# eTutorials with voice groupware: an investigation into real-time conferencing to support M206 students at a distance

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# eTutorials with voice groupware: an investigation into real-time conferencing to support M206 students at a distance

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## ABSTRACT

This paper reports on an investigation into the use of real-time voice groupware to support students on a computing course offered by the Open University, UK. The main objective of the investigation was to assess the feasibility and pedagogical advantage of deploying synchronous conferencing technology on a large population computing course to complement existing face-to-face and asynchronous online support for its students. In this paper we report on the findings from such an investigation, and draw a number of conclusions and recommendations covering feasibility, scalability and best practice in the use of voice groupware for eLearning.

## Keywords

Voice groupware, synchronous conferencing, distance learning, eTutorials.

## 1. Introduction

The Open University (OU) is the major provider of distance education in the UK and one of the major players world-wide. It has a long tradition of supporting students electronically, mainly via text-based asynchronous conferencing (see, for example, Mason, 1989; Mason and Bacsich, 1998; Eisenstadt and Vincent, 1998). Recently a number of courses in faculties across the university have been experimenting with a voice groupware system called Lyceum. This system allows the real-time transfer of audio, images, and text between computers connected to the Internet.

We ran a small trial of Lyceum with tutors and students on a computing course, by running a number of eTutorial sessions, during the 2001 presentation of the course. In this paper we describe the trial we conducted and report on our findings.

### 1.1. Theoretical Background

Distance education employs different delivery methods compared to traditional, classroom-based teaching. Most of the time students work independently, at their own pace. There are limited opportunities for face-to-face contact with tutors and other fellow students, which are very intensive, concentrated over short periods of time, and generally take place in the evenings, weekends or in residential schools. By building

high levels of interaction into the course materials, distance educators (can) ensure that the materials are used in such a way as to construct a dialogue between the teacher and the student. New information and communication technologies provide educators with means to enhance such a dialogue.

Recent advances in communication technology over the Internet has enabled rich media, such as sound and images, to be exchanged at relatively high speed and low cost. In the context of eLearning, this provides a viable means to connect students and teachers, and opens up new possibilities for the delivery of teaching materials in distance education.

Communication over the Internet can be broadly classified as *asynchronous* – users send information to common repositories which can be accessed by other users later on – and *synchronous* – users share virtual meeting spaces and exchange information in real-time. There are obvious differences between these two types.

Asynchronous communication poses fewer demands on participants' time, as it allows them to choose when they can/want to be online. As there may be prolonged time intervals between communications, it also allows for more time for reflection. On the other hand, it may yield interactions that are artificially protracted over time. This seems to indicate that asynchronous communication is more suitable for situations in which participation has to be flexible, e.g., participants have differing time availability, or is optional, or there are activities which require personal reflection or investigation in between communications.

Synchronous communication, on the other hand, is more spontaneous and provides a greater sense of participation. Although research on synchronous systems is still sparse, some studies have reported that the use of synchronous systems enables effective learning practices and improves group performance and productivity (Marjanovic, 1999). Here it is important to differentiate between synchronous systems that enable computer mediated *collaboration* (e.g., shared whiteboards) as opposed to systems that only support *communication* (e.g., text-based chat). Compared to the traditional classroom setting, some studies have indicated greater improvements in the level of active participation, discussion quality and group dynamics when synchronous collaborative systems are brought into teaching (Davenport and McKim, 1996 and Butler 1990 cited in Marjanovic, 1990).

Table 1. illustrates an attempt by Goodyear and Steeples (1998) to summarise the strengths and weaknesses of synchronous, asynchronous, text based and multimedia communications.

| | **Synchronous** | **Asynchronous** | **Strengths** | **Weaknesses** |
|---|---|---|---|---|
| **Text based** | e.g. IRC (Internet Relay Chat) | e.g. e-mail, CMC | encourages clarity of expression, formalization of knowledge etc.; indexible, searchable; small data files | time-consuming to produce; hard to capture 'practices'; hard to eradicate or control ambiguity? |
| **Multimedia** | e.g. live video-conference | e.g. video-on-demand; video-mail | vivid; rich; allows 'showing' as well as 'telling'; can be | hard to index and search; large data files |

| | | | easy and quick to produce and 'read' | |
|---|---|---|---|---|
| **Strengths** | supports interactive communication; timely sense of event and audience | time to reflect; flexible use of time | | |
| **Weaknesses** | inflexible use of time; may not scale up to large numbers | can be slow or cumbersome | | |

