TECHNOLOGICAL SUPPORT FOR FLEXIBLE LEARNING WITHIN A PRE-ENDORSEMENT MASTERS OF MIDWIFERY COURSE

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Abstract

This paper briefly describes the flexible delivery Master of Midwifery course developed at USQ. This course contains four units taught almost totally via CDROM and Internet. The majority of the paper examines the ways in which the lecturers and students believed the CDROMs enhanced their educational work. A core advantage for the lecturers was the highly iterative development methodology which was used. While most students had no prior experience with computer CDROMs they felt that their learning was empowered and most preferred the unit to similar paper based units.

Keywords

Online education; web education; CDROM; development methodology; educational impacts; technology; midwifery; media; situated learning

The Master of Midwifery course: design and delivery

The Master of Midwifery (MoM) course is a twelve unit flexible delivery course designed to address the needs of rural midwifery practice. The development of this course occurs within a statewide shortage of midwives (Lenton, Carse & Norrie, 1998) in which rural hospitals report difficulty recruiting midwives and some rural maternity units have closed for lack of qualified midwives. The course includes students doing their clinical placements as part of the paid workforce in hospitals in Far North Queensland.

The development of the MoM course also occurred as the role of the midwife is changing to reflect marked cultural changes in maternity services delivery including team-midwifery, birth centres, community-based midwifery and closer links between professionals and lay groups. In addition, consumer pressure has demanded a variety of birthing options and choices about models of care, including midwifery models of care (NHMRC, 1996). This course is designed to prepare midwives to practise in traditional settings as well as to be able to confidently practise in their own right. The philosophy of the Master of Midwifery is grounded in the Australian College of Midwives Incorporated (ACMI) (Australian College of Midwives Incorporated, 1995) philosophy.

Within the MoM course "flexible delivery" includes traditional paper-based distance education materials, CD-ROM interactive learning, on-line discussion groups, classroom learning at residential schools, workplace based clinical training and collaborative learning groups, access to WWW documents, on-line assessments tasks and direct e-mail between lecturers and students. The ability to provide such a wide

range of educational options is partially due to the fact that the MoM course is a joint project of the several health services and USQ.

More detail of the MoM course and the partnerships for development and delivery are provided in Evans, McDonald and Fahy (1999).

The CDROM based units

Four of the twelve units are delivered to students on CD-ROMs containing all unit content (apart from selected readings). The ambitious nature of the flexible delivery goals of the MoM course have been recognised by the fact that this was one of the "flexible delivery flagship projects" undertaken at USQ. On average each of the CD-ROMs for these four units contains:

- over 200 screens of information;
- 30 video clips;
- 50 interactive diagrams; and
- 4 interactive "You be the midwife" exercises

The MoM course is significant because of its adoption of the Midwifery Model of Care and the way it has been developed and delivered through the collaborative arrangements between USQ and the Cairns District Health Service. The CDROM based units are also significant for several reasons including:

- the degree to which they use the capabilities of the CDROM to support situated learning;
- the speed of development (four CDROMs over little more than a 12 month period);
- almost 100% of the unit is based on the CDROM; and
- the large amount of video, audio, images and interactive elements which are woven into the unit materials.

The remainder of this paper focuses on how lecturers and students believed the CDROM nature of the units impacted on teaching and learning. A detailed description of the MoM CDROMs and the underpinning educational philosophy of situated learning is available online (Evans, McDonald and Fahy, 1999).

Technological impact on teaching and learning

What is technology

Many people would see only "the computer" or "the Internet" as the technologies which are being used within the MoM course. However, any examination of the impact of computer based technology has to be seen in the context that technology is woven into the very fabric of what it means to be a *homo sapiens*. Bronowski (1975) claims that the use of tools and technology to enhance our biological and cognitive abilities is responsible for the very rapid "ascent of man" as opposed to the

evolutionary "descent of man"
(Darwin, 1872).

