such as receiving customer orders, approving credit, entering data, picking and packing goods, despatching goods, updating subsidiary ledger, updating general ledger, sending monthly accounts

and generating reports. Figure 4 shows the video when “enter data” is clicked. The control buttons along the bottom allow students full control over the video function enabling students to pause the video at any time to see a still, move forwards, rewind and play. A “summary” activity accompanies each of these processes to allow students to consolidate their understanding of the material covered.

The screenshot shows a video player interface. At the top left, a circular clock icon displays '30 June'. To its right, the title 'Enter Data' is written in pink. In the top right corner, there is a small icon of a fruit basket. The main video area shows a woman with brown hair, seen from the side, sitting at a desk and typing on a keyboard. She is looking at a computer monitor displaying a software interface. The background of the video player is purple with a large black circular graphic. On the left side, there is a black vertical panel with white text listing activities under the heading 'Credit Sales': receive customer order, approve credit, enter data (highlighted in pink), pick & pack goods, despatch goods, update subsidiary ledgers, update general ledger, send monthly account reports, and summarise "credit sales". Below this list are two buttons: 'help' (red) and 'exit' (purple). At the bottom of the screen, there is a control bar with several buttons: a left arrow, a double left arrow, a red pause button, a right arrow, and a double right arrow. To the right of the control bar is a 'GO BACK' button (orange arrow pointing left) and a 'MOVE ON' button (green arrow pointing right).

Figure 4 “Enter Data” video segment of Credit Sales in the Revenue Cycle

2. **The cycle in detail** looks at all the theoretical concepts relating to each cycle and related activities. Figure 5 shows an example of a “cycle in detail” screen showing all eight elements on the left as described in Figure 1. To see additional information, students would be able to click on the major concepts of control shown in the middle of the screen – authorisation, segregation of duties, safeguarding, adequate documents and records, and independent checks.

Control - Revenue Cycle

Control is a major element of any accounting system. Controls in the revenue cycle are instituted to:

- ★ safeguard assets
- ★ prevent and detect errors
- ★ promote organisational efficiency
- ★ encourage adherence to prescribed managerial policies.

The most important control for accounting purposes is **internal control**, which is achieved by:

- ★ authorisation
- ★ segregation of duties
- ★ safeguarding
- ★ adequate documents and records
- ★ independent checks

Golden Circle:

- ★ despatch control
- ★ storage control
- ★ cheque control
- ★ stocktake

Segments from the Golden Circle case study that show the controls in use with credit sales:

- ★ receive customer order
- ★ enter data
- ★ despatch goods
- ★ approve credit
- ★ pick and pack goods
- ★ send monthly account

Figure 5 Cycle in Detail for the Revenue Cycle

An index allows students to access any relevant concepts that are discussed on the CD ROM. They can also click on the movie symbols to see a video relating to the applicable concepts.

3. **Tasks** provide formative activities for students which link the theoretical concepts and practical aspects. There are three parts:
 - (i) “Summary Questions” which require substantial written responses. These are similar to the type of questions that students could expect in an examination. Before attempting to answer these questions, the student should have worked through the three parts of the case study as well as “the cycle in detail” section.
 - (ii) “Cycle Questions” which contain all the activities in “the cycle in detail”. Activities include questions or diagrams to complete.

- (iii) “Summarise Case Study” tasks which contain the three processes in the case study where the student completes the summary activity.

An example of a Tasks screen is shown in Figure 6.

Summary Questions
long answer questions

Links to Cycle Questions
input
storage - linked files
processing
document flows
control

Links to "Summarise Case Study"
credit sales
cash receipts
sales returns

index
help
exit

Sales Order File			
Sales Order No	Date	Customer No	Customer Ref

Sales Order Inventory Line Item File		
Sales Order No	Inventory No	Qty Order

Inventory Master File							
Inventory No	Description	Selling Price	Weighted Average Cost	Qty on Hand	Qty on Order	Reorder Point	Reorder Qty

The sales order contains data from all 3 files. The linking of the files through their primary keys enables the files to be combined.

What fields are used to generate a sales order? [Click to enter your answers.]

What fields are used to generate an invoice? [Click to enter your answers.]

What fields are used to generate a receipt from an accounts receivable? [Click to enter your answers.]

