

Chapter 5

Research results

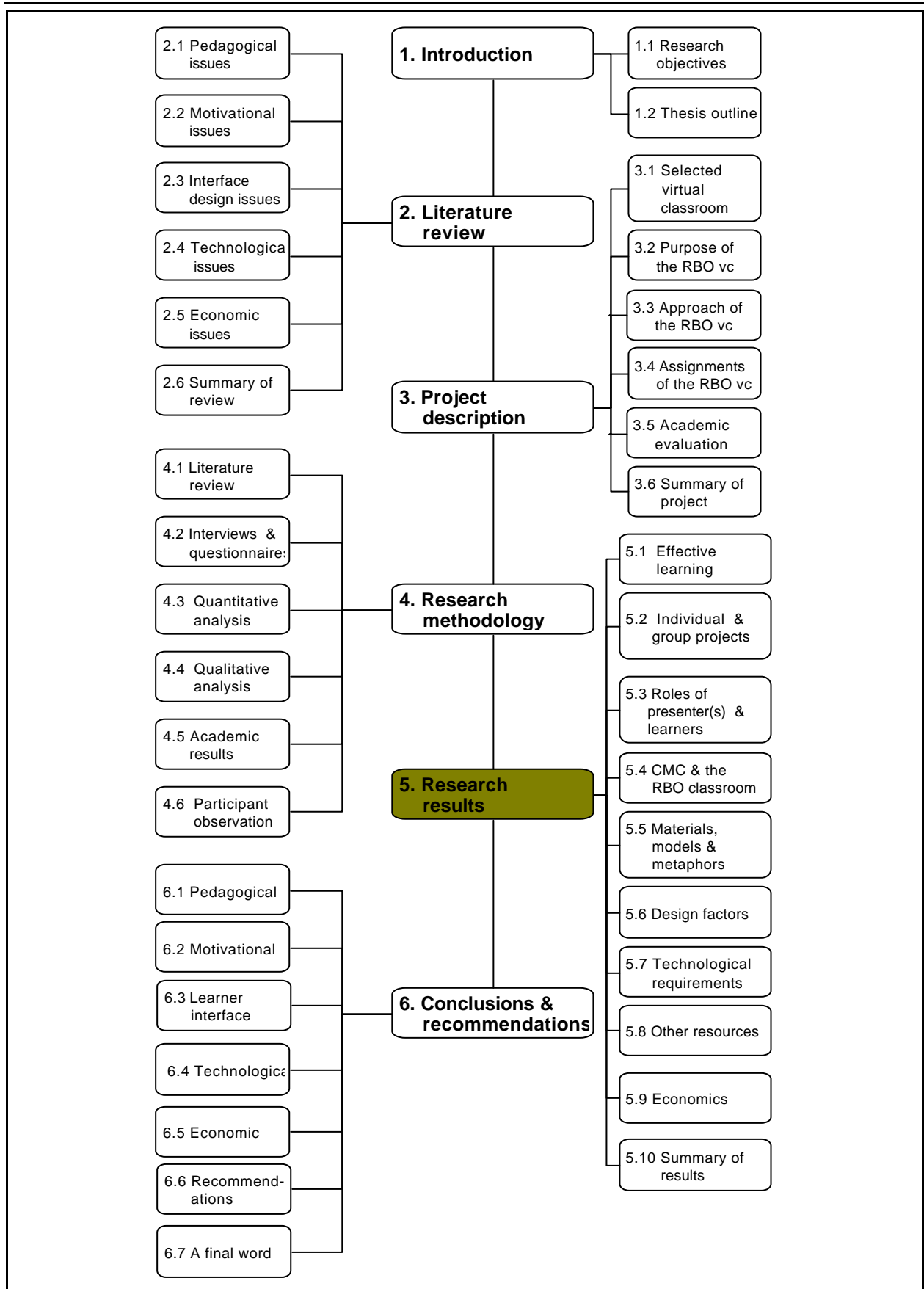
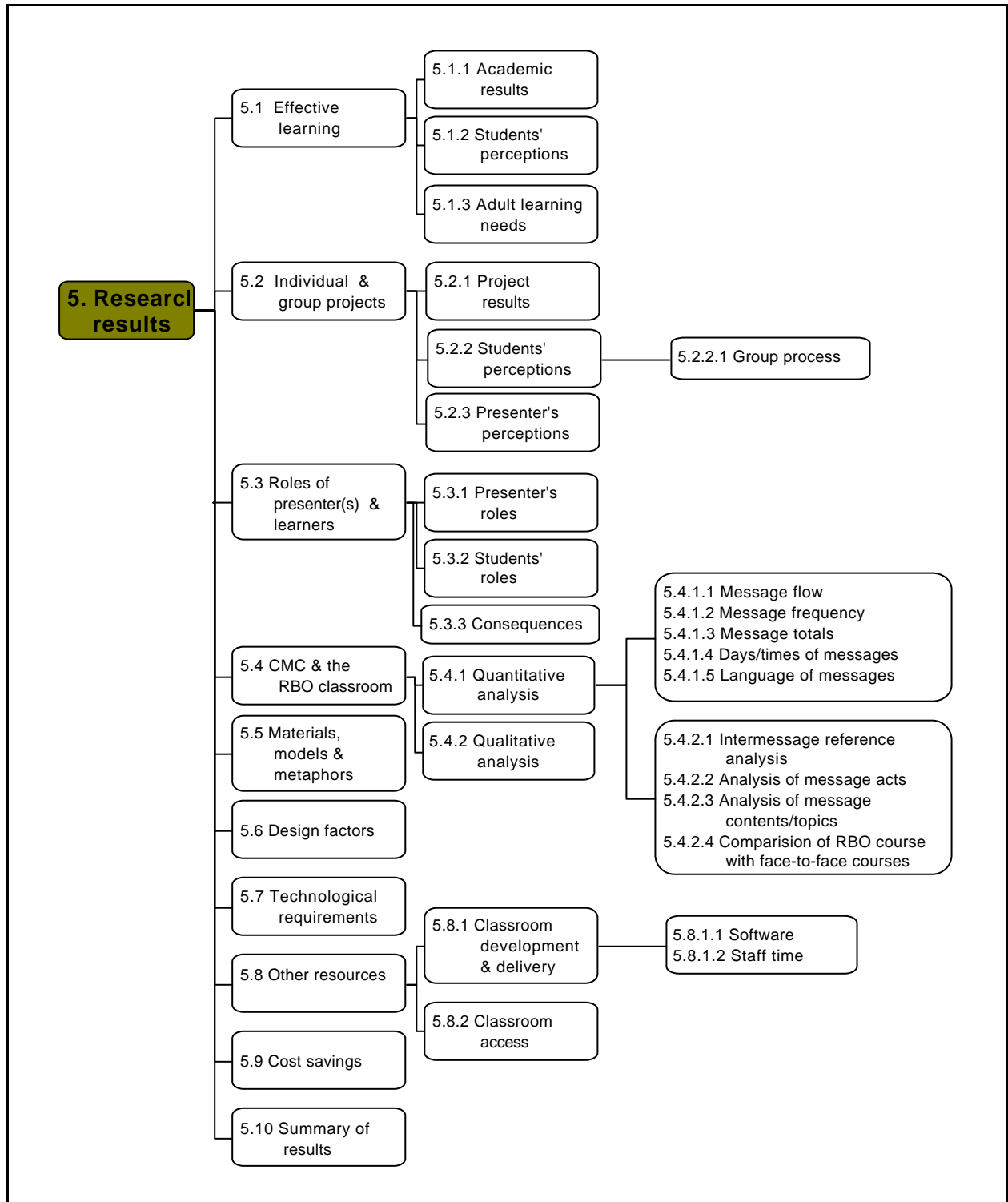


Figure 5.1 Outline of Chapter 5



The research results outlined in this chapter are presented in the order that they appear in the matrix of research questions and methods (Table 4.1, page 48) and as presented in the chapter outline above. Illustrative quotations in this chapter are taken verbatim from the responses to email questionnaires and on-line interviews.

5.1 To what extent can a Web and email delivered course adequately facilitate and enhance learning?

This section presents the course results and perceptions of participants on factors that enhanced or hindered their learning.

5.1.1 Academic results

Academic results of the ten students who completed the course were considered to be of a high standard. The results are summarised in Table 5.1.

Table 5.1 Summary of RBO course results

N	Mean	Median	S.D.	Minimum	Maximum
10	71.1	74.0	9.9	50.0	84.0

A factor that distinguished between the results of the top five students and the remaining five was their degree of Internet literacy prior to the course. The five students who met all the course pre-requisites on previous exposure to the Internet and familiarity with the software, obtained higher results than the remaining students. Table 5.2 indicates that there was no overlap in the results of these two sub-groups.

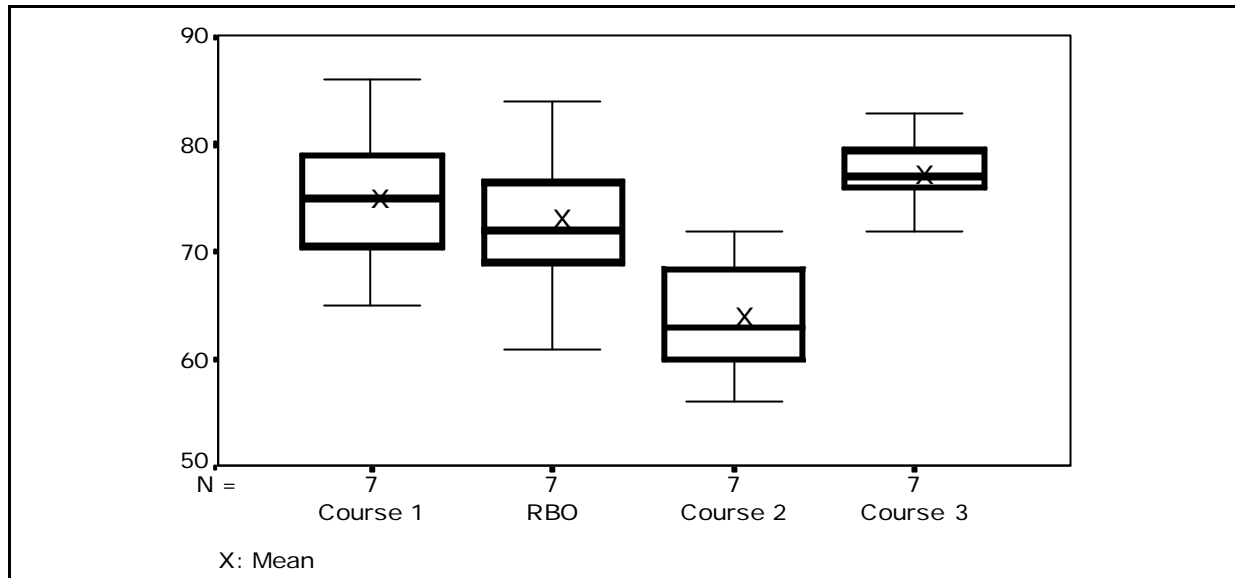
Table 5.2 Course results of students with initial Internet literacy vs. those without initial Internet literacy

Group	N	Mean	Minimum	Maximum
Met course pre-requisites	5	78.0	76.0	84.0
Did not meet course pre-requisites	5	64.4	50.0	72.0

To compare the RBO course results with results for face-to-face courses, the results of the seven students in their second year of M. Ed. study were compared with their results for three completed course modules given by the same course presenter. Figure 5.2 illustrates the overlap between the distribution of the RBO course results with those of the other courses. Although the mean (marked on the graph with X) and median (represented by the horizontal line through the box) were below those of two of the other courses, for four of the seven students the

RBO mark was their best or second best mark of the four courses. Overall these results indicate that the RBO results were comparable with those of the face-to-face courses.