Ong (1988) makes the point that many tools and technologies have become "interiorised" and have largely disappeared as an "external device". Heidegger (cited in Winograd, 1986) gives a vivid illustration of "disappearing technology" by describing a person driving in a nail.

To the person doing the hammering, the hammer as such does not exist.... It is part of the hammerer's world, but is not present any more than are the tendons of the hammerer's arms. The hammer presents itself as a hammer only when there is some kind of breaking down or unreadiness-to-hand. Its 'hammerness' emerges if it breaks or slips from grasp or marks the wood, or if there is a nail to be driven and the hammer cannot be found." (p. 36).

Perhaps the most pervasive interiorised technology is that of language, reading and writing (Laudauer, 1988).

Thus while this paper focuses on the application of the CDROM and the Internet as the technology of interest the entire situation is pervaded by technologies which have "disappeared". In fact a measure of our success is the degree that the computer, CDROM and Internet disappears into the work of educators and students. Rogers (1995) plots a similar pattern in his model of technological innovation with the "early adopters" focusing on the technology per se and the later stages focusing more on the purposes for which the technology is used.

Who the technology impacts on

While the use of CDROMs has impacted on most people involved with the MoM course (lecturers, students, media specialists and developers) we will focus on impacts on the midwifery educators and the students. The following discussion is based on data collected in the following two ways:

- short interviews held with two USQ midwifery educators (E); and
- responses to a short paper and pencil questionnaire by nine students (S). Not all students responded to all questions.

In future, we will devote more time to carefully evaluating the impact these technologies have on student work through the use of more comprehensive data collection tools.

Evaluation of the development methodology

Unit development occurred within the unit team process which has been long used at USQ. The unit team consists of the unit team leader (lecturer), an instructional designer, the IMM developer (IMM lead), various media specialists and a Materials Development Clerk (MDC). The lecturer had had much experience developing

traditional paper based distance education materials and she was very familiar with the process in which:

> I work in my office on a word processor and ... I was used to designing what I was going to get.... When I started this project ... I had no experience with interactive multimedia.... [I wanted] all the very clinical components of the course ... made very real on the CDROM and also the ethical and psychosocial / spiritual issues to come through, [but] I didn't know how that would happen. (E)

Initially there was much debate, drawing of numerous story boards and discussion of high educational and technological ideals. It was not until about June or July of 1998 that the team was confronted with the reality of "until it is in the document" all the meetings in the world will not produce the CDROM. At this stage the lecturer began to spend significant blocks of time using a computer in the IMM section to create the units using the Interactive Learning Services Markup Language (ILS-ML). ILS-ML is an Extensible compliant markup language (XML) (XML.COM, 1999) which allows the content expert to quickly markup content in a way best suited to their own project.

The lecturer described the production process as being:

> ... highly interactive and iterative. I do a bit and ... because it is immediately translated ... into something on a screen I can see what it looks like.... Some aspects of the midwifery CD particularly the "Be the Midwife" emergency scenarios went though 20 to 30 [iterations] ... I'd do a bit, I'd look at it, revise it and do it again. It wouldn't have been possible for me to produce that kind of highly clinical, highly situated, amazingly clinically accurate information sitting in my office with a blank piece of paper. (E)

Diagnosis: Abdominal and Vaginal Assess (labeling) | Abdo-vag assess
To assist you with the interactive exercise it may be beneficial for you to print out and refer to the 'descent of the fetus' diagram displayed below.
{image name="*sb*../media/images/nolabels/descent.jpg" align="center" caption="Descent of the fetus."}

Figure 1: Part of the Word document containing an ILS-ML tag in brackets "{}" to show an image and the long and short title (used in the left hand menu) for the page.