Figure 6 Tasks for Revenue Cycle shown with a light bulb. These tasks can also be accessed through the Cycle in Detail

4. **Emblems** for the respective firms are presented in the introduction of each cycle. The introduction contains relevant details about the organization, a link to their web site and a listing of the people involved in the case study. Interviews with key staff are also featured. These include all the video interviews found in “the cycle in detail”. While it is more beneficial to view the videos in the context of the “cycle in detail”, placing all the videos together allows students to review the content of the videos more easily than having to navigate back through various screens.

The CD ROM features allow students to learn in three different ways. Firstly, students are able to “experience” the key processes involved in the relevant cycles of a recognizable business through the video segments. Students are able to watch these segments and deduce which processes are actually happening in a real business. The tasks allow students to then check their responses against a proposed solution. In this way, students can discover the extent of their knowledge. Secondly, students are able to compare and contrast these flows in order to deduce general concepts relating to the cycles applicable to most organizations. Finally, students are able to relate this to the overall conceptual knowledge of Accounting Information Systems outlined in Figure 1.

4. Evaluation Methodology

4.1 Rationale

The CD ROM was evaluated using a combination of qualitative and quantitative methodologies to determine students’ perceptions of the CD ROM as an effective learning tool. The evaluation strategy, combining focus groups and questionnaires, was applied over a five year period affording a robust and in-depth evaluation giving credence to the validity and reliability of the evaluation.

Focus groups are among the most widely used qualitative research methodologies in the social sciences (Stewart and Shamdasani 1990) and allow for an in-depth exploration of students’ preferences. The student evaluation questionnaires, based on several decades of research, are acknowledged in educational research as a valid and reliable means of evaluating teaching and learning environments (Marsh and Dunkin 1992, Centra 1993, Wachtel 1998). Ballantyne *et al.* (2000; 222) argues that, “it is generally considered that, provided students are asked about those aspects of teaching environments which they are qualified to comment upon, student evaluations are more useful, accurate and valid than other measures of teaching performance and have the added benefit of being a direct measure of consumer satisfaction”.

In contrast, it is accepted widely in educational research that because learning is influenced by factors such as individual ability and motivation as well as a number of other parameters, attempting to measure the effectiveness of teaching strategies by assessing student learning outcomes through, for example examinations and

assignments, is not only difficult but fraught with validity and reliability issues (Coaldrake & Stedman 1998; Biggs 1999). Learning cannot be attributed solely to teaching strategies but to a multitude of external factors which can't be controlled for (Biggs 1999, Pratt 1992).

4.2 Background Information

The CD ROM was available to students as an additional learning resource in a second level university accounting unit (Computerized Accounting Systems) for which the predominant teaching modes were lectures, textbooks and tutorials. Use of the CD ROM was not compulsory, although some assessment did include reference to the CD ROM. Over the 5-year period of the research, only one person was involved in the lecturing of the unit ensuring as close as possible the same teaching conditions. During this time, the CD ROM did not change in any way. Further information about how the CD ROM was implemented into the teaching of the unit is shown in Appendix A.

4.3 Questionnaires

Student evaluation questionnaires were distributed to 829 students between 1998 and 2002, comprising five years of data across 7 separate student cohorts. As shown in Table 1, the sample sizes are quite large, ranging from 42% to 76% of the total population. All students completed the questionnaire at the same time each semester. This was approximately 2 weeks after the last piece of relevant assessment took place for which the CD ROM content was assessed.

4.4 Focus groups

Focus groups were conducted on three separate occasions during the first year of implementation in 1998 and involved voluntary students from 2 classes. The focus groups were conducted by an external, independent evaluator using a semi-structured interview technique. Initially, the interviewer asked students to describe their preferred approaches to learning in order to contextualize responses to questions specific to the CD ROM. Following the lead question of "How have you worked through the CD ROM?", students were encouraged to lead discussion throughout the

sessions, with the interviewer using probing questions formulated around students' responses.

The first round of focus groups was conducted early in the semester in the first year of operation, and the second round was conducted just prior to the end of semester examination two months later. A third and final group was conducted after all assessment had been finalised to determine the influence, if any, of exams on students' pattern of use on the CD ROM. The duration of the focus groups was approximately 45 minutes to one hour.