**Table 1. Strengths and weaknesses of synchronous and asynchronous multimedia and text-based communication according to Goodyear and Steeples.**

It is important to note that synchronous multimedia systems require more sophisticated information technology solutions than asynchronous ones, in order to sustain a quality of communication that is acceptable to human participants. For instance, in a real-time audio conferencing system, users expect the voice streams to travel fast and accurately through the network, so that the system provides a good approximation of a face-to-face conversation. There is little or no time for the software to recover from, say, information lost on the network, without the users noticing.

Certainly, the ability to transfer task-related images and documents synchronously, when 'talking about' the task enriches the interaction because of the added visualisation aspects. Visualisation enhances audio conferencing by providing the means to share visual representations of the concepts discussed and makes it easier to talk about the task in hand. To quote Ligorio (2001):

> "Visualisation exploits the ability of the visual system to identify patterns in images. In the fields of art, physics, and science, inquiry is often hard when only based on numerical or textual data. Visual representation often facilitates investigation and makes learning easier. In fact, visualisation is considered one of the most productive features of new technologies. Recent software and particularly that of the desk-top virtual reality type, provides users with numerous possibilities for the visual representation of objects. The combination of different media (graphics, sound, animation, text) also reflects the multiple representations that humans are capable of."

Overall, the use of synchronous multimedia communication seems to broaden the role of computer mediated communication in teaching and learning, and multimedia communication systems that make use of narrow to medium bandwidths are becoming widespread (McConnel, 2000). However, there is still limited research published on the nature and use of these systems, and in particular on how such systems could be used to the best advantage of learners and teachers.

For instance, it has been observed that synchronous communication impose psycho-social conditions on participants which can both enhance and detract from the instructional event. For example, participants may be reluctant or shy to talk in front of a live audience; international students may experience additional pressure due to language difficulties; conflicts may arise during live discussions. In addition in an electronic environment, the elements of group dynamics such as member roles, informality, the effects of humour and sarcasm may be perceived differently, and may result in unintended consequences (Berge, 1995).

Related to the above is the teacher's role in facilitating effective conferencing as a discussion leader and group moderator. In synchronous systems, the spontaneity of the interaction and the consequent effect of psycho-social conditions increase the importance of the teacher's role in helping students understand how to work in this type of environments. For instance, the teacher may have to greet the learners and help them access the system and the conferences which are set up for the sessions to take place. The learners who are most likely to be new to this sort of environments may require some initial guidance on how to transfer their existing, familiar metaphors for learning into the new medium (see Salmon and Giles, 1997 for more on 'moderating' online).

## 1.2 The course

We deployed Lyceum on an OU course that provides a broad introduction to computing, with an emphasis on modern software engineering practices. The course is called 'M206 Computing: an object-oriented approach' (Woodman *et al*, 1998). It requires very limited prior computing expertise, and was designed as an introduction to computing for all OU students interested in the subject. Because of this, it attracts a large and heterogeneous student population (approximately 6,000 students per year, from the UK, mainland Europe, and Hong Kong).

Tutors support students within tutor groups of 20-25 students. Usually, tutor groups are structured regionally, with each group made up of students and a tutor from adjacent geographical areas. However, this does not necessarily imply that students and tutors are geographically close to each other. For instance: students living in the North of Scotland or the Scottish Islands tend to be geographically sparse; and tutor groups in continental Europe may be made up of students and tutors from different countries.

Students have access to a number of face-to-face tutorials, run by their tutor, throughout the course. However, for students in sparsely populated regions, face-to-face tutorials are more difficult, if not impossible, to attend, and students who cannot participate in tutorials feel disadvantaged compared to their fellow students in more densely populated areas.

The course deploys a wide range of media to support distance learning, including textbooks, software and TV broadcasts. It already includes a computer conferencing component, FirstClass, which is text based and asynchronous. On the course, FirstClass is used both as a convenient bulletin board, and, more importantly, for group discussions and groupworking (Tosunoglu, Rapanotti, 2001).

Although tutors often post supplementary material for their students using FirstClass, its use to run eTutorials is negligible. This is not surprising due to its primarily asynchronous mode of operation and the lack of visual collaborative tools, which poses severe limitations to the type of activities that can be carried out online.