Figure 5.2 Box-plot of distribution of four course results of M. Ed. students



Although the sample is too small for any generalisation to be made, it could be argued that these findings support the contention that the medium does not influence learning (Clark, 1994). The next section includes aspects which students considered *were* favourably influenced by the course approach.

5.1.2 Students' perceptions of their course results and learning

*I learnt 200% more than from other courses
And probably put in much more as well.*
RBO Student

Of the ten students who completed the course, eight responded to questions concerning their perceptions of their results and learning. There were also responses from two students who had dropped out in the early stages of the course because of critical problems with Internet Service Providers (ISPs) in their home regions.

Students who completed the course considered that marks a fair reflection of their knowledge and abilities. Despite the possibility that the media did not influence learning there were other aspects which students thought were favourably influenced: most students ranked the course as first or second when asked how much it provoked their interest compared to other M. Ed. modules.

Whether the RBO results were among their best results or not, and whether the students completed the course or not, they all expressed enthusiasm about how much they had learnt and benefited from the course, its approach and methodology.

Student expectations of what they would gain from the course included the development of their knowledge and capabilities related to on-line learning. They hoped to learn how to design and develop on-line learning environments and scenarios and also to gain insight into possible pitfalls. After the course students reported that they had fulfilled these expectations. They referred to considerable academic, technical and social learning gains as a result of the on-line course.

Specific positive aspects that were referred to by students included:

- ❑ Contact through the email list resulted in more contact with the course presenter and other students than might have been possible in a face-to-face contact course (four students).
- ❑ Comments, feedback and moral support from others via the email list were invaluable and served as useful 'scaffolding' for new learning (three students).
- ❑ Attending the virtual classroom proved cheaper than travelling to attend a physical classroom at the learning centre (three students).
- ❑ The virtual classroom provided regular access to those with similar interests (two students).

The students mentioned the following negative aspects regarding the course delivery method:

- ❑ Unreliable, unstable email and Internet links caused frustration (seven students).
- ❑ The absence of an initial face-to-face introductory class increased the learning curve for some (six students).
- ❑ The lack of pre-requisite exposure to and familiarity with email, Internet and the Web slowed down progress (five students).
- ❑ Inadequate hardware specifications prevented optimal performance of software (four students).
- ❑ Organisational 'firewalls' and policies hindered access to on-line material and communication (two students).
- ❑ Unstable freeware and shareware software programs led to frustration (two students).

- ❑ Inadequate help from the university network supervisor caused frustration (two students).
- ❑ The Internet link from home incurred costs (one student).
- ❑ The lack of some form of synchronous communication e.g. Inter Relay Chat (IRC) was felt (one student).

Many of the problems experienced were related to technical issues outside of student control. For those who continued the course, these issues did not diminish their positive response to the classroom approach and methodology. The positive responses on the overall quality of the learning experience and improved access to the lecturer and other learners, confirm the findings of Hiltz and Wellman (1997) and Laurillard (1996).

5.1.3 To what extent can a Web and email delivered course meet the needs of adult learners?

The success of the RBO virtual classroom outshone my expectations.

RBO course presenter

The course presenter found that the constructivist design of the course, including the assignments and the longer-term (two-month) examination project, enabled the RBO on-line course to meet a number of the adult learning needs listed in Chapter 2 (page 10), and italicised in the discussion below. In addition, students reported that the nature and methodology of the course contributed to their intrinsic motivation to progress.

The assignments required that students carry out tasks and activities in order to meet broadly defined course *objectives*. This gave students considerable *choice* and *flexibility* as to the specifics and details of the methods and materials that they used to meet the prescribed goals. Students designed and implemented individual contributions (the Web-based desks) as well as *collaborative* posters that continued the construction of the virtual classroom. In the process they became *active* learners, motivated to acquire the necessary *skills* to achieve the course objectives.

The two-month examination project provided the opportunity for students to *apply the new knowledge* they had acquired through the assignments in immediate and practical ways. Each learner identified a *relevant* problem to work on that could have *real-life application* in his or her work situation. During the two months they then monitored or solved and reported on the problem. This process enabled students to identify the *value* of their learning for themselves. Accordingly they invested considerable time and energy in the tasks, as reflected in the results

presented in the next section. At the same time, the design of the assignments incorporated the adult learner's need for *problem-centered* and *solution driven* learning.

The email communication and collaboration that supplemented the course provided the necessary *feedback* from peers and course presenter and facilitated on-line *rapport, social and cognitive interaction*. Various factors combined to provide *diverse learning scenarios* including the provision of *tutorials* via the Roadmap96 on-line lectures, *consultation with experts* on the ITForum email conference list and the course presenter, and *group activities and participation* for implementation of the group projects.

As not all students had met the course prerequisites, they did not all meet the course objectives to the same extent. The course presenter concluded that in future courses adult learners would benefit more if provided with diverse course entry points coupled with evaluation of individual progress rather than assessment of assignment products only.

5.2 To what extent can a Web and email delivered course facilitate individual and collaborative projects?

The success of individual and collaborative projects was assessed in terms of project results and the perceptions of course participants.

5.2.1 Course project results

Table 5.3 presents a summary of the results for individual and group projects.

Table 5.3 Individual and group project results

Project	Mean	Median	Minimum	Maximum
Group project	78.3	75.0	70.0	90.0
Longer project (individual)	74.8	76.0	52.0	90.0
Contribution to discussion (individual)	68.8	75.0	50.0	90.0
Individual desk project	67.2	75.0	50.0	80.0

The results in Table 5.3 indicate a high level of achievement in all projects with higher marks overall for the group projects. This suggests that collaborative projects can be as successfully implemented as individual projects in a Web and email delivered course.

After the course presenter described the RBO virtual classroom and projects on the ITForum listserver of international professionals in instructional technology, visitors to the web-site gave positive feedback concerning the classroom and its projects. The reception of the group project web-site, "Who's Who in IT" (Viljoen, 1997), was so favourable that it is now a permanently maintained resource linked to the ITForum web-site as a useful and comprehensive listing of professionals in the field. This site was awarded the InTRO (Instructional Technology Research On-line) award for Best Instructional Technology Web-site 1997-1998.

5.2.2 Students' perceptions of group work in the RBO virtual classroom

*In groupwork process, not product, is the key. But it is
overwhelming when various processes get out of sync.*
RBO student

5.2.2.1 Group process

Five groups of three students were originally planned for the collaborative projects, one student having dropped out almost as soon as the course began. When a further five students dropped out of the course, one of the remaining groups was reconstituted, and three collaborative group projects were completed.

Students were initially divided into matrices of 'expert' and 'home' groups with the intention that they would work according to a 'jigsaw' method (Aronson, Blaney, Stephan, Sikes and Snapp, 1978; cited in Slavin, 1991). 'Experts' could collaborate and take what they had learnt back to their respective 'home' groups, with two home groups per project able to collaborate across groups.

Initially only one of the groups comprised group members who knew one another from the same M. Ed. year. In each of the other groups two of three members knew each other. After another student left one group was reconstituted to include three students from the same M. Ed. class. Each group included at least one member who lived approximately 700 km from the others and the learning centre.

The initial roles allocated to each group's members by the course presenter are summarised in Table 5.4.

Table 5.4 Roles allocated to group members for collaborative projects

Role	Tasks
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Designer	Manage work distribution among group members; design web-site.
Surfer	Search and collect information
Author	Author the group project's web-site and transfer the files to the server.

The reduced student numbers after six students dropped out of the course meant that only three projects, with no duplication, were completed. Members of all three groups, independently of the course presenter, implemented more flexible role allocation for the following reasons:

- ❑ distances coupled with tight deadlines required more sharing of roles,
- ❑ when a group member dropped out re-distribution of work was required, and
- ❑ uneven distribution of expertise and facilities required re-distribution of work.

As a result of role re-allocation and regrouping, the 'jigsaw' method of groupwork, where 'experts' collaborate, fell away. Nevertheless there was considerable collaboration among all members of the different groups through the classroom email list.

Factors that members of the group project teams considered contributed positively to the collaborative work are listed in Table 5.6 overleaf.

Table 5.5 Positive factors that contributed to collaborative work

Factors	Description
Prior learning	Students drew on what they had already learnt from the theory of group processes and collaborative group work as well as their experience of group work in other modules.
Prior relationship with group members	Where students already knew one another they could fill in body language gaps that do not feature in email communication.
Team spirit	One group focused on positive encouragement in all email to facilitate trust and team spirit. All students retained their sense of humour when they faced difficulties.
Access to completed projects	Students were inspired and motivated by seeing completed projects of other groups.
Role flexibility	There was flexibility with respect to group roles and close consultation on ideas and decisions.

In addition to learning the required theory, skills and expertise required for completion of the group projects, members of the groups reported that they advanced their learning of group process, particularly as it relates to interpersonal electronic communication.

Factors referred to by members of the groups that were potentially counter-productive to group work are presented in Table 5.6.

Table 5.6 Factors that were counterproductive to group work

Factor	Description
Time constraints	Full-time employment and busy work schedules conflicted with tight project deadlines; Delays resulted as students with intermittent email access took longer to communicate with group members; Deadlines meant limited time to search for additional on-line resources.
Technical constraints	Delays were caused when: <input type="checkbox"/> the university Web server went down; <input type="checkbox"/> the server operating system was changed without warning. Intermittent email and web access resulted in uneven distribution of work among group members.
Team membership	Work allocation problems occurred when: <input type="checkbox"/> group members dropped out of the course; <input type="checkbox"/> the group had to accommodate members who had not met course prerequisites.
Safety factors	Some students were concerned about their safety at workplaces after hours.

Most group members reported that the tight deadline for the group work was unrealistic: only one group met the initial deadline and believed that they had sacrificed quality of work to do so. A further consequence of the tight schedule was that two of the groups decided to supplement email communication with local and long distance telephone calls.