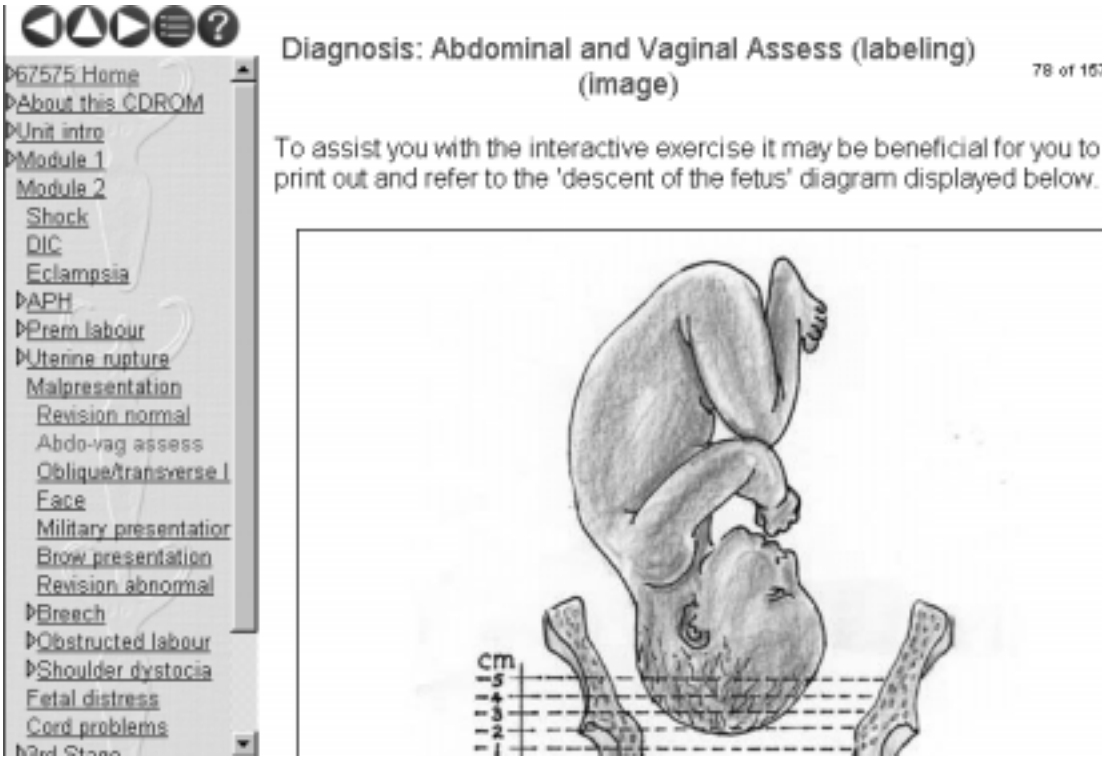

Figure 2: Single page of the web site corresponding to the ILS-ML portion shown in the previous figure. This page also shows the round navigation buttons and the hierarchical fish eye menu to aid navigation.

The general development process used to develop the CDROMs involved the lecturer (with assistance from others) using Microsoft Word to create the content in an ILS-ML tagged document (figure 1). Whenever required (sometimes several times a day) the IMM lead used our web publishing system to generate the web site (figure 2) from this document. Thus the process was highly interactive and iterative with the lecturer having the ability to change or reorganise the content up until a week before the CDROM was mastered. Our interactive development methodology also involved the use of small interactive learning objects (COOL Tools) designed to address a specific educational goal. Perhaps the best known example of such learning objects are those created by the Educational Object Economy (EOE, 1999) and the Instructional Management System (EDUCAUSE: IMS, 1999) initiative sponsored by EDUCAUSE. These COOL Tools allows us to include higher levels of interaction within the HTML presentation in a way that is cost effective to develop and maintain. The COOL Tools support site (USQ: COOL Tools, 1999) provides more information. More details of the two level HTML / COOL Tool strategy can be found in Evans (1999).

The COOL Tool methodology allows the midwifery educator to be centrally involved in developing these interactive components. For example, we developed an editor which allows the lecturer to easily create interactive labelling activities (see figure 3) on their own desktop computer. Empowering the lecturer with such interactive development tools allows them to revise the content in ways that were not possible using a sequential batch orientated system in which the lecturer creates the content and the developers implement it.