Recent advances in technology and a wider access to the Internet make it feasible for richer online environments to be deployed on the course. Already, self-organised groups of students make use of synchronous conferencing tools to get together online, for instance using text chat rooms and other low-cost real-time conferencing tools. Also, for the past couple of years, a small group of tutors on the course have been experimenting with NetMeeting[1], in order to provide extra online support to their students. The trial reported in this paper originated from the need to consider how the latest conferencing technology could be best deployed on the course.

### 1.3 Lyceum

Lyceum (Rapanotti and Hall, 2000) is a voice groupware conferencing system developed at the Open University. Lyceum supports many-to-many synchronous conferencing and collaboration over the Internet. This means that many users can participate in a conference with voice and data exchanges occurring in real-time. Lyceum was conceived as a tool to enhance the quality of the learning experience for students on distance learning courses by allowing real-time interaction with their tutors and other students. In particular, Lyceum was intended for use by groups of students participating in real-time collaborative eLearning.

Lyceum is a client/server system. Users install the Lyceum client on their PC and access the Lyceum server across the Internet via a dial-up service or a corporate network. Currently, Lyceum technology is only available to Open University's staff and students. The major trial of Lyceum to date was undertaken by the OU Business School within their MBA programme (Buckingham Shum *et al.* 2001). Smaller trials of the system on other OU courses are planned for the next academic year. Lyceum has also been used in a study on remote usability evaluation of software applications (Dunckley and Rapanotti, 2002).

The Lyceum client is designed to run on mid-range Windows PCs with standard multimedia support. In particular, the recommended *minimum* specification to run the Lyceum client is a Pentium II at 266MHz, with 64 Mb of RAM, running Windows '95/'98/2000/NT4.0. To support audio, microphone and speakers or a headset, plus any 16-bit Soundblaster-compatible sound card are needed. Also, users need be connected to the Internet using an ISP via a 28.8 kbps modem, at least; connection via LAN is also possible, although the system may now work if the client software is behind a firewall.

## 2. The Trial

The main objective of the trial was to assess the feasibility and pedagogical advantage of deploying synchronous conferencing technology on a large population course at a distance, to complement existing face-to-face and asynchronous online support for the students on the course. More specifically, the project aimed at:

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[1] NetMeeting is a Microsoft product.

1. evaluating the participants perceived value of real-time voice groupware, in general, and Lyceum, in particular, as an eLearning tool;
2. documenting best-practice;
3. assessing the feasibility of its large-scale deployment; and
4. identifying potential problems and areas for improvement.

We ran a small trial of Lyceum with tutors and students during the 2001 presentation of the course. Two experienced tutors replied to our call for participation in the trial; they in turn recruited two groups of student volunteers.

The volunteer tutors had previous experience of NetMeeting, a Microsoft product. NetMeeting is similar to Lyceum and supports real-time conferencing and collaboration. However, the tutors had only used NetMeeting in the so-called 'peer-to-peer' mode that is without the mediation of server technology. In this mode, NetMeeting does not allow many-to-many voice communication, only text chat. Hence the tutors were particularly keen to explore the potential of Lyceum's many-to-many voice communication.

## 2.1 Use of Lyceum

Among Lyceum's features, the following were particularly relevant to our trial.

Participants met in *virtual rooms,* hooked by the Lyceum server. In each room they took part in real-time collaborations and discussions. In particular, they could talk to each other and share *collaborative tools*.

Three collaborative tools deployed with Lyceum were used during the sessions: a whiteboard, a concept map editor, and a text editor. The whiteboard is a simple generic drawing application that allows participants to sketch simple shapes and annotate them with text. The concept map editor allows users to draw concept maps as graphs, with nodes representing concepts and arrows between nodes representing concept associations. Finally, the text editor allows users to edit a text file collaboratively.

We used the Lyceum *voice tools* (see Figure 1.) to facilitate the moderation of audio sessions. These include: a 'Talk' button, that has to be kept pressed when talking; a simple voting system ('Yes/No/Wipe' votes); and a request-to-speak tool (hand up).



**Figure 1.  Lyceum's voice tools.**

A *text chat channel*, for synchronous text communication, was used as a back-up channel in case of audio failure.