One group made four telephone calls when the deadline made it impossible to wait until all group members could access their email when next at work. A second group made three calls as one member could only access email twice a week while another experienced email access difficulties because of the limitations of the available hardware and software configurations.

In the remaining group one group member had problems with email access throughout the duration of the group project. Another member dropped out before contributing to the group process, later to be replaced at the time of the deadline with a group member who initially experienced email and web access difficulties because of his company's 'firewall'.

5.2.3 Course presenter's perceptions of RBO group work

*I share their joy as they discover that they can do it
for themselves.*

RBO course presenter

In retrospect the course presenter felt that a most important factor which contributed to the success of the group projects, despite the above-mentioned difficulties reported by students, was the students' prior exposure to the theory and practice of collaborative work in previous study modules. This gave students a sound basis on which to build, and seemed to have helped them adapt and cope when group members dropped out or when extended deadlines conflicted with other study commitments.

The initial deadlines had underestimated the challenges of collaborative work for students working in their own space, at a distance from one another and according to their own schedules. The pace at which they could work was also controlled by the demands of a job, other studies, family commitments and variable network links. Once extensions were granted all other deadlines were shifted accordingly. Other course modules then overlapped with the extended duration of the group projects. To some extent this added to deadline difficulties, as many students were away from their computers and Internet links while attending other M. Ed. modules that took place in Pretoria.

Collaborative work was also negatively affected if not all group members had met the course pre-requisites. Initial deadlines meant that other group members had to carry the load if there was insufficient time for students to make good their deficits.

In the RBO on-line course the group projects contributed to the successful on-going construction of the virtual classroom. Nevertheless the considerable challenge of geographically dispersed students collaborating via email is better addressed when group members have met the course pre-requisites and have a sound background in collaborative group work. Flexibility of deadlines and allowing group members autonomy to adapt the work and its execution according to their circumstances, also contributed to the success of the group work.

5.3 How does this delivery method affect the roles of course presenter(s) and learners?

*His open democratic approach gave us as learners
a sense of ownership of our classroom.*

RBO student

I liked what happened in the class when I hung back.

RBO course presenter

The underlying constructivist philosophy of the on-line course meant that the roles of participants were different from the more traditional situation with lecturer as deliverer of instruction and students as passive recipients.

To assess the role of the course presenter, the strategic model of Ryba and Anderson (1990) for the teacher's role in teaching with computers was adapted. The essential roles they envisage include those listed below:

- ❑ planner,
- ❑ manager,
- ❑ guide,
- ❑ facilitator,
- ❑ model, and
- ❑ participant.

The roles taken by students were also assessed against this same strategic model of roles. The motivation was that on-line courses can provide the opportunity for a variety of communication types including one-to-one, one-to-many, many-to-one and many-to-many. Lewis and Hedegaard (1993, p.69) suggest that this can facilitate a 'democratic element' that

provides students with an equal chance to contribute independent of inhibiting status and role differences.

Table 5.7 presents a summary of a description of roles with check marks to indicate if the course presenter and students manifested these roles in the RBO classroom. This information was extracted from the email communication and the responses to interviews. From the table it is evident that the course facilitated the adoption of the same rich diversity of roles by the course presenter and the students.

Table 5.7 Roles taken by course presenter and students in the RBO classroom

Role	Nature of the role	Course presenter	Students
Planner	Establish goals Deadlines Evaluate	✓ ✓ ✓	✓ ✓ ✓
Manager	Provide resources Monitor progress	✓ ✓	✓ ✓
Guide	Help Question Co-ordinate Motivate	✓ ✓ ✓ ✓	✓ ✓ ✓ ✓
Facilitator	Encourage Feedback Support	✓ ✓ ✓	✓ ✓ ✓
Model	Variety of behaviours e.g. Flexibility Confidence Encouragement Sense of humour	✓ ✓ ✓ ✓	✓ ✓ ✓ ✓
Participant	Observer Working alongside others	✓ ✓	✓ ✓

From early on in the course students and course presenter acknowledged the similarity of the roles they were undertaking in the processes of the on-line classroom. In the light-hearted vein that characterised the classroom communication, the course presenter was referred to as "he who gives the marks" (or its acronym HWGTM), in contrast to students who were "they who need the marks". This was in recognition of the one clearly distinguishable feature of their respective roles.

5.3.1 Course presenter's roles in the RBO on-line course

The course presenter designed and made available to learners the initial virtual classroom, a number of on-line resources, the address of an on-line course that provided instruction on the Internet, objectives for the individual and group projects, and a guide to group roles and deadlines. With respect to giving instruction to students on the topic of how learning occurs using the Internet and the Web, the course presenter followed the constructivist model of “without information given” (Perkins, 1991). Rather than providing on-line lectures himself, he provided links and outlined activities. Embedded in meeting the objectives of these activities was the necessity for students to learn a number of skills e.g. how to use search engines, transfer and download files. The activities also gave students exposure to well and poorly designed Web pages which informed the design and development of their own Web pages that were part of the course activities.

A quote from a mailing from the presenter to ITForum early in the course illustrates how he saw his role in this constructivist on-line course:

- a) I develop NO content. I simply point them to resources.*
- b) I provide NO instruction. I monitor their classroom listserver discussion and prod and prompt here and there.*
- c) I set goals and deadlines*
- d) I take flak from frustrated learners*
- e) I share their joy as they discover they can do it for themselves.”*

In addition to enabling students to take on many of the guiding, support and facilitative roles, the course presenter acknowledged that in the constructivist approach it is the instructor who learns most. Thus he also saw himself as participant learner with the on-line course as his sustainable project, similar to the two-month sustainable examination projects that the students designed and implemented on use of the Internet and the Web in learning.

When the course presenter chose to hang back in response to students' messages which asked questions or presented problems, he observed other students respond with successful solutions to one another's problems without his intervention. However, the quotation from the presenter provides an underestimation of his role in the RBO Virtual Classroom.

From the perspective of the observer in the U.K., the course presenter had a strong presence on the email list, particularly during the initial stages of the course when more scaffolding was required as students began work with unfamiliar software and processes. The students felt that the nature of his presence and approach facilitated their learning. Their opinions, extracted from responses to on-line questionnaires, indicate their appreciation that he was:

- ❑ supportive,
- ❑ non-intrusive yet firm,
- ❑ empowering,
- ❑ enthusiastic,
- ❑ inspiring,
- ❑ flexible, and
- ❑ democratic.

5.3.2 Students' roles in the RBO on-line course

Students reported that the flexible and constructivist course approach enabled them to take on diverse roles, as outlined in Table 5.8. The opportunities afforded for students to take on the same diversity of roles as the course presenter together with the presentation of their assignments on the publicly accessible web-site, indicate a democratisation of the learning process. This supports the views of Underwood and Karelse (1996) and Lewis & Hedegaard (1993).

The collaborative approach of the course also encouraged students with more experience and exposure to the Internet and the Web to share their expertise, which was appreciated by the less experienced.

Included among the descriptions students used for the roles of fellow students were those listed below:

- ❑ a useful resource,
- ❑ a mentor, and
- ❑ always available to share their expertise and experience.

Other qualities that students considered helpful in other students included:

- ❑ a sense of humour,
- ❑ supportiveness,
- ❑ motivating encouragement ,
- ❑ solidarity, and
- ❑ 'hand-holding'.

5.3.3 Consequences of flexible roles

The flexible design and implementation of the course enabled students and course presenter to take on the diversity of roles which enhanced the interactive learning processes that occurred in the RBO classroom.

During the course students could choose how to implement the assignments and define the scope of their own projects, both individual and group, provided they met the objectives and used the required tools. When students take more responsibility for the planning and implementation of their learning tasks, this needs to be accompanied by realistic estimations of the limits of what can be achieved within the time frame. The flexibility of the approach of the RBO course resulted in projects which varied qualitatively and quantitatively. The variation was manifested in an overestimation of what was feasible in a two-month project (e.g. the award winning "Who's Who in IT" web-site), and projects that were comparatively thin on content (e.g. "The Web and Guardian - Society and the 'Net"). Most students came to view deadlines as increasingly flexible with the result that the course overshot the original three month duration.

5.4 To what extent can a Web and email delivered course provide adequate and effective communication among learners and between learners and course presenter?

The students were told not to TALK to me about it.

RBO course presenter

To assess the degree of success of communication in the RBO classroom, records of all email messages were collected and analysed. Almost all communication during the on-line course was by email, thus collection of all messages to the list was possible without intrusion on the ongoing communication. This section reports on the quantity and quality of these communications.

5.4.1 Quantitative analysis of communication in the RBO classroom

The email messages that were monitored for this analysis comprised the 462 course related messages that were posted to the list (354) or directly to the course presenter (108). The additional 66 messages, or "corridor whispers" among students not directed through the email list but copied or forwarded to the U.K. observer, were not made available for scrutiny. Thus negotiated confidentiality was not breached. Also not included in this analysis were the limited number of messages sent directly from the course presenter to individual students. The course presenter replied to almost all messages through the email list whether the messages of origin had been sent to him directly or through the list. All messages from the course presenter to the email list were included in the analysis.

5.4.1.1 Message flow in the RBO classroom

Figure 5.3 displays the targets and senders of the total of 462 email messages transmitted during the on-line course, while Figure 5.4 focuses only on the message flow between students and the course presenter.