The "situated learning" (Brown, Collins & Duguid, 1996; McLellan, 1996; Wilson, 1996) educational model also mandated this iterative development process.

> Situated learning allows the stimulus for learning to come out of the real practice ... in the middle are the objectives for students to learn and then there is the scientific and clinical content that supports the learning of those objectives. And so it was quite a creative process linking all those together. (E)

The lecturer's comments support the notion that there was a good match among:

- the educational model which was being used (authentic situations, linked to ACMI competencies, linked to the underlying biological and physiological knowledge);
- the educational environment which the lecturer wanted to create (learner controlled and highly interactive); and
- the development methodology allowing the lecturer to create content using familiar tools, quickly see it as a finished web site and then test and iteratively refine it.

While a "batch" orientated development process consisting of a number of independent sequential processes could be used to produce an expository linear project, it couldn't produce CDROMs or web sites such as those in the MoM course.

Evaluation of teaching and learning

Previous experience with computers

Before examining impacts on teaching and learning it is important to know a little about the prior experience of students. When asked "before doing the Masters of Midwifery units how often would you have used a computer CDROM or the Internet" all but one answered "never" and one answered "once per week".

Despite this very low prior experience with computers only 2 of 8 students reported that they would have "preferred to do the unit as a paper based unit". Also, only one student said that the CDROM and Internet based nature of the units would dissuade them from recommending the units to other students.

Global evaluation

The following comments exemplify the student's positive overall satisfaction with the CDROM:

> One of my students ... she has just completed her Midwifery training at another university which was paper based ... has now got the CD and she thinks it is fantastic and she can't believe that it has not been invented a long time ago ... Why we weren't learning like this a long time ago? (E quoting a S)

> I enjoyed the CDROM component because it was a new (advanced) [sic] form of learning

and [it] was more real. (S)

Interesting, concise, motivates me to learn. (S)

Please continue to use it [the CDROM] (S)

The idea is excellent. (S)

Learner control and interactivity

A member of the team commented that she believed a major advantage of the CDROM was that it allows the students to interact with the materials at a place, time and pace that suited them. Moreover:

> With the CDROM they can see it animated and watch it with an explanation from beginning to end (and) if they didn't get it the first time they can go away and make a cup of coffee and come back straight away and watch it again and again and again. As many times as it takes for them to get it. (E)

She contrasts this with the traditional classroom:

> ... if I was demonstrating a breech delivery using a doll and pelvis they would see it once ...(and) they are expected to grasp the concept the first time. (E)

Interactivity has long been seen as "a necessary and fundamental mechanism for knowledge acquisition" (Barker, 1994; Sims, 1997). Romiszowski (1982) suggests that true interactivity should be measured by the quality of thinking it demands of the learner rather than simply by the frequency of interactions.

Students also commented on the degree of user control and interaction when asked to name the best feature of the CDROM.

[Its] interactive nature. (S)
How interactive it is and it promotes you to sit there and study. (S)

Some forms of interactivity used within the CDROMs include:

- following thematic links through the materials;
- annotating videos or animations with their own comments;
- using interactive "You be the Midwife" situated learning scenarios; and
- using the many interactive labelling activities (see figure 3) allow the student to learn, practise and self assess their basic knowledge of anatomy and physiology.