Following transcription of data, content analysis involved the following techniques:

- Designation analysis to examine which objects are mentioned most consistently;
- Attribution analysis to determine the frequency with which certain characteristics or descriptors are used;
- Assertions analysis which provides the frequency with which certain objects are characterised in a particular way; and
- Pragmatic content analysis to emphasise why comments are made.

This method of content analysis has a long and rich history in the social sciences and has been applied widely to varied phenomenon including education, psychology and media (Stewart and Shamdasani 1990).

Results

5.1 Student Questionnaire

The results in Table 1 were obtained from the student questionnaires administered from the beginning of 1998 to 2002.

Table 1 Factors Derived From Student Evaluation Survey ²

		Semester 1 1998 Sample of 175 students out of 230 (76%)	Semester 2 1998 Sample of 92 students out of 150 (61%)	Semester 1 1999 Sample of 110 students out of 261 (42%)	Semester 2 1999 Sample of 79 students out of 166 (48%)	Semester 1 2000 Sample of 152 students out of 260 (58%)	Semester 2 2000 Sample of 80 students out of 153 (52%)	Semester 2 2002 Sample of 141 students out of 254 (56%)	Average	Standard Deviation
1	The CD ROM was easy to use	4.2	4.2	4.1	4.2	4.3	4.1	4.1	4.2	.08
2	The CD ROM was enjoyable to use	3.8	3.7	3.6	3.8	3.6	3.7	3.7	3.7	.08
3	I comprehend the processes (document flows, data entries, debit/credits, controls, procedures) involved in each of the case studies	3.9	3.7	3.8	3.9	3.8	3.8	4.0	3.8	.10
4	The CD ROM gave me a varied learning experience	4.1	4.0	3.9	4.1	3.9	4.0	4.1	4.0	.09
5	The information was presented in an understandable form	4.2	4.0	4.0	4.1	4.1	4.1	4.1	4.1	.07
6	The amount of information on each screen was manageable	3.9	4.0	3.8	4.0	3.9	3.8	4.1	3.9	.11
7	The CD ROM helped me comprehend material from lectures	3.9	3.6	3.8	3.7	3.8	3.8	3.9	3.8	.11
8	I find Computer Assisted Learning helps my learning	3.9	3.7	3.8	3.9	3.7	3.9	3.9	3.8	.10
9	Computer Assisted Learning should be used on a large scale in this course	3.7	3.8	3.5	3.7	3.4	3.7	3.7	3.6	.14
10	Of those who used the CBE computer lab facilities at QUT, it was easy to get a computer to use the CD ROM	2.4	3.1	2.1	2.4	2.0	2.6	1.85	2.4	.42
11	Of those who used the CD ROM at home, it was easy to install	4.1	4.2	3.5	3.7	3.9	4.1	4.2	4.0	.27

A five point Likert Scale was used with 1 representing strongly disagree, 2 disagree, 3 neutral, 4 agree and 5 strongly agree.

² The surveys were not included in 2001 and semester 1 2002 as the author was not involved in the teaching of the unit. All data shown in the table reflects as close as possible the same teaching conditions. Inconsistency of teaching is therefore not a variable.

A five point Likert Scale was used with 1 representing strongly disagree, 2 disagree, 3 neutral, 4 agree and 5 strongly agree. For questions 1 to 9, students “agree” (rating 4) on average with the statements and “agree” specifically that the CD ROM gave them a varied learning experience (question 4). Some students expressed dissatisfaction with the difficulty in obtaining a computer at the University (question 10). However, the majority of students from 1999 to 2002 used the CD ROM at home and “agree” that the CD ROM was easy to install (question 11).

Students were also asked to provide an overall rating for the CD ROM. The five point Likert Scale was maintained but this time 1 represented very poor, 2 poor, 3 satisfactory, 4 good and 5 very good. Table 2 shows the results for question 12 which have been averaged and the appropriate breakdowns obtained. Overall, the average response over the five year period was 4.0 which is a rating of “good”. The actual breakdown of responses indicates that 97.1% of students rated the CD ROM as “satisfactory” and 78.6% rated the CD ROM as “good” or “very good”. These overall results, illustrated in Tables 1 and 2, demonstrate strong consistency with very small standard deviations, suggesting that the majority of students perceived the CD ROM as an enjoyable and worthwhile learning resource.