Figure 2. illustrates the Lyceum client during one of the eTutorial sessions. The names of the participants have been deleted for data protection.
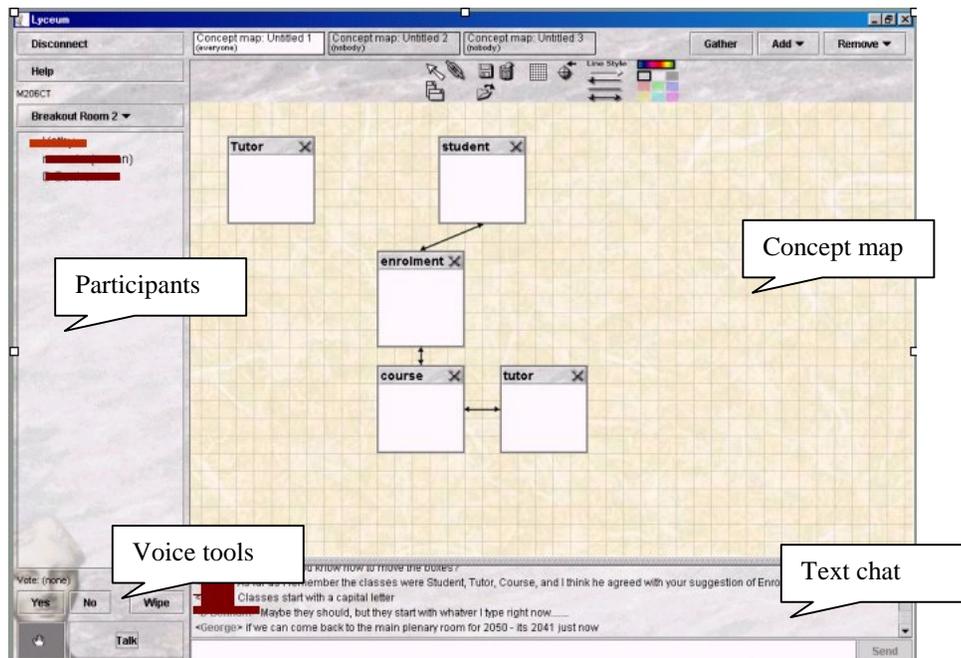


**Figure 2. The Lyceum client during an eTutorial session.**

## 2.2. Pre-session work

Participants were sent an installation program for the Lyceum client via email, together with installation and testing instructions. The testing procedure included testing the PC sound system and the Lyceum client both off-line and on-line. Conveniently, for the on-line test, users can connect to a special virtual room on the Lyceum server form where they can echo their audio, hence testing correct client-server communication in their own time and through the ISP/LAN of their choice. All users were requested to perform the tests before participating in the eTutorials.

All users owned PCs of appropriate specification to run Lyceum. In a few cases, they did not own a microphone and we provided suitable headsets. It should be noted that successful testing of the system, although necessary, is, unfortunately, not sufficient to totally guarantee the smooth operation of a Lyceum audio session. Factors which impact the technology are line quality and the amount of traffic. Hence our sessions were not totally free from technical hitches.

## 2.3. The sessions

Two topics from the course's syllabus were selected for presentation via Lyceum. These were among areas of the course known to be particularly problematic for the students. The topics were:
1. the use and selection of collection classes in Smalltalk, the programming language used on the course; and
2. object-oriented analysis in software development.

We ran four eTutorial sessions (one per tutor per topic) over four months. The sessions were run in step with the course's study calendar, in order to maximise the relevance and benefit of the experience for the students taking part in the sessions. One tutor moderated each session, with the other tutor and one or two observers collecting evaluation data.

The tutors prepared the resources for the online sessions jointly. These included some preparatory material sent to the students prior to going online, and material to be used during the sessions. The sessions included a combination of plenary and group work. Usually, the tutor would welcome the students in a plenary session and outline the activities for the session. There would also be a review of some basic concepts and definitions relevant to the topic covered. Following this, the tutor group would be split into sub groups to work on a range of practical exercises in a number of 'breakout rooms' (essentially Lyceum sub conferences), with the tutor visiting the rooms in a round-robin fashion to assist the students. Collaborative visual tools such as the whiteboard and the text editor were used for the exercises. For instance, for the Smalltalk collection classes, students were asked to 'fill in' the blanks, in assertions about Smalltalk collections classes; for object-oriented analysis, they were asked to draw an initial object model given a simple statement of user requirements. A sample of the material used for the session is included in Appendix A.