Students commented:

> The ability to repeat assessment provides a great learning experience. (S)
> Empowered with this knowledge they [students] come prepared for clinical teaching sessions about how to palpate a woman's pregnant abdomen and record their findings with appropriate language. (E)

Multimedia

The CDROMs contain a very large number of colour images, photos and diagrams which would be prohibitively expensive in a paper based format. When asked what was the best feature of the CDROM two students answered: "The graphics" and "Pictures!". Another commented:

> Visualisation is the most appropriate way to learn from my own experience of learning. (S)

Some of the diagrams and animations on the CDROM represent processes which are not normally visible (see figure 4) such as:

> the internal rotation of the foetus on the pelvic floor ...[and] they can clearly identify the most favourable position for birth .... (E)

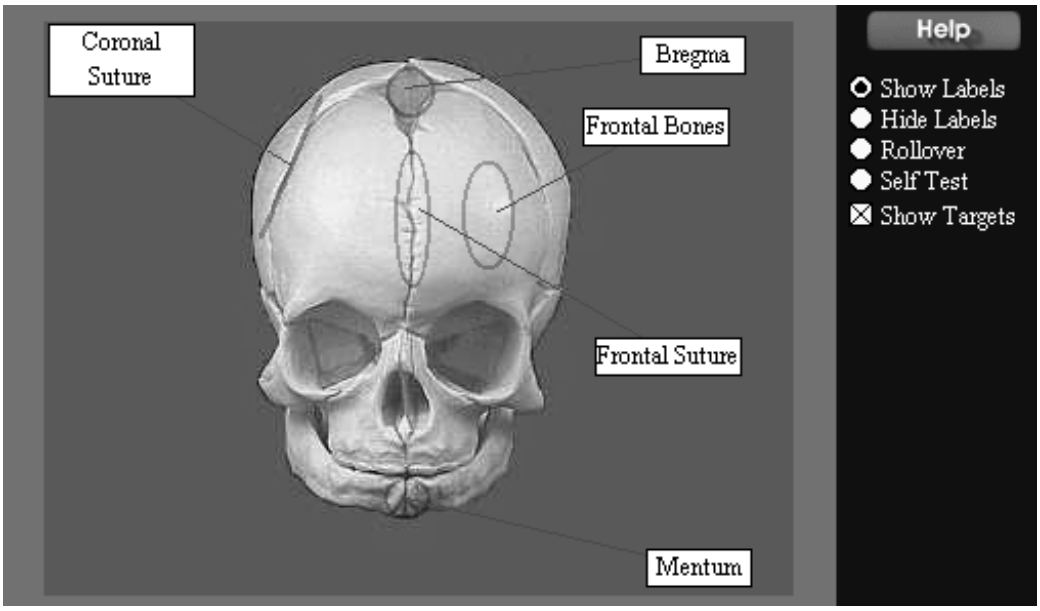

Figure 3: The Interactive Labels COOL Tool allowing students to interact with labelled diagrams to show, hide, explore and do a self test.