Figure 5.3 Summary of total message flow during the course

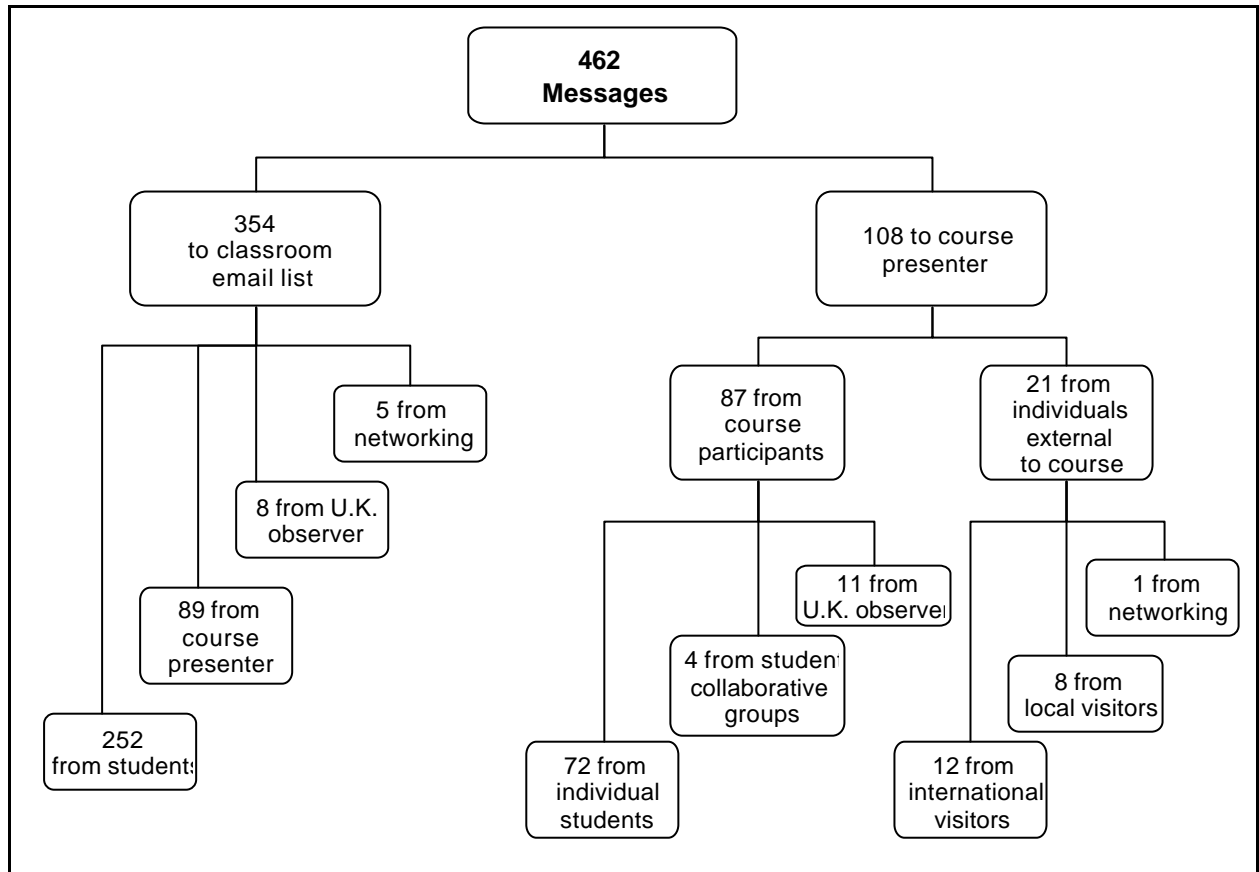
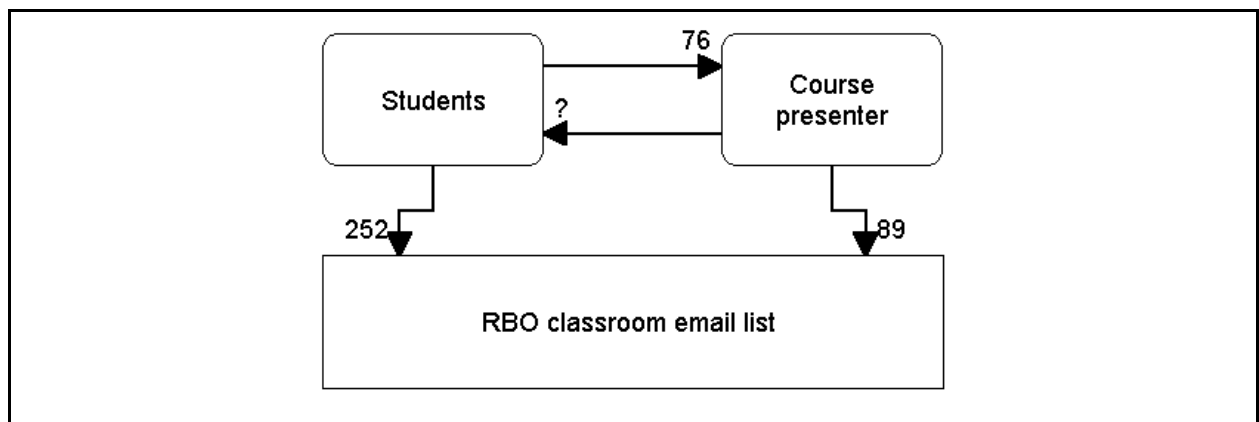


Figure 5.4 Summary of message flow between students and course presenter



Messages from individuals external to the course included those from international visitors who had been informed of the existence of the classroom web-site and/or the *Who's Who in IT* web-site through the ITForum email conference list. Most of these messages included positive comments about the RBO classroom and its projects.

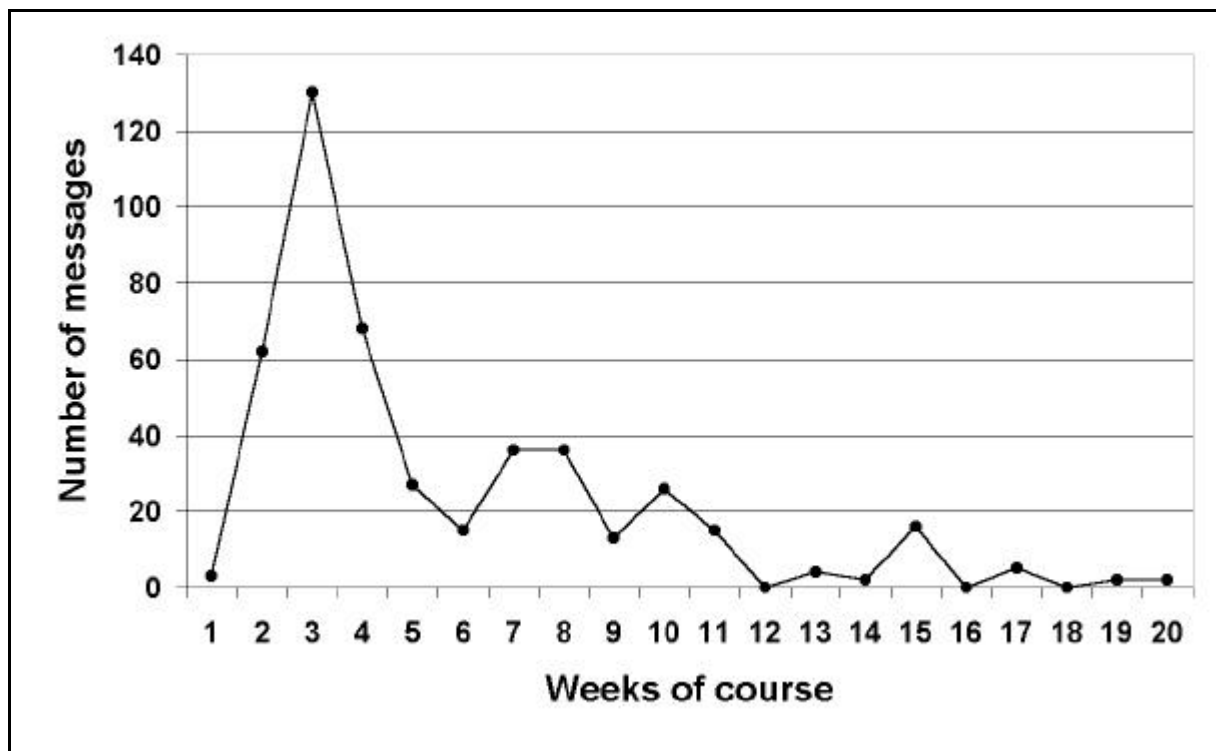
Messages from local visitors to the classroom list included topics considered pertinent to the topic of learning via email and the Internet. Messages from networking personnel were in response to course participants' queries concerning subscription to the email list, logging in to transfer files and problems that arose in accessing the classroom.

Most of the messages between group members of the various group projects took place external to the classroom email list, while copies of four intra-group messages confirming the completion of group projects were forwarded to the course presenter.

5.4.1.2 Frequency of messages in the RBO classroom

Although the course had been planned to run from mid-January to late April, the email list received messages until late May. Final project assessments were carried out thereafter. Figure 5.5 illustrates the flow of messages during each of the resultant twenty weeks.

Figure 5.5 Message flow per week of course



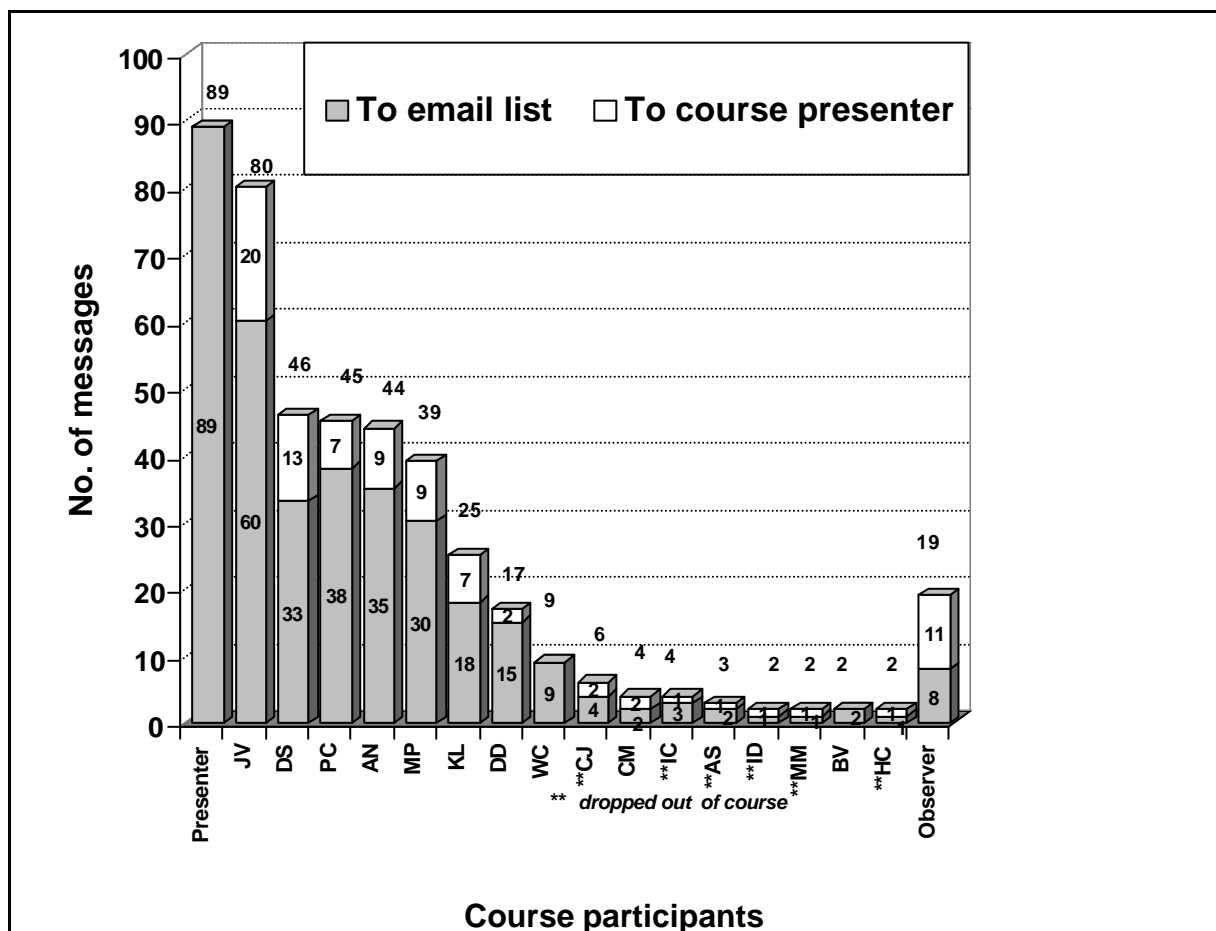
After the initial few days in mid-January during which the course got underway, the highest frequencies of messages were mailed during the next three weeks until mid-February. This trend coincided with the duration and deadlines of the first three course assignments. The frequency of mail slowed down between then and the end of March. A slow trickle of messages continued until the end of May, with a small peak in April which coincided with the initial deadline for the two-month sustainable examination project. During only three weeks were no messages sent at all. One of these weeks coincided with the Easter public holidays in South Africa.