Prior to the eTutorial sessions, the students were invited to participate in 'warm-up' sessions run by the tutors to get them accustomed to Lyceum, voice moderation and voice communication protocols. We also ran a number of Lyceum sessions with the tutors, to acclimatise them to the system and to test and refine the eTutorials. In these sessions, we were located at the OU headquarters, while the tutors joined in from their home or workplace.

## 3. Evaluation methods

We collected evaluation data by direct observation of the eTutorial sessions, from formal student questionnaires, and from informal reports from the tutors after each eTutorial. We also held online review meetings with the tutors throughout the project, and had a face-to-face meeting at the end of the project to discuss issues arising from the trials and to reflect on the experience.
Table 1. summarises dates of and participation to the eTutorial sessions.

| Date of eTutorial | Tutor | No. of students | No. of observers |
|---|---|---|---|
| 23 May | Tutor 1 | 8 | 3 |
| 27 May | Tutor 2 | 5 | 2 |
| 8 July | Tutor 2 | 2 | 2 |
| 11 July | Tutor 1 | 6 | 2 |

**Table 1.  Summary of eTutorial sessions.**

### 3.1 Direct observation

During each eTutorial two to three observers were present in order to collect data and record the session. Full recording of all audio and visual interactions was particularly difficult to achieve due to the lack of recording facilities on the Lyceum server. We experimented with a number of software packages for video capture, but found that they tended to interfere with Lyceum and cause a degradation of its performance. Software audio recording was also unfeasible, as Lyceum requires the exclusive use of a PC's sound card.

In the end, we resorted to low-tech solutions in order to obtain a record of the sessions. We used a high quality tape recorder and microphone connected to the observers' PC speakers to record audio, and took regular screen shots to record visual events of interest.

### 3.2. Evaluation questionnaires

An evaluation questionnaire was designed and sent to the students after they had participated in each eTutorial. The questionnaire covered three major areas: the student's previous experience of synchronous conferencing systems; Lyceum as a learning environment, and the activities within the eTutorial session, including the most and least useful aspects of the session; Lyceum usability and the quality of its components. Responses to items in usability section were based on a six point Likert type scale of "Strongly Agree"=5, "Agree"=4, "Neutral/Not Sure"=3, "Disagree"=2 and "Strongly Disagree"=1. (See appendix C for a copy of the questionnaire.)

The students were also given the opportunity to make free-form comments at the end of the questionnaire.

## 4. Students' feedback

Students were invited, on a voluntary basis, to complete the evaluation questionnaire described in the previous section at the end of each eTutorial. Out of the total of seventeen students who took part in the sessions, nine returned their evaluation questionnaires. The findings reported in this section are derived from the returned questionnaires.

Additional four students had serious technical problems and had to abandon the sessions; they were asked to fill in a technical feedback form covering areas such as specification of the PC used, details of their Internet connection, problems experienced, any actions taken and comments.

### 4.1 Students previous experience

We were interested in the students' experience with synchronous conferencing applications prior to the eTutorials. Six out of nine students said that they used NetMeeting for OU coursework. Half of the students who had experience with NetMeeting said that they used it for both audio and text chat. Students were also asked to mention any other software they had used for text/audio conferencing, but none of the students did so. However later on, one of the students who had problems with the Lyceum returned a technical feedback form in which he mentioned that he had used ICQ to contact another students in the session after a Lyceum failure.

## 4.2 Learning

Despite the problems in running of the software, all nine students said that they enjoyed using Lyceum and the eTutorials were worth participating; seven students said that the eTutorials contributed to their understanding of Smalltalk collection classes/object-oriented analysis. When further probed about their learning and whether they had learnt anything new in the eTutorial, 5 students gave specific answers and one other student said the session reinforced his learning:

*The use of an array in conjunction with a Smalltalk method to check for inclusion of an object within a set rather than using an* `ifTrue: ifFalse:` *construct demonstrated a very powerful tool.* (Questionnaire no. 2)

*It cleared up how* `do:` *works for me* (Questionnaire no. 1)

*The eTutorial using the Whiteboard for discussion gave me a chance to interact with George (Tutor) and other members in a question and answer forum. I realised through discussions with other members that there are several ways of looking at a problem particularly with a view to implementing a method of code - a pooling of ideas for brainstorming a problem! :O)* (Questionnaire no. 4)

*Triangular relationship as indicator of redundancy OR of existence of Invariant.* (Questionnaire no. 7)

*Consolidated my understanding of how objects are linked and interact* (Questionnaire no. 9)

## 4.3 Sources of confusion

Apart from the technical problems causing confusion (mentioned by four students), one student mentioned that he found moving form one element to other i.e. whiteboard to document to breakout rooms confusing. He was not sure whether he was in the right place or not. Another student found the concept map tool initially difficult:

*Found the drawing a little difficult to master in the first instance but soon got in the swing of it.* (Questionnaire no.9)

The other two students did not report any confusing aspects of the software.