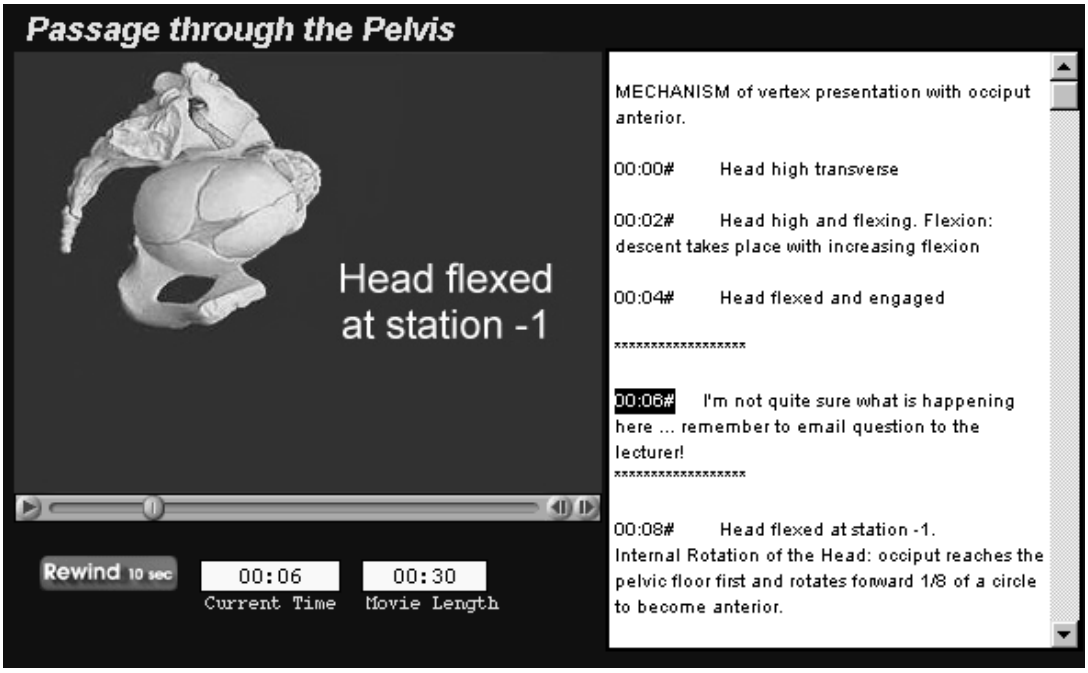

Figure 4: Animation showing the head passing through the pelvis. The synchronised text on the side can be edited by the student and shows student generated notes.

The CDROMs contain a large number of stories in which women and midwives tell of their own experiences and feelings. The user is able to use a controller to stop, start and replay these stories and most are accompanied by photos of the speaker and other relevant images. Kozma (1991) suggest that characteristics of different media types (images, audio, video, text) can either enhance or detract from the effectiveness of a desired message. The CDROMs contain several examples (see figure 4) where the following features of different media elements are used synergisticaly to achieve a desired result:

- video: to represent dynamic events;
- text: to provide supporting and supplementary information and allow student annotation; and
- voice: to convey emotions and the "realness" of the situation.

Listening to the stories or looking at people using these CDROMs supports the synergistic value of using multiple media types. When asked what was the best feature of the CDs some students commented:

> Ability to vary mode of information — tapes, audio, visual, reading, stop and read other readings. (S)
>
> The combination of listening and reading. (S)
>
> Multimedia! It is good to hear and see people on the CDROM. (S)
>
> I found that the combination of listening and reading was a successful part of learning for these units compared to the dominant reading units. (S)
>
> She loved the interviews with the women because it gave her an insight as to how they thought. (E quoting a S)

While the initial purpose of the audio and video interviews was to provide authentic clinical situations upon which to base situated student learning, a lecturer and student commented that they would also be "enlightening" to practising clinicians because:

> ... there is not very much time for that kind of exploration in a clinical field, where they are running on skeleton staff ... There is no time to sit back and talk to a woman and explore how she felt about an incident. ... These CDs could be produced in bulk [and located] in hospitals so that if people have time they can go to the library and share that knowledge as well. (E)

Even though some of the emergency experiences are relatively rare, the midwife has to be able to respond appropriately and if there is no preparation this places huge strain on the practitioner.

> You can wait five years in a clinical field and not see it ... [and even if it does occur] everyone is so shell shocked that it is never discussed (E)

Navigation and disorientation

Another core advantage of the web environment is the provision of links. In addition to the navigation links there are a large number of thematic links between related pieces of information and links to external web sites.

The opportunity for students to further investigate was ... prompted by the materials (and the hyperlinks) (sic) on the CDROM. (S)

Another student commented that the best feature of the CDROM was "hyperlinks to follow up information." Of course, the flip side of providing the user with finger tip access to a vast amount of multimedia information is that the user can sometimes become lost or disorientated. Two students commented thus:

> So much information ... [I was] worried I would miss things. (E)

> Sometimes I got very distracted from my actual study and [got] lost exploring. (E)

Being distracted or lost is both a feature of the environment as well as a feature of the user and their ability to strategically navigation through the package. It is also related to the level of experience with such environments and the very low prior computer experience may explain why several students commented that while they were initially disorientated this was no longer a problem.