5.4.1.3 Message totals sent by participants of the RBO classroom

Figure 5.6 presents the number of messages that were sent by students (referred to by initials), the course presenter and the U.K. observer. The graph gives an indication of the proportion of messages sent to the email list compared with those sent directly to the course presenter.

Asterisks (**) indicate students who left the course during its early stages.

Figure 5.6 Distribution of messages from participants to list and course presenter



From the graph in Figure 5.6, it is evident that students addressed one another through the classroom email list considerably more frequently than they approached the course presenter directly. Two students sent messages exclusively to the list.

Part of the course assessment of students was related to their level of contribution to discussion on the email list. However, the diversity of messages together with the open, frank and informal nature of the communication suggests that, with the exception of students who had intermittent access to their email, students used the email list for classroom discussion in the same way discussion occurs in a physical classroom and its corridors. More discussion on this topic can be found later in this chapter in the section on the analysis of message acts and contents.

5.4.1.4 Days and times of communication in the RBO classroom

One of the perceived advantages of a virtual classroom is that it is open seven days a week. This was borne out by the distribution of messages to the classroom email list by days of the week, illustrated in Figure 5.7. Although the majority of participants had their email links at their respective places of employment, messages were also posted on weekends. Message frequencies tended to peak around the beginning of the week, often related to questions and comments arising from weekend work.

Figure 5.7 Distribution of email messages by days of the week

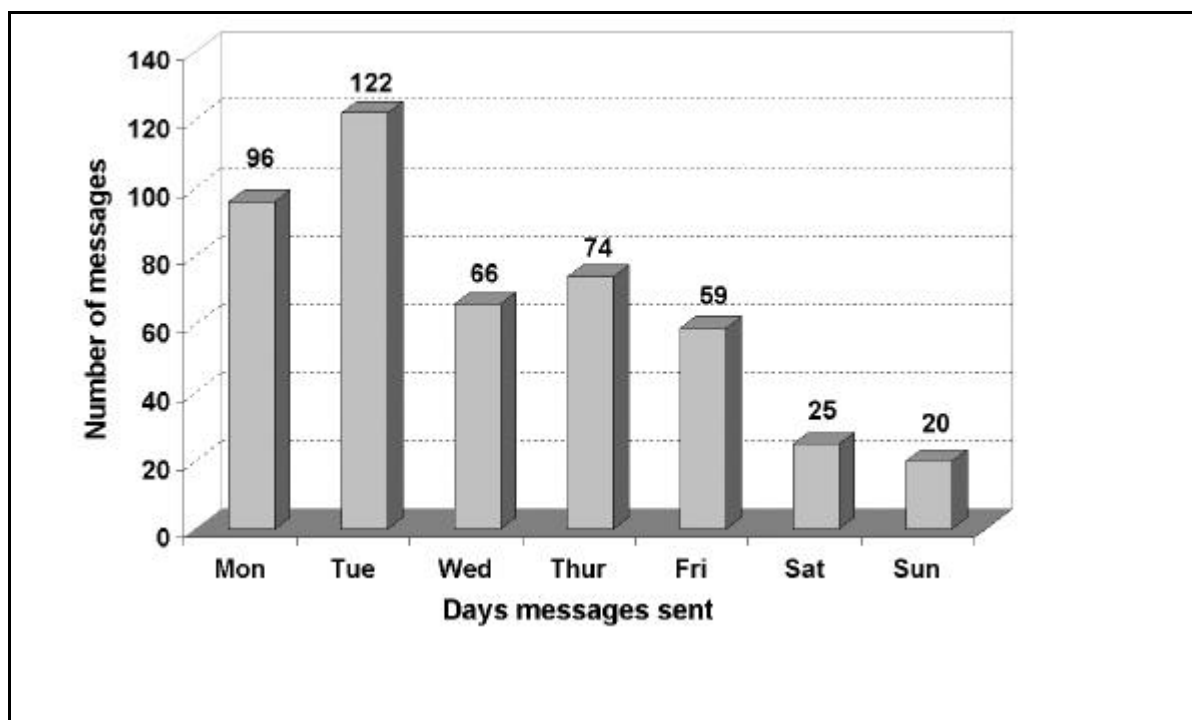
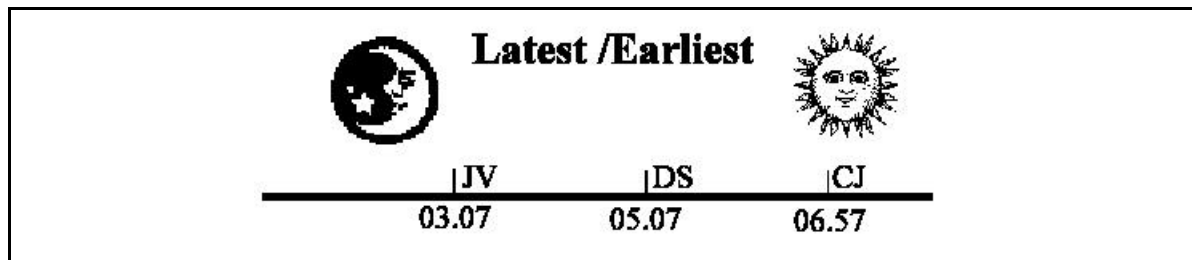


Figure 5.7 confirms that virtual classrooms can facilitate work according to learners' own time frames. Assuming the correctness of the computer clocks on all servers involved in message

transmission and receipt, indications were that post-midnight and the early hours of the morning were not unusual times for messages to be sent. This was confirmed in other communication with students.

Figure 5.8 presents a graphic of the most extreme times recorded for message transmission to the classroom list.

Figure 5.8 Extreme times of email message transmission during the course



Only two of the classroom participants who sent messages at the monitored extreme times illustrated in Figure 5.8 had email links from their homes. Those with links at places of employment worked outside normal hours, either in the evening or early morning. They often returned to work at weekends in order to work on the projects. In this way students of the classroom were able to schedule their studies according to their own individual timetables.

5.4.1.5 Language of communication in the RBO classroom

Students in the RBO classroom were permitted to communicate in either English or Afrikaans. Of the sixteen students originally enrolled, eleven used both languages while five wrote in English only. The course presenter communicated in both languages and all other messages were in English only. Table 5.8 presents a summary of the messages totals in each language.

Table 5.8 Language distribution in the messages of the RBO classroom

Language	Students	Course presenter	Other	Total	%
Afrikaans	78	5	0	83	18
English	250	84	45	379	82
Total	328	89	45	462	100

As students of the course are expected to be able to understand both English and Afrikaans, no difficulties were experienced with the dual language medium. Only the U.K. observer required the course presenter to translate some student messages.

5.4.2 Qualitative analysis of communication in the RBO classroom

Qualitative approaches to assess the nature of communications focused on an analysis of content or topic(s) and the level of interactivity of the subset of 417 messages exchanged among the students and the course presenter of the classroom (see Figure 5.4). The results that follow are derived from adaptations of *inter-message reference analysis* and *message act analysis* (Levin, Haesun and Riel, 1990).

5.4.2.1 Intermessage reference analysis

Table 5.9 details how 95 (22.8%) of the 417 messages were referenced by 255 (61.2%) other messages. The total number of messages not referenced at all was 67 (16%).

Table 5.9 Frequency of referencing of messages by other messages

Number of messages referenced	Number of references	% of messages
1	16	0.2
3	13	0.7
3	10	0.7
2	6	0.5
4	5	1.0
4	4	1.0
11	3	2.6
22	2	5.3
45	1	10.8
Total: 95	Total: 255	22.8
67	0	16.0

The figures in Table 5.9 indicate that many messages were in response to other messages mailed to the list. This confirms the interactivity and responsiveness of the email communication.

In order to establish the type of messages referenced, the topics of the messages referenced ten or more times (detailed in the first three rows of Table 5.9), were further explored.

The message referenced the most (with 16 follow-up messages) was posted by the course presenter in response to a suggestion from the U.K. observer that student 'corridor whispers' were indicating that the workload was too onerous for the deadlines. The students were not party to that communication between the U.K. observer and the course presenter. The course presenter's next message to the email list informed students that the deadline for the group project (Assignment 3) would be extended and that the virtual desktops (Assignment 2) could be developed as the course progressed. In the same message he communicated his differing opinion that the work given out was too onerous and provided a list of many more complex tasks that could have been included in the course.

The responses from students to this message were varied and included digressions from the original topic. The inclusion of more than one idea or topic in these messages confirms the 'multi-threaded' nature of email communication referred to earlier as well as the phenomenon of thread 'drift'.

The following student responses, with the totals of messages, were in reference to the course presenter's message:

- ❑ Acknowledgement/appreciation for the extended deadlines and related discussion (5).
- ❑ Queries whether extending deadlines was fair to students who kept to deadlines (2).
- ❑ Queries on detail around a forthcoming project (2).
- ❑ Light-hearted responses concerning possible additional tasks that could have been included, which led to further light-hearted comments (4).
- ❑ Digression to a thread on the latest anonymous graffiti that appeared on the classroom's virtual blackboard and conclusions about the perpetrator from evidence presented in one of the messages in this thread (3).

Three messages that were the next most referenced, with thirteen responses each, were on the following topics:

- ❑ A suggestion from a student concerning file-naming conventions so that students did not inadvertently overwrite one another's project files when transferring files to the classroom web-site.
- ❑ A direct request for help from a student on getting started with an individual project.
- ❑ A posting from the course presenter concerning a project done by a group in the previous year's class. The message was perceived by the students as unflattering to

the group concerned. The ensuing discussion focused on how criteria change over time.

Three messages that were each referenced by ten messages were on the following topics:

- ❑ An observation by a student on the extreme times that students were sending email messages.
- ❑ A question from a student concerning the difference between the file extension .htm and .html.
- ❑ A request from the “Who’s Who in IT” student project leader for suggestions on how to compile an appropriate list of professionals in the field of instructional technology.