## 4.4 Audio communication

One important aim of the evaluation was to find out how comfortable students would be communicating with other students and tutor through Lyceum. Most of the students were very positive about the audio aspect of Lyceum and were comfortable in using it:

*Yes – I feel the audio option is more effective than text when several people type at once and it is easy to lose track...* (Questionnaire no. 1)

*It is a good method of communication for the conservative as well as the extroverts among us.* (Questionnaire no. 3)

*Thoroughly enjoyed myself! Find it fascinating talking to other members and getting their perspective on things :O)* (Questionnaire no. 4)

*Yes even without a mic I could type answers* (Questionnaire no. 5)

Only one student mentioned that it was not always obvious when the connection to the server had failed and he had lost the buttons to talk and vote. There were times hecould not be heard but could hear others. Apart from technical problems students found that voice communication was faster than text communication.

Personal differences play and important role how comfortable they felt using the hand signal but they all agree that it is an effective and polite method and lets them make their views known to the group. Volume levels on the other hand was found to be variable from machine to machine and some participants were very loud while others were barely audible.

## 4.5 Lyceum as a learning tool

Students were invited to comment on what they thought was the best thing about Lyceum as a learning tool and what was the least helpful aspect of it in terms of its potential to promote learning.

Apart from one student, all others stated that having speech, graphics and text all in the same program made it very flexible. Students appreciated the ease of sharing documents and opportunities for participation it provides.

'*Learning more in the time available*' and '*feeling almost like in a real tutorial*' were two comments made by students about the Lyceum session.

The main spin off for a student was:
…a*n opportunity to solve a problem collectively as you would do in 'real life' I guess if you were working in a team. Everyone had a contribution to make and it was possible to revise your original concept of the way you arrive at a solution thro' collaboration. Tutor's input kept us on track, and gave me a mental nudge to think about the analysis laterally.*

The least helpful aspect of Lyceum reported by students (apart from technical problems including audio) was use of text. They did not like having to type long sentences, and wanted a facility to be able to save the text chat window. In later sessions it became clear that inability to refer back to documents used in main plenary room when doing work in breakout rooms was another disadvantage.

## 4.6 Activities in the sessions

Students' replies to questions regarding the activities that took place in the eTutorilas are presented in Table 2.

**Table 3 - Activities** (Answers are based on the 8 students who answered this question)

| Statements | Students' answers |
|---|---|
| The activities included in the eTutorial were | Yes 8     No 0 |

| | |
|---|---|
| challenging. | |
| The activities carried out during the eTutorial are likely to promote learning. | Yes 8   No 0 |
| During the eTutorial it was clear what one had to do. | Yes 7   No 1 |

The first eTutorial was on Smalltalk collection classes. Tutors used the same teaching material for both sessions. It was found that the amount of materials was too much for a one-hour session and the tutor decided to omit some of the activities. Technical problems also used up considerable teaching time. The activities were very well planned and run without any disturbing technical problems in the last two sessions on object-oriented analysis. The students' replies to the questions show that the majority of students thought that the activities were likely to promote learning and they did not have any problems in coping with them.

## 4.7 Usability of Lyceum

Section B of the questionnaire contained Likert-type items on several usability features. The whole set of items and students' answers are provided in Table 3. The key for the column headings are: SA= Strongly Agree, A= Agree,
U= Neutral/Undecided, D= Disagree, SD= Strongly Disagree, N/A= Not Applicable.