In addition to their overall perceptions, students were asked a number of questions relating specifically to their learning. The questions and the summary results based on those that responded (bearing in mind that a student could list several items or not answer at all) are shown in Tables 3 to 6. The data that makes up the summary results in these tables is shown in Appendix B.

Table 2 Overall Student Rating of CD ROM

	Semester 1 1998 Sample of 175 students out of 230 (76%)	Semester 2 1998 Sample of 92 students out of 150 (61%)	Semester 1 1999 Sample of 110 students out of 261 (42%)	Semester 2 1999 Sample of 79 students out of 166 (48%)	Semester 1 2000 Sample of 152 students out of 260 (58%)	Semester 2 2000 Sample of 80 students out of 153 (52%)	Semester 2 2002 Sample of 141 students out of 254 (56%)	Average	Standard Deviation
12 Overall, how would you rate the CD ROM	4.1	4.0	3.9	4.2	4.0	4.0	4.1	4.0	.10
Breakup - Very Good	62 (35.4%)	22 (23.9%)	21 (19.3%)	26 (33.7%)	44 (28.9%)	26 (32.5%)	44 (31.2%)	29.3%	.06
Good	77 (44.0%)	53 (57.6%)	63 (57.8%)	38 (49.4%)	73 (48.0%)	30 (37.5%)	72 (51.1%)	49.3%	.07
Satisfactory	29 (16.6%)	13 (14.1%)	23 (21.1%)	12 (15.6%)	31 (20.4%)	22 (27.5%)	20 (14.2%)	18.5%	.05
Poor	4 (2.3%)	2 (2.2%)	2 (1.8%)	1 (1.3%)	3 (2.0%)	2 (2.5%)	3 (2.1%)	2.0%	.004
Very Poor	1 (0.6%)	1 (1.1%)	0 (0.0%)	0 (0.0%)	1 (.7%)	0 (0.0%)	0 (0.0%)	.4%	.005
No response	2 (1.1%)	1 (1.1%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	2 (1.4%)	.5%	.006

A five point Likert Scale was used with 1 representing very poor, 2 poor, 3 satisfactory, 4 good and 5 very good.

Table 3 Results from the question “What features of the CD ROM assisted you in the comprehension and understanding of material (for example variety of tasks, explanations, use of diagrams, videos)?”³

	Total Responses from 829 students over 5 years
Videos	436 (52.59%)
Use of diagrams	309 (37.27%)
Interaction with tasks/ Interactive tasks/ Variety of tasks/ Exercises	245 (29.55%)
Explanations	182 (21.95%)
All features	39 (4.70%)
Real World	33 (3.98%)
Interactive learning	15 (1.81%)
Control pace of learning	8 (0.97%)
Other	<u>20</u> (2.41%)
	1287

Table 4 Results from the question “Overall, which aspect of the CD ROM was of most assistance to your learning?”⁴

	Total Responses from 829 students over 5 years
Interaction of tasks/ Interactive tasks/ Variety of tasks/ Exercises	206 (24.85%)
Videos	198 (23.88%)
Explanations	78 (9.41%)
Use of diagrams	75 (9.05%)
Apply to real world/ real cases and examples	50 (6.03%)
All features	20 (2.41%)
Content	17 (2.05%)
Other	<u>44</u> (5.31%)
	688

³ Not all of the cohort responded to this question and some students responded with more than one feature

⁴ Not all of the cohort responded to this question. However those that did respond only gave one response.

Table 5 Results from the question “Overall, which aspect of the CD ROM did not foster learning for you?”⁵

	Total Responses from 829 students over 5 years	
Interviews/videos	71	(8.56%)
Reading on one page/ long pieces of writing/Pages of pure information	64	(7.72%)
Tasks/summary diagrams	49	(5.91%)
Extent of information	38	(4.58%)
Use of diagrams	28	(3.38%)
Repetition of videos	7	(0.84%)
Other	84	(10.13%)
	341	

⁵ Not all of the cohort responded to this question. However those that did respond only gave one response. The responses varied widely and the total number of responses was very low compared to the total number of students in the survey. This indicates that many students did not feel there was problem in this area.

⁶ This only relates to 4 years as the question was not asked in the first year.

Table 6 Results from the question “Did you find the CD ROM helpful in gaining a real life understanding of the various concepts involved in the General Ledger and Reporting, Revenue and Expenditure Cycles?”