Of the seven messages most referenced by other messages in the classroom’s email communication, two messages were initiated by the course presenter while the remaining five were initiated by students. This confirms the trend observed in the email communication that there was considerable interaction among students who were as likely to respond to messages from fellow students as they would to those from the course presenter. It also illustrates the capacity of on-line courses to facilitate an equal chance for students to contribute to communication independent of inhibiting status and role differences, as reported by Lewis and Hedegaard (1993).

Earlier in the course the U.K. observer had commented on the strong presence that the course presenter maintained in the classroom. Overall the course presenter posted a little more than 19% of the total messages sent to the email list. However, more than half of his messages were in the first two weeks of the course when course and learning management matters were high on the agenda and he needed to provide more scaffolding to students as the course got underway.

5.4.2.2 Analysis of message acts

This analysis of message purpose or intention, as well as the analysis of message content or topics in Section 5.4.2.3, focused on each *text unit*, defined as any paragraph of contiguous combination of paragraphs in a message that presented a discrete topic or idea.

Table 5.10 provides a summary of the number of text units in student messages (total text units 1597) and in those posted by the course presenter (total text units 425).

Table 5.10 Summary of message text unit totals

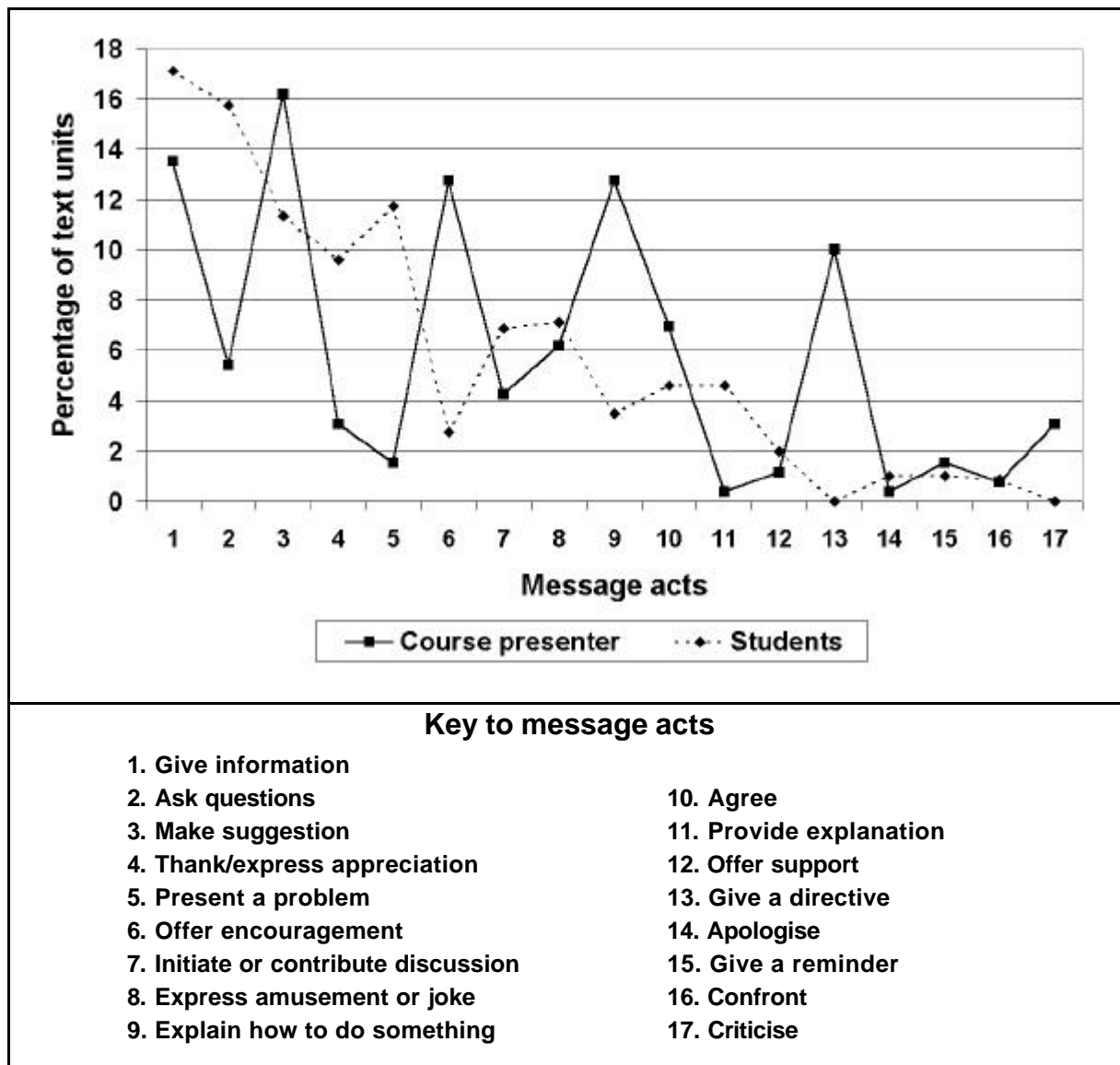
Message sender	Text units	
	Total	Mean per message
Course presenter	425	4.78
Students	1597	4.87
Total	2022	4.85

Almost the full range of message acts that were evident in the course email communications was present in both student and course presenter messages, although often in different proportions. The only exceptions were that only the course presenter gave directives or offered criticism. Figure 5.9 overleaf illustrates the diversity of the message acts of students and course presenter as percentages of their respective message text unit totals.

The highest percentages of course presenter's text units in his messages were concerned with the following purposes:

- made suggestions to assist with problems,
- provided information,
- gave encouragement,
- explained how to do tasks, and
- gave directives.

Figure 5.9 Message acts of students and course presenter as percentage of their total text units



The highest proportions of text units in the message acts of students are presented in the list below:

- provided information,
- asked questions,
- presented problems with which they needed help,
- made suggestions to help solve problems presented by others, and
- expressed appreciation and thanks for the help provided by others on the list.

The students and the course presenter had a similar percentage of message acts that were dedicated to expressing amusement or sharing a joke. Lightheartedness and humour were

features of the classroom's email interactions. This is another way in which the on-line classroom was similar to the M.Ed. face-to-face modules that had preceded it. Humour was often a feature in those classes on the part of both students and the course presenter.

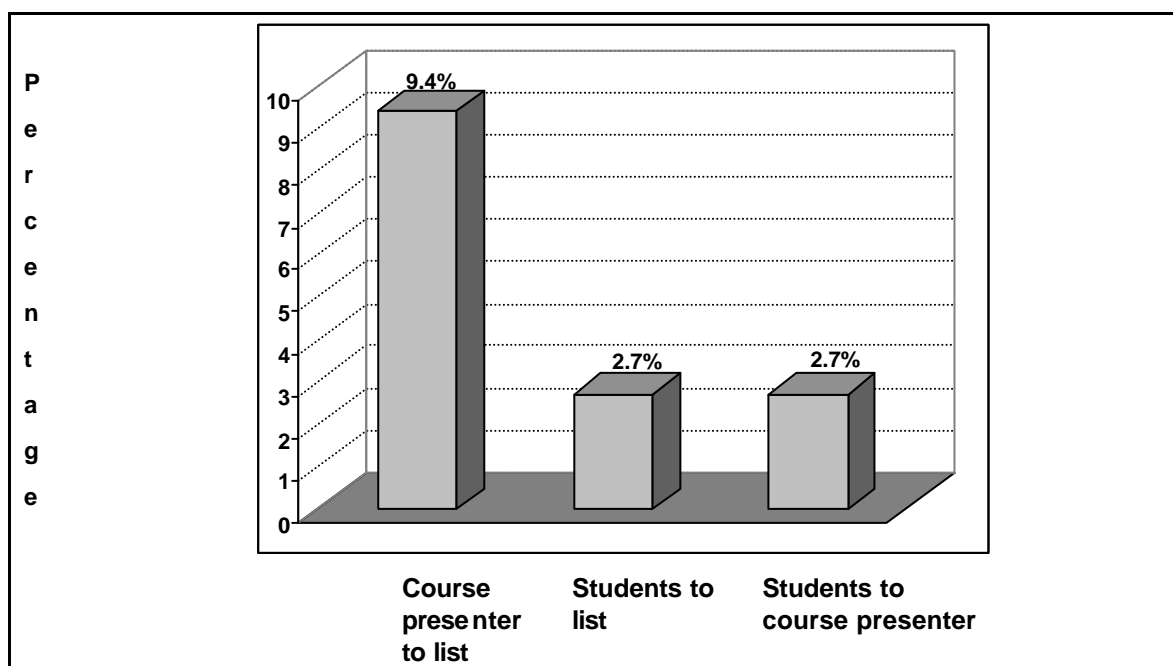
Other course presenter and student message acts that shared similar though small proportions, were:

- ❑ apologies,
- ❑ reminders, and
- ❑ confrontation.

A student who had participated in a previous email conference felt that the classroom communication lacked confrontational debate on more complex issues. Research suggests that more complex interaction and discussion of concepts seldom occurs spontaneously in student email but has to be structured (Draper, 1997). A number of students reported in retrospect that while climbing the learning curve they did not have time to progress to participating in more complex debates.

The analysis identified from the above-mentioned message acts, those of an administrative nature e.g. dates and scope of projects. Figure 5.10 presents a comparison of percentages of these text units in student messages to the course presenter and to the list, as well as in the course presenter's messages to the list.

Figure 5.10 Percentage of course administration message acts posted by course presenter and students



Fewer than 10% of the course presenter's total message text units were concerned with administration and course management issues. All students subscribed to the mail list received these messages, even if they were in response to only one or two students' queries. Perhaps for this reason the proportion of course management related message text units were only 2.7% both of the total text units that students mailed to the email list and directly to the course presenter. This small proportion of all their email text units from students related to course management, contradicts previous research findings that a high proportion of student email messages are dedicated to course administration issues (Draper, 1997; Laurillard, 1993).