**Table 4 -  Usability of Lyceum** (Due to missing data, row totals do not always sum up to 9)

| *Lyceum…* | *SA* | *A* | *U* | *D* | *SD* | *N/A* |
|---|---|---|---|---|---|---|
| 1. doesn't always do what I was expecting | 2 | 4 | | 3 | | |
| 2. has an intuitive interface | 1 | 7 | | 1 | | |
| 3. is easy to operate | 1 | 6 | 2 | | | |
| 4. helps you learn | 4 | 3 | 1 | | | 1 |
| 4. is initially difficult to operate | | 2 | | 5 | 1 | |
| 6. has an effective help facility | | 3 | 3 | | 1 | |
| 7. makes you feel in command when using it | 1 | 4 | 1 | 2 | 1 | |
| 8. gives you good feedback when using it | 1 | 4 | 2 | | 2 | |

These answers show that the majority students thought the interface was intuitive (item 2) and the software easy to operate (item 3), even at first use (item 5); however, it did not always behaved as expected (item 1). Again, the majority of students agreed that Lyceum helped their learning.

## 4.8 Quality of Lyceum's components

Students were also asked to rate the quality of some components of Lyceum. The audio component got the lowest marks, mainly due to technical problems experienced. Whiteboard, document editor and text chat tools were popular components. The concept map tool only used in the last two eTutorials and those who used it found it good. The icons and labels on the desk top were also found from good to average quality.

**Table 5 - Rating components of Lyceum**

|  | Very good | Good | Average | Poor | Very poor | Not used |
|---|---|---|---|---|---|---|
| Audio | 1 | 1 | 2 | 3 | 2 |  |
| Whiteboard | 2 | 7 |  |  |  |  |
| Text chat | 2 | 5 | 1 |  |  |  |
| Concept map | 1 | 2 | 1 |  |  | 4 |
| Document tool | 1 | 5 |  |  |  | 2 |
| Image capture |  |  |  |  |  | 8 |
| Use of icons and labels | 2 | 2 | 3 |  |  | 1 |

The ability to divide participants into smaller groups in breakout rooms was one the most popular features of Lyceum. One student put it:

*I found it all useful but particularly like the ability to move off into splinter groups and work with other students* (Questionnaire no. 9)

The only drawback was that in the object-oriented analysis eTutorial, the documents used in the main plenary were not made available to students in the breakout rooms, and this created problems when students needed to refer back to it. This was however a problem with the session's setting and moderation rather than of Lyceum.

The students did not have any difficulty in using tools like the concept map or the whiteboard. They picked up the basics very quickly and were able to carry out tasks efficiently.

In one eTutorial, one of the participants accidentally deleted a line from the text displayed on the whiteboard. This raised the issue of weather the whiteboard contents could be locked so that only the tutor could change it, but still allow the participants to add/annotate the text. As a matter of fact, Lyceum provides a way to upload a background onto the whiteboard, which cannot be edited. The tutors could have used this facility of Lyceum to prevent accidental editing, however, they were not aware of its existence when they run the session.

## 5. Tutors' feedback

Tutors were asked to write brief reports of their sessions after each eTutorial. These provided part of the data on the tutors' perception of Lyceum as a learning environment. We also held an online review meeting with the tutors half way through the project and after the first set of eTutorials. Finally, we invited the tutors to the OU's headquarters to discuss issues arising from the trials and reflect on their experience.

As mentioned earlier, both tutors had some previous experience of NetMeeting for teaching. They found the Lyceum experience quite different, mainly due to the spontaneity of voice interaction and the fact that they had to take care of many more things happening at the same time.

In their previous experience with NetMeeting, they had primarily to follow the discussion taking place in the text chat window and present their teaching material using the whiteboard and, maybe, the desktop sharing facility. Student queries were dealt with within the text chat window, and they found that this gave them enough time to reflect and even consult course resources.

In Lyceum, however, as well as presenting teaching material using a variety of collaborative tools, they had to talk, encourage the students to participate, manage turn taking (by giving permission to talk to students who requested it using the hand up signal), manage the voting system, and keep an eye on the text chat. Having to answer queries and questions verbally added pressure, as they often had to improvise their answers. It was obviously a challenging position for tutors to be in.

The tutors' reports shows that they were well aware of the importance of carefully preparing the sessions beforehand, especially when using shared whiteboards and documents in the plenary and breakout rooms. They thought it was useful and time-saving to have all the documents and whiteboards uploaded in the appropriate 'rooms' before the start of the sessions. They noticed, however, it was possible that they would disappear if there were a connection problem during a session.