	Total Responses from 562 students over 4 years ⁶	Standard Deviation
Yes	89.46%	.04
No	6.16%	.04
Other	4.38%	.02

Table 3 indicates that students felt the videos (52%), diagrams (37%), interactive tasks (29%) and explanations (21%) were elements of the CD ROM that most assisted their comprehension and understanding of the material. Table 4 demonstrates that the interactive tasks (24%) and videos (23%) were rated highest for aspects which were considered to be most beneficial to their learning. Table 5, which illustrates responses to the question, “Which aspect was least effective to your learning?”, should be interpreted with care as only a very small number of the total respondents answered this question. The small response rate suggests a general level of satisfaction with most components of the CD ROM. According to responses, the interviews/video components (8%) were the least liked feature. While this appears contrary to the results in Tables 3 and 4, the results in Table 5 confirm the proposition that not all students want to learn in the same way. Table 6 illustrates that more than 89% of students agreed that the CD ROM was helpful in gaining a real life understanding of the various accounting concepts.

To add a more qualitative perspective, Figure 7 provides a sample of comments from students who completed the surveys.

Figure 7

Comments by students who completed the surveys regarding the use of the CD ROM

Maybe some more practical exercises would help. Other than that I think the CD ROM was pretty good and I can't think of anything else that could help it. S1162

The use of various media was very useful. It broke the monotony which sometimes develops when studying. The videos were interesting as they showed the systems and the opinions of the people using them in a real time situation. S1125

The variety of tasks gave you a chance to have an attempt at the exercises. The explanations, use of diagrams, videos also helped to understand the material. S1113

To see how different operations were done was quite FUN. It is far easier to get into what you're doing if you enjoy learning about it. The CD ROM allowed me to learn and understand more. S1110

Being able to listen repeatedly to the sections you didn't understand. Do it in your own time, and being able to stop when learning was no longer productive. S161

I found the CD ROM a refreshing break from usually monotonous lectures. In that way it was a good tool.....On the whole, it was a good learning tool and I would encourage its continual use and expansion. S210

Not much really. The set up is user friendly and it is a very easy program to manipulate (move around). I was comfortable the way it was. S235

Results indicate the strength of the CD ROM is in combining a virtual ‘real life’ experience with active learning exercises and appropriate diagrammatic explanations. In providing a context for the abstract knowledge, the CD ROM acknowledges the interdependence of situation and cognition described by Herrington and Oliver (2000) in the educational theory section mentioned previously. The results of the evaluation also indicate that students felt the CD ROM offered a holistic approach by combining the content, tasks and virtual ‘real life’ learning experiences through a multimedia medium.

5.2 Focus Groups

The overwhelming response from students in the focus groups was very positive. The attribution and designation analysis determined that the majority of students found the principal benefit of the CD ROM to be the practical focus it lent to their learning experience. Typical comments from students described the CD ROM as providing “a window to the real world” and likened it to “work in the real world”. This was encouraging, particularly given the objective to provide students with more experiential learning opportunities in an effort to encourage deeper learning.

The assertions analysis demonstrated students’ acknowledgement that the practical focus of the CD ROM helped them to understand the theory provided during lectures and in the textbook. They used descriptors such as “helping to tie the theory with the practical”. Comments indicated that this was facilitated by the way information was presented through videos and practical exercises, and the relevancy of the information provided on the CD ROM itself. Far from the videos and exercises being perceived as arbitrary “added on” features, students felt they were central in assisting their understanding. A typical comment was:

“It helped to pull things together for me, and I had been through the practical side of it in my review and I looked at that and enjoyed that.... It pulled some of the theory together from slightly different angles than the lecture had. It’s always good to see a different perspective.”

The majority of students interviewed found the video segments to be most useful to their learning. An important point made by students is that the videos showed real people in real working situations rather than simply showing talking heads. Many

students commented on the degree to which the visual learning helped them to understand the theory. For example:

....you can see how it works and how it relates in a company rather than something fictitious - you get to see how people do it.

You get to see how it's done in practice, because for people who have never been into a business before we don't know how they utilise these accounting packages, seeing how they're actually used is really good. I think that's the main thing you get out of it.