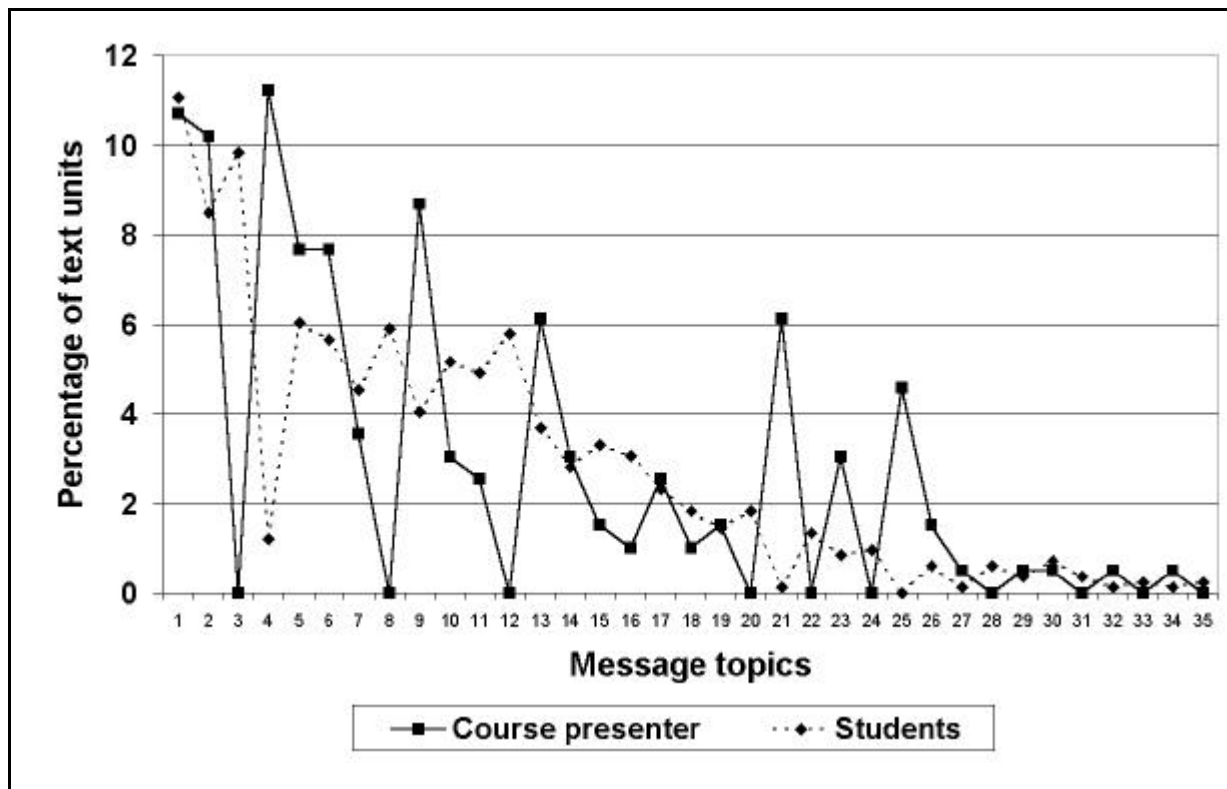
5.4.2.3 Analysis of message contents/ topics

Generally messages in the virtual classroom were concerned with the subject matter of the course as well as the skills and activities that were required to fulfil the learning objectives. The topics in the messages of students and the course presenter expressed as percentages of their respective message text unit totals are presented in Figure 5.11 overleaf.

The range of message topics was more diverse in student messages, which contained ten additional topics to those posted by the course presenter. Three of these ten additional topics concerned only students, namely posting the first assignment, *Who Am I?* (Topic 3 in Figure 5.11); each students' reflection on their progress in the course in response to the course presenter's query (Topic 8), and notifications or announcements of making projects available on the classroom website – the equivalent of handing in completed projects (Topic 12). The remaining seven of the ten topics that were not contained in the course presenter's messages illustrate the extent to which the students collaborated with one another to discuss and solve problems. This was often done without any intervention from the course presenter, who hung back and waited to see what solutions would be forthcoming from students themselves. These seven topics were:

- ❑ how to deal with rudeness from an external source,
- ❑ email list issues,
- ❑ email connection problems,
- ❑ notification of a virus and suggestions on how to deal with it,
- ❑ comments on an on-line interview with the course presenter published by ITForum,
- ❑ discussion of acronyms, and
- ❑ problems resulting from different screen resolutions.

Figure 5.11 Message topics of students and course presenter as a percentage of their respective total message text units



Key to topics

- | | |
|--|---|
| 1. Discussion/suggestions for <i>Who's Who</i> project | 19. Virtual chalk board |
| 2. Project proposal (for Assignment 4) | 20. How to deal with rudeness (in response to <i>Who's Who</i> project request) |
| 3. <i>Who Am I?</i> message (Assignment 1) | 21. Dates for projects |
| 4. Other M. Ed.- projects and external courses | 22. Email list issues |
| 5. RoadMap96 course on the Internet | 23. Trivia |
| 6. Deadlines | 24. Email connection problems |
| 7. URLs | 25. Discussion on <i>Who Am I?</i> submissions |
| 8. Reflection on progress with course | 26. Notification of tempory absence |
| 9. Suggestions on file-names | 27. Information on conferences |
| 10. Assignment 3 (Group project) | 28. Notification of and dealing with viruses |
| 11. HTML editors | 29. Available readings |
| 12. Notification of handing in a completed project | 30. Evaluation criteria of course |
| 13. Workload | 31. The INTro interview |
| 14. Problems with networks | 32. The ITForum listserv |
| 15. Virtual desk-top project (Assignment 2) | 33. Acronyms |
| 16. HTML code | 34. Glossary of terms |
| 17. File transfer protocols (ftp) | 35. Problems with screen resolution |
| 18. Assignment 4 project | |

The topics that took up the highest proportion of the course presenter's messages included those listed below:

- ❑ discussions and suggestions on the *Who's Who in IT* group project,
- ❑ information on RoadMap96 course and other M.Ed. modules,
- ❑ comments and suggestions in response to student examination project proposals,
- ❑ responses to student suggestions on naming files, and
- ❑ deadlines.

Topics that took up the highest proportion of student messages, other than those related to the assignments already referred to above, are listed below:

- ❑ suggestions on the *Who's Who in IT* group project,
- ❑ RoadMap96 compulsory course,
- ❑ URLs of useful learning related web-sites,
- ❑ suggestions on file naming,
- ❑ discussion and responses concerning group projects,
- ❑ questions and responses concerning available HTML editors, and
- ❑ discussion concerning the workload.

The nature of email communication places it somewhere between speech and writing, not as casual as the spoken word nor as formal as the printed word or language of the book (Greller et al, 1993). An illustrative extract from the short thread on how to deal with a rude reply from an individual who was to have been included in the *Who's Who in IT* web-site is included as Appendix J. This thread was made up of only student contributions as the course presenter felt that the suggestions offered included those he would have offered. The conversational and informal tone is typical of that found in messages to the class email list.

5.4.2.4 Comparison of communication in the RBO on-line course with that of the face-to-face courses

Confirming studies by Burgstahler (1997), communication via an email list enabled students to send messages to the list at any time they chose from seven days a week and twenty-four hours a day throughout the duration of the course. Thus they were not confined to the restricted window of 8.00 to 17.00 access that prevailed during the three to five day, face-to-face contact modules. In addition, email communication enabled students to ask questions or make their point without having to adhere to the 'turn-taking' required in synchronous communication. Nor was it necessary to contribute to a discussion immediately. They could choose to return to an issue after more reflection. Two students who were out of the country for short periods during the on-line course were able to pick up the threads of communication on their return, as was the course presenter after short absences from the university. These benefits of email communication have been reported in other studies by Karayan and Crowe (1997).

Every student who enrolled for the course sent messages to the list. Most sent messages directly to the course presenter as well. Overall the students sent more than three times as many messages to the classroom list compared to the number they sent directly to the course presenter. In retrospect the course presenter expressed his opinion that the nature and frequency of email interaction during this course resulted in his feeling closer to the students than he had in previous and subsequent face-to-face contact courses. Furthermore the email messages provided him with more information and insight into every phase and aspect of their work.

In the previous face-to-face modules of a few days' duration, the presenter's time was divided among learners so that he spent limited amounts of time with each individual or group. As a result he was only able to experience fragments of the processes involved before moving to the next individual or group. Through email, by contrast, the course presenter for this module was able to experience a more complete picture almost as it was being drawn. Furthermore, as messages remained available on the receiver's computer system until deleted by the recipient, he could return to messages, reread and reconsider them at any stage of the course, as could the students.

Email communicated learning relationships that started between students during the on-line course facilitated the development of learning support groups. Some of these continued beyond the course time frame and subsequently broadened into professionally and socially supportive relationships. This contradicts earlier studies which indicated that computer mediated communication was useful for instrumental relationships rather than social supportive roles (Hiltz and Wellman, 1997).

5.5 To what extent can a Web delivered course provide materials, models and metaphors to learners that elicit sufficient extrinsic and intrinsic motivation?

... the metaphor of the classroom led to intrinsic motivation in the fantasy (Malone, 1981) type. Many students 'played the game' of being kids in a classroom writing on the board and 'splitting' on their friends who had done so.

RBO course presenter

We can even 'get silly' and go off the topic at times – just as one does in a real classroom situation.

RBO student

The metaphor of the classroom was chosen by the course presenter in order to give students a familiar base from which to explore the Web-based course. The simple classroom design of the course web-site with its virtual cupboard, virtual desks and virtual blackboard gave a visual form to the metaphor and provided students with a site that was simple to relate to and navigate.

An RBO student who attended the SITE 97 (Society for Information Technology and Teacher Education) conference in the United States soon after the on-line course, commented that all the virtual classrooms presented at that conference were strongly text-based, visually identifiable with pages from books. By comparison it was felt that the vivid graphical classroom design of the RBO virtual classroom was far more appealing and motivating to learners.

A comparison can be made between the blackboard graphic in Figure 3.2 (see Chapter 3, page 37) as it was on day one of the course, with that in Figure 3.4 (see Chapter 3, page 39), as it appeared on the final day of the course. The comparison provides an idea of the number of students who were motivated to 'scribble' on the board as they might have done in a physical classroom. This occurred despite the difficulty of finding the board's graphic, which the course presenter moved on a number of occasions for technical reasons, though the students were of the opinion that it was moved to increase the challenge. These moves provided them with additional experience of searching for and transferring files, and editing graphics.

Participating actively meant entering into the spirit of guessing the perpetrators of the anonymous graffiti that was added to the board replacing previous scribbling on an on-going basis. Not stopping there, students would 'split' to the class and course presenter concerning possible perpetrators as if in a school classroom, often light-heartedly addressing the latter as 'Sir'. The enthusiasm underlying these activities confirms the presenter's opening remarks

(quoted) on the role the classroom metaphor played in fulfilling the fantasy needs of the students. The students themselves acknowledged the extent to which the metaphor facilitated the type of light-hearted behavior that has parallels in real-time physical classrooms.

Some students chose to perpetuate and extend the classroom metaphor in their hand-in Web-based projects. The virtual desk portrayed in Figure 3.5 (see Chapter 3, page 43) used graphical images to portray a physical desktop and related objects, including files and pencils. Other students used graphics as links to their virtual desk-tops, which represented real desks of various forms. One presented bare feet as they would appear if reclining with feet on the desk top. Another student had as her link graphic a photograph of herself seated at her real-world physical desk (see Figure 3.3, Chapter 3, page 38).