Not after I worked out how to use it however in the initial stages ... it was very distracting. (S)

The CD was confusing at first but was easy to "cotton onto". (S)

Because disorientation or "lost in hyperspace" (Conklin, 1987) is one of the most common problems of large IMM systems, we designed many features into the interface (see figure 2) to assist the user to know where they were, and how to get to related information. The questionnaire showed that most students used these devices and found them useful (see Table 1). Surprisingly few students said that they used the browser's history list or bookmarks to revisit previously visited locations.

Table 1: Navigational features of the CDROM showing the number of people who used the feature and their rating of its usefulness (on a 5 point scale from "not useful" to "very useful")

Feature	# who used this feature	# who said feature was either "useful" or "very useful"
left hand menu	8 of 9	8 of 9
Table of Contents	8 of 9	7 of 9
navigation buttons	9 of 9	9 of 9
embedded hyperlinks in the materials	8 of 9	8 of 9
the browser's history list	2 of 9	2 of 9

Situated learning: you be the midwife

The "You be the Midwife" scenarios (see figure 5) have gone through several redesigns since November 1998 and involve students doing the following types of activities:

- view a video e.g. a home interview between a pregnant woman and a midwife;
- analyse and annotate the video by identifying the discussed issues and typing these into a synchronised analysis window;
- explore these issues by examining the foundation knowledge within the unit;
- examine an expert's identification of issues;
- adopt the role of the midwife in the specific situation and respond to these issues within the context of the interview and the unit; and
- reorder clinical actions in response to changing physiological data within a timed activity.

Some of these student responses are emailed to the lecturer before the student is shown an immediate, expert response.

These activities are also "situated" within the remote student's workplace and social context (contact with workplace based mentors and electronic contact with the lecturer) and are undertaken over a period of several months.

In addition to interacting with content, the CDROM and Internet environment contain features which encourage students to interact with the lecturer and other students e.g. links to the unit's USQconnect study desk (USQ: USQconnect, 1999) as well as the unit newsgroups. The lecturer posts a question to the online discussion group about once a week and she commented "I have been very pleased with the quality of the online discussion." Students commented:

> Emailing is quicker and easier then posting. (S)
> The discussion group is great. (S)

Software installation and getting started

Issues related to software installation proved to be more difficult than anticipated and this may have been exacerbated by the fact that only 1 of 9 students had ever used the Internet or a computer CDROM. To successfully use the CDROM a student needed to install the following supplied software: Netscape Navigator, ShockWave and QuickTime plug-ins and several support files required by ShockWave. Students commented that the installation process was difficult:

> It was very frustrating when it took so long to get the CD working properly. It was very time consuming
>
> I lost 5 kg in first week due to the stress of the computer setup.

Figure 5: Example of a "You be the Midwife" emergency scenario showing some of the stages. Clockwise from topleft: the trigger situation, reordering clinical actions, feedback video and response which is emailed to the lecturer.

We responded to these issues and by the next semester provided a far easier installation process as evidenced by:

By 67573 I had got it all working and this unit was little trouble.
The last CDROM ...did the installation for me. ... it is improving.

Conclusions

To some degree the technologies of CDROM, Internet, ILS-ML and COOL Tools are disappearing or are being "interiorised" for both the lecturer and the students. As this occurs it allows them to devote more of their cognitive and emotional energies to the educational task of developing competent and independent midwifery practise.

Impacts which we have seen include:

- selection of an appropriate development methodology can allow collaborative and iterative development involving lecturers, IMM developers and media specialists;
- despite very low levels of computer experience students can effectively learn from a well structured computer CDROM;
- the CDROM can allow students to learn at their own pace and in a place and time that suits themselves;
- high levels of user control and interaction adds to the students experience;
- carefully mixing different media types (e.g. audio, video, drawings, images and text) enhances student interest and communicative power;
- thematic links throughout the content can encourage student exploration;
- disorientation can be reduced through careful interface design;
- online communication students is a valuable addition to the educational environment; and
- careful selection of a development methodology can significantly facilitate future redevelopment.

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- other people involved in the project.

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