In addition, the students indicated that the variety of material presented was very important in helping them gain a deeper understanding of the concepts, and in some cases glean a new perspective. Students also appreciated the variety afforded by the three different companies – Movie World, Golden Circle and Zupps Parts. This helped them to grasp a clearer understanding and appreciation of both the theoretical principles and applied nature of accounting processes.

I think you're more likely to remember how it's actually working in theory if you've seen it done in practice. You kind of have a visual key to remind you of what happens and what the process is.

I found it very good to see the different company's practical approaches to the theoretical problems of separations and various controls.

As described in the educational theory section previously, the CD ROM was designed specifically in a non-linear fashion. Although some students did work through the material in a linear fashion, many of the comments demonstrate the myriad of ways students approached their learning on the CD ROM. For example:

I only spent about fifteen minutes in MovieWorld and then jumped to Golden Circle and Zupps.... I just checked out quickly what was available and then compared the three.... I went into detail in the different cycles and I did figures when you had to fill in the information.

Before the lecture I went straight to the drag and drop to see how much I knew.

I went to the end first and tried to do the questions on there first and then went back to see about the parts I couldn't do.

Overall, the comments provided by students in the focus groups indicated that they found the CD ROM to be an effective tool in helping them to develop a better understanding of the theories and processes associated with the accounting cycles, and that this was derived largely from the practical components of the CD ROM.

Some difficulties with the CD ROM were raised but were relatively minor. Specific problems related to the volume of information presented, repetition, and some minor confusions related predominantly to use by the very first groups of students

Most students were keen initially to have a print function incorporated on the CD ROM. In some cases this relates to the initial accessibility problems they experienced. However, the need to print can also be attributable to the students' approach to learning, with many of them preferring to print copious notes, possibly to facilitate learning by rote. A print option may compromise the interconnectivity of the CD ROM's elements, with students only going to key sections to print rather than exploring all the other sections which complement each other. This was the primary reason why the print option was not included.

Some students were critical of the level of feedback offered in the exercises. The first area of concern involved the level and consistency of guidance provided to students whilst doing the exercises. It should be noted that only one group found this problematic. The second concern involved the degree and immediacy of feedback received during the exercises. Both groups felt that more feedback could have been provided for some of the exercises. However, the intention of the design was that students should go back to the theoretical material to find answers for themselves, thus discouraging rote learning.

Many students commented on the large volume of information presented on the CD ROM. It is important to contextualize the comments, in that these students were also accessing the theoretical content in lectures and felt, therefore, that much of it was repeated unnecessarily in the "Cycle in Detail" on the CD ROM. The volume of information may well assist students who use the package independently of lectures, tutorials or textbooks and for the many English as a second language students who wish to review the content in their own time.

6. Conclusions

The project described in this paper demonstrates the value of multimedia technologies in providing effective learning experiences especially in large learning environments typical of universities today. Results from the evaluation of the CD ROM support the educational theory outlined earlier which espouses the benefits of experiential learning to facilitate effective student learning. The study also illustrates students' receptiveness to learn in appropriately designed and constructed online educational environments. Survey results over 5 years indicate clearly that students benefited from using the CD ROM, with 97.1% of students rating it "satisfactory" or better, and 78.6% of students rating the CD ROM as "good" or "very good". It is important to note that these results have been consistent across the 5-year evaluation period.

A significant result was the students' perception that the CD ROM offered them "a window to the real world" which made learning more meaningful. Although a "virtual experience" does not replace the efficacy of real life learning experiences, the combination of the media including video, interactives and content constructed in a carefully considered environment, offers opportunities to improve the learning experiences for students in large cohorts. It also provides a valuable supplementary resource to traditional teaching methods.

Students' comments describing the CD ROM as "helping to tie or link the theory with the practical", indicate the value of video segments and the interactive exercises in enhancing the learning experience rather than being regarded as arbitrary or tacked on features. The degree to which the visual learning experiences have been useful, and the differences and variety of experiences afforded by the range of material presented, were toted as being very important in helping students gain a deeper understanding of the key concepts involved, and in some cases, them gleaning a new perspective. This is further evidenced by the fact that 89% of students indicated that the CD ROM was helpful in gaining a real life understanding of the various accounting concepts.

The focus groups also indicated that the design of the CD ROM allowed students to approach their learning in a variety of ways. This is fundamental in encouraging students to construct their own meaning and engage with the materials to facilitate

deeper understanding and appreciation of both the theoretical principles and applied nature of accounting processes.