The graphic nature of the Web lends itself to the use of metaphor. Another student, resident in a coastal city, presented her desk by means of a (sea) 'surfing' image. This partly echoed the familiar metaphor of 'surfing' the web to search for information and included the descriptive explanation of 'bunking' class to go surfing. All the learning objectives in that desk were given surf equipment labels. Other metaphors used by students included that of a journey and a virtual newspaper to report on social issues in relation to the Web (Figure 3.6, Chapter 3, page 44).

Students did not passively 'learn about' virtual classrooms. To quote Viau (1994: p. 5) in relation to learning with metaphors, they 'lived' it for the twenty weeks of the course, using the actual tools and materials involved in learning via the Internet. Their enthusiastic response to the classroom metaphor and the care taken in the presentation of their own personal metaphors was confirmation of their active involvement.

5.6 What design factors best facilitate learning via on-line Web-based material?

As described in Section 3.3 (Chapter 3, page 41), the approach taken in the design of the course was constructivist. This extended to the main thrust of activities: students constructed the classroom as they implemented required course tasks. In order for them to construct their own individual and collaborative web pages around certain issues, they needed contact with the course presenter and one another. To this end an essential component of the virtual classroom was the inclusion of the dedicated classroom email list that facilitated effective interaction and communication.

The classroom web-site itself used a simple design of text, graphics and tables with the familiar and accessible metaphor of a physical classroom. Generally the simplicity of the design of the

classroom was in keeping with design recommendations that learning web-sites be kept accessible even to those not using the latest browser software, avoiding confusion and navigation problems (Lynch and Horton, 1997). At the time of this course some students adopted use of the version 3.0 browsers as soon as they were released, while others continued to use earlier browser software.

As no Java or JavaScript applets were included in the original classroom web-site design, all students could browse it without difficulty. Graphics were all given alternative text labels so that the classroom could even be browsed with the graphics turned off for those with slow links.

Despite the simplicity of the design there were problems for students who accessed the classroom web-site with their screens at the resolution of 480 by 640 pixels as they did not have machines with the necessary extra video-ram (random access memory) to run at a higher resolution. Since the web-site was designed for 800 by 600 resolution and the graphics were not kept within the screen safe area for different resolutions, it was necessary to scroll to the right in order to see the classroom cupboard, which contained useful on-line learning resources. It was some time into the course before some students realised that there was a useful part of the classroom that was beyond the right-hand border of their screens. Fortunately they discovered this after reading references to these useful resources in messages from those students who had already accessed the virtual cupboard.

Student projects that were linked to the classroom as the course progressed which included Java or JavaScript applets accessible only to the up-to-date browsers, were not always accessible to fellow students. Together with the screen resolution problem referred to already, this provided students with first hand experience of one of the pitfalls of Web-based classrooms. Unless a course is run with learners all linked to the same Intranet with standardised equipment, it is not always possible to control what learners see on their screens as opposed to what the course designer intended them to view.

From the perspective of learning how to teach and learn via the Web, the design of the RBO Virtual provided a good model to facilitate exposure to the strengths and advantages of the methodology without ignoring potential pitfalls.

5.7 What level of computer and telecommunication equipment is required for course delivery, access and communication?

The speed at which new technologies are developing in relation to the Web means that the required level, power and cost of equipment required to mount an effective Web-based course is changing all the time, depending on the level of interactivity that becomes possible with each new development.

For setting up the 1997 RBO classroom, two computers were used. These computers incurred the main costs (R15 000) of developing and delivering the course, over and above the costs of networking and Internet access which were already provided by the home-site university. The course presenter used a Pentium 75 running OS/2 to develop and transfer materials to the server, as well as to access email and communicate with students. The experimental server that hosted the classroom web-site and mail list server was a Pentium 100 attached to an existing university Novell network linked to the Internet and running the Unix operating system. During the course the server was converted to Windows NT.

Students accessed the classroom on computers with either 486 or low end Pentium processors running either Windows 3.1 or Windows 95 as the operating system.

5.8 What other resources and costs are required to set up, maintain and deliver such a course?

As implied in the previous section, hardware, software and network specifications tend to develop and change rapidly within short time frames. It would thus be unwise to present the financial costs to deliver and access the course under review as a definitive guideline for future courses. However the necessary materials, other than hardware and networking that were used, are outlined below.

5.8.1 Classroom development and delivery

The RBO virtual classroom was put together without resorting to proprietary Web learning management systems e.g. *Top Class*, *Web Mentor*, *Lotus Notes*. At the time there was limited experience of these products locally and it was decided that, where possible, existing and easily accessible services and materials would be used. Had proprietary software or systems been incorporated in the course, the costs would have escalated considerably.

5.8.1.1 Software

The course presenter used free- and shareware software packages with the following functions:

- ❑ Web-page editor,
- ❑ graphics editor,
- ❑ graphics format converter,
- ❑ file transfer and telnet, and
- ❑ electronic mailer.

5.8.1.2 Staff time

The computer literate course presenter took eight days of eight hours each for the initial (paper) design of the classroom through to the successful uploading of all files to the server. He already had some familiarity with HTML, but included in this time frame was time to download and learn how to use the software packages as well as to learn and implement the cumbersome Unix commands. In addition, a network supervisor dedicated a few hours to setting up directories and the mail list on the server.

For the duration of the course the course presenter devoted time on a daily basis to monitor and respond where appropriate to course related email messages sent to the email list or directly to him. The number and frequency of messages generated by the total number of students (sixteen were initially enrolled and ten completed the course) required approximately one hour a day of the course presenter's time during the early stages of the course. Larger course groups would very likely generate considerably more email traffic that could be more difficult to monitor without some sort of division of labour.

Over and above the time devoted to email interaction, the course presenter activated links to the student work that was submitted for inclusion on the classroom web-site, though in later classes students were able to do this for themselves. Additional time was required in the early stages of the course to use Unix based commands to communicate with the server and transfer files to it. After the server was converted to Windows NT, these functions were reduced to faster and simpler WYSIWYG 'drag and drop' procedures to a drive mapped to the course presenter's computer.

While the initial development time for the first course of this nature can be reasonably high, once the processes are learnt and mastered it is likely that they can be applied more quickly in subsequent courses which therefore become comparatively more economical to provide.

5.8.2 Classroom access

The course presenter, the observer based in the U.K. and the students accessed the classroom either through the network facilities provided by their employers, usually tertiary institutions or corporations, or through private service providers. Two students who lived in the Gauteng area eventually accessed the RBO classroom from the home-site university network after having difficulties with their Internet links, one from her home, the other from his workplace.

Students reported accessing their email at least once a day, except for the student who could only access it twice a week. Overall students who completed the course reported devoting between three and forty hours a week on the course and related assignments. Of those who completed the course there was no observable relationship between the length of time per week devoted to the course and the reliability of access or previous experience with the Web and email. Those who were the most enthusiastic tended to devote more time whether they experienced connection difficulties or not.

Students who were not provided with Internet and email access courtesy of their employers incurred the extra (monthly) costs of linking through private Internet service providers. Local telephone class are billed in South Africa which meant additional costs for time spent linked to the Internet. A student who accessed email and the Web on a daily basis from his link from home, reported that his telephone bill increased by R 150 a month during the on-line course. This represented an increase of more than 100%.

Participants used a range of software to access the classroom and implement the project tasks of Web authoring, graphic editing and file transfers. These products represented the range of popular and accessible software for the required functions at that time and were predominantly free- or shareware. Table 5.11 overleaf presents a summary of the electronic mail software that was used by students. While the specific email software that was used did not affect students' access or the functionality that was available to them, the *Pine* email software was running on a machine with featured at the lower end of the memory and power specifications that were available at the time. It was also attached to a 'low-end' network with access to limited features that made it less user friendly for mailing and transferring files.

Table 5.11 Email software used by students

Email software	Total number of users
Pegasus (P-mail)	8
Miscrosoft	4
Eudora	2
Mozilla	1
Pine	1

5.9 To what extent can this approach generate cost savings for course presenter(s) and learners?

By responding to each student query by email to all students in the class, the course presenter was able to reduce time that might otherwise have been spent repeating answers to questions on the same topic. The latter is a common occurrence in face-to-face courses where students visit or contact the course presenter on a one-to-one basis with common queries. Time was also saved by including Web-based, comprehensive information on course management issues so that students had access to an up to date record of information that they could consult at any time. In addition a permanent record of all information and discussion from the course presenter and other students remained available for reference and consultation throughout the course and beyond, by all participants who saved the email messages.

The added expense for students who paid for their own network access time could be offset against the savings they made from not having to pay the physical travel costs to attend face-to-face lectures. The student whose telephone bill increased by R150 a month during the course lived 80km from the university. This amount is approximately what it would have cost in petrol and vehicle wear and tear had he attended lectures on campus for three days.

For the registered students who lived furthest from the learning centre during the 1997 RBO course, their travel and boarding costs to attend a four-day contact module in Pretoria were often in the region of R1 000 each for the duration of a module. The costs saved by students who were able to study from their home regions were along the lines predicted by Muller (1997).

5.10 Summary of results

The academic results of the RBO course participants confirmed that the Web-based classroom, enhanced with a dedicated email list for interaction, successfully facilitated learning. The methodology was particularly effective for those who complied with the course pre-requisites with respect to exposure to email and the Internet and familiarity with the software.

Reliable network connections and stable Internet links were critical pre-requisites for the success of these learning methods. A further contributor to the course success was the constructivist design of the course and its encouragement of collaborative work. Although on-line collaborative work imposed considerable challenges, these were better met if students had already obtained a sound grounding in the theory and practice of group work.

Despite asynchronous communication lacking the visual cues and temporal immediacy of face-to-face communication, it proved itself a powerful tool in the on-line course. It provided the course presenter with more access to students' learning processes than is usually possible in face-to-face courses. Similarly it facilitated more direct access to the presenter and other students over a more extended time frame than in the face-to-face modules. Email communication also contributed to the democratisation of the learning processes with students and course presenter adopting similar roles in meeting the goals of the learning processes.

The classroom metaphor of the course web-site proved to be an effective medium for motivating students. It provided a simple but effective interface to course material and useful links. The delivery of comprehensive Web-based, therefore easily updateable, instructions and related material gave students immediate and effective access to course management information. This reduced the necessity for the presenter to handle repetitive or frequent messages asking for clarification, as often occurs in face-to-face courses. As noted, another timesaving device used by the course presenter was to reply to all students' queries, even those not directed through the list, to everyone on the list. This also reduced the frequency of repetitive queries from students.

While the on-line course saved time and costs as distance students did not have to travel the long distances required of other modules, more realistic deadlines and time frames were necessary to accommodate students who had to fit in the necessary course work after normal work hours.

While initial course development proved demanding on staff time, it is likely that for subsequent courses this time could be reduced as processes are mastered and applied more quickly.

Enrolling more students in the course would not have extended the time required for most aspects of course management. However, it is likely that there is an optimum number of students above which the traffic of email messages would result in information overload for students and course presenter alike.

Conclusions and recommendations arising from the results of this study are presented in Chapter 6.