Finally, ascertaining the views of employers and/or business groups with respect to the effectiveness of the CD ROM in developing students' employability skills and enhancing learning outcomes, in particular developing understanding of key accounting concepts, would be useful given the increased focus on employability skills in Australian higher education.

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Appendix A

Background Information to the Use of the CD ROM

The CD ROM is used in a second year unit called Computerized Accounting Systems. The only prerequisite unit is an Introductory Accounting unit in order that students understand the basic nature of accounting. Computerized Accounting Systems has 12 credit points which means that students should spend on average 12 hours per week studying this unit over a 13 week period. 2 of these hours are in the form of lectures and 1 hour is a computer workshop which covers an accounting package and spreadsheets. The other 9 hours per week is independent study.

The content of the unit includes an introduction to Accounting Information Systems (AIS); controls; general ledger and reporting cycle; revenue cycle; expenditure cycle; human resources management/payroll cycle; production cycle; accounting packages including development of effective accounting systems and the use of an accounting package such as Attache or Accpac; computer fraud and security; accounting in an electronic environment; and spreadsheets including the use of Excel.

The CD ROM was designed for students to use as an independent resource. Therefore, in the first lecture on the general ledger and reporting cycle, a demonstration lasting about 15 minutes shows students the basic elements of the software. The only other time that the CD ROM is used in class is in both the Revenue and Expenditure cycles lectures, where about 4 video clips are shown to demonstrate to students some of the theoretical concepts being discussed and to arouse their interest in the CD ROM.

A small 6 page user manual is given to students which outlines how to set up the package; the overall structure including the various cycles, the case studies, the cycle in detail, tasks and emblems; general operation; tasks; video operation; sound; help; and printing. It also outlines various approaches that can be taken by the students such as:

- . a top-down approach starting with the “overview” and then looking at each of the cycles to include “the cycle in detail” and then the “case study”
- . a bottom-up approach starting with the “case study” and “the cycle in detail” in each cycle and then moving to the “overview”
- . a testing approach starting with “tasks” to determine how much the student knows and then going to those parts where they feel deficient
- . A combination of any of the above.

The manual also gives an approximate time that students should spend on the various elements such as 1 hour on the overview; 2 hours each cycle on the case study and the cycle in detail; and then 1 hour on the tasks making a total recommended study time of 8 hours

From an instructor’s viewpoint, the approach taken by the authors is essentially one of self-study by the students, as the design allows for students to study in a very flexible way. Using this approach, most of the videos are therefore a new experience to the students which adds to their intrinsic curiosity and interest. However instructors could use the CD ROM in lectures as a base for students to see practical examples of the concepts being taught. The videos are very good in this regard as they are very short segments. Students could then review the material to consolidate the concepts. Obviously, the tasks can be done at any time by the students to reinforce the concepts learned.

Appendix B

Data for each semester that makes up the summary data in Tables 3 - 6

Data For Table 3 Results from the question “What features of the CD ROM assisted you in the comprehension and understanding of material (for example variety of tasks, explanations, use of diagrams, videos)?”⁷

	Semester 1 1998 Sample of 175 students	Semester 2 1998 Sample of 92 students	Semester 1 1999 Sample of 110 students	Semester 2 1999 Sample of 79 students	Semester 1 2000 Sample of 152 students	Semester 2 2000 Sample of 80 students	Semester 2 2002 Sample of 141 students	Total Responses from 829 students over 5 years
Videos	112	51	42	38	87	39	67	436 (52.59%)
Use of diagrams	55	36	35	35	65	24	59	309 (37.27%)
Interaction with tasks/ Interactive tasks/ Variety of tasks/ Exercises	27	31	18	22	59	30	58	245 (29.55%)
Explanations	36	10	38	23	28	13	34	182 (21.95%)
All features	13	0	7	5	4	3	7	39 (4.70%)
Real World	0	0	0	0	14	5	14	33 (3.98%)
Interactive learning	0	0	0	0	11	3	1	15 (1.81%)
Control pace of learning	6	0	0	0	0	0	2	8 (0.97%)
Other	<u>4</u>	<u>3</u>	<u>8</u>	<u>3</u>	<u>1</u>	<u>1</u>	<u>0</u>	<u>20 (2.41%)</u>
	253	131	148	126	269	118	242	1287

⁷ Not all of the cohort responded to this question and some students responded with more than one feature

Data For Table 4 - Results from the question “Overall, which aspect of the CD ROM was of most assistance to your learning?”⁸

	Semester 1 1998 Sample of 175 students	Semester 2 1998 Sample of 92 students	Semester 1 1999 Sample of 110 students	Semester 2 1999 Sample of 79 students	Semester 1 2000 Sample of 152 students	Semester 2 2000 Sample of 80 students	Semester 2 2002 Sample of 141 students	Total Responses from 829 students over 5 years
Interaction of tasks/ Interactive tasks/ Variety of tasks/ Exercises	17	28	25	20	40	16	60	206 (24.85%)
Videos	59	19	21	14	50	20	15	198 (23.88%)
Explanations	10	5	16	16	13	11	7	78 (9.41%)
Use of diagrams	13	9	11	10	9	9	14	75 (9.05%)
Apply to real world/ real cases and examples	15	4	7	5	5	5	9	50 (6.03%)
All features	11	0	3	0	0	3	3	20 (2.41%)
Content	7	3	2	1	0	0	4	17 (2.05%)
Other	<u>9</u>	<u>1</u>	<u>1</u>	<u>2</u>	<u>16</u>	<u>2</u>	<u>13</u>	44 (5.31%)
	141	69	86	68	133	66	125	688

⁸ Not all of the cohort responded to this question. However those that did respond only gave one response.

Data For Table 5 - Results from the question “Overall, which aspect of the CD ROM did not foster learning for you?”⁹

	Semester 1 1998 Sample of 175 students	Semester 2 1998 Sample of 92 students	Semester 1 1999 Sample of 110 students	Semester 2 1999 Sample of 79 students	Semester 1 2000 Sample of 152 students	Semester 2 2000 Sample of 80 students	Semester 2 2002 Sample of 141 students	Total Responses from 829 students over 5 years
Interviews/videos	8	6	12	5	15	7	18	71 (8.56%)
Reading on one page/ long pieces of writing/Pages of pure information	6	3	17	12	8	6	12	64 (7.72%)
Tasks/summary diagrams	17	2	9	6	5	1	9	49 (5.91%)
Extent of information	9	2	2	4	9	0	12	38 (4.58%)
Use of diagrams	7	0	3	4	7	5	2	28 (3.38%)
Repetition of videos	5	0	1	0	0	1	0	7 (0.84%)
Other	<u>14</u> 66	<u>13</u> 26	<u>7</u> 51	<u>4</u> 35	<u>23</u> 67	<u>19*</u> 39	<u>4</u> 57	84 (10.13%) 341

* 8 of these responses related to the jingles that were played at the beginning of each case study. These were the real jingles that are used by the companies in their advertising

⁹ Not all of the cohort responded to this question. However those that did respond only gave one response. The responses varied widely and the total number of responses was very low compared to the total number of students in the survey. This indicates that many students did not feel there was a problem in this area.

Data For Table 6 – Results from the question “Did you find the CD ROM helpful in gaining a real life understanding of the various concepts involved in the General Ledger and Reporting, Revenue and Expenditure Cycles?”

	Semester 1 1998 Sample of 175 students	Semester 2 1998 Sample of 92 students	Semester 1 1999 Sample of 110 students	Semester 2 1999 Sample of 79 students	Semester 1 2000 Sample of 152 students	Semester 2 2000 Sample of 80 students	Semester 2 2002 Sample of 141 students	Total Responses from 562 students over 4 years	Standard Deviation
Yes	-	-	94 (85.5%)	74 (93.7%)	140 (92.1%)	67 (83.8%)	130 (92.2%)	89.46%	.04
No	-	-	7 (6.4%)	2 (2.5%)	9 (5.9%)	10 (12.5%)	5 (3.5%)	6.16%	.04
Other	-	-	<u>9 (8.1%)</u>	<u>3 (3.8%)</u>	<u>3 (2.0%)</u>	<u>3 (3.7%)</u>	<u>6 (4.3%)</u>	4.38%	.02
	-	-	110 (100.0%)	79 (100.0%)	152 (100.0%)	80 (100.0%)	141 (100.0%)		