During the use of the breakout rooms for groupworking, tutors found it difficult to be in control of all the rooms at once. Also, they found it cumbersome to have to visit each room in order to invite the participants back into the plenary room, and would have welcomed the ability to send messages to breakout rooms without actually visiting them. They also thought that it would be useful to be able to have private conversation with participants. They found this practice useful in face-to-face tutorials since allowed them to discuss individual students' progress privately.

Because of the volatility of the connection to the Lyceum server, a slight discomfort for the tutors was caused by the absence of visual clues as to reassure them they were still connected and could be heard. Incidentally, this concern was echoed by some of the students.

Both tutors agreed that humour was important in a conferencing environment. They thought it was relatively easy to achieve it in a text only environment, thanks to the use of 'emoticons' or other conventions commonly used in email and text chat communication. On the other hand, when you are telling a joke while using voice in Lyceum, the other participants can not see your face and there is always a risk of misinterpretation.

Tutors found eTutoring with Lyceum much closer to face-to-face tutorials than just using a text-chat. For instance, like in face-to-face tutorials, they found ice-breaking activities useful, in particular when people were new to each other; also, learners waited their turn to talk and used the 'hand up' button if they wanted to say something. However, they felt that in Lyceum they had to put an extra effort into stating things clearly for everybody to understand, and, at all times, had to keep in mind the absence of visual clues.

Tutors preferred not to have too many students in one session. In one of the early sessions there were about nine students online at the same time, and it happened to be

the session with the highest number of technical problems. This led to a belief in the tutors that Lyceum could not cope with too many participants. In terms of running the session smoothly and avoiding technical problems, tutors thought the number of participants should be kept low, with six to eight students online.

The tutors emphasised the importance of providing technical support for the students. They found that dealing with students' technical problems during a session was very disruptive, and distracted the participants from the teaching activities, in particular when problems were recurrent. Also, some problems were beyond the tutors' technical expertise. Tutors suggested that it would be useful to have an online Lyceum helpdesk to deal with students' problems arising during a session. This would not only allow them to get on with their teaching, but also expert help would be more effective when dealing with unfamiliar and complex environments like Lyceum.

We were interested in the effort required to prepare the teaching material for the Lyceum sessions. Tutors stated that, as they were starting from scratch, this took quite a long time. However, they thought that they could easily re-use and adapt the material for future use, and this would reduce the preparation time considerably.

On a more general note, the tutors stated that the OU, and in particular, their regional office, provided adequate support and encouragement in the use of new technology for teaching. They felt that they (and their colleagues) were kept informed of new developments and provided with the necessary tools, should they to deploy them in their teaching. On the other hand they felt there was scope for improvement in the amount and quality of training available covering the use of these new technologies.

Overall, both tutors thought, if reliability issues are addressed, Lyceum had the potential to be a very useful teaching medium, in particular for students in disperse geographical areas. The immediacy of interaction between students and teacher was found to be the most valuable aspect of the learning environment offered by Lyceum.

## 6. Summary of findings

Students enjoyed using Lyceum for learning and the majority considered the sessions worthwhile. They found the activities challenging and likely to promote learning. They reported that the sessions contributed to their understanding of the subjects covered; they even provided specific examples of learning from the topics covered in the sessions.

Students, even those without any previous knowledge of synchronous systems, did not experience any particular problems with the skills required to use Lyceum. The majority found the Lyceum interface intuitive and the software easy to operate. However, some students found the use of collaborative tools and 'breakout rooms' slightly confusing.

Students found audio communication more effective than just text, and thought that the combination of speech, graphics and text within the same system made it very flexible. Among the components of Lyceum, the whiteboard, text editor and text chat tool were found to be the most useful by the majority of the students. The performance of the audio component was found to be disappointing by half of the

students. The audio levels amongst the participants were often not uniform, with some participants being perceived as very loud and some as very faint. In extreme cases, some students could hear, but could not be heard and had to resort to using the text chat to make their contributions to the sessions.

Tutors thought that, if reliability is improved, Lyceum has the potential to be a very useful teaching tool. Because of their previous experience, they could compare Lyceum with NetMeeting. They found teaching with Lyceum more challenging, with so many things to be monitored at the same time. On the other hand, the immediacy and interactivity it allows is a great asset for teaching students at a distance.

Tutors found teaching with Lyceum much closer to face-to-face than their experiences with NetMeeting using just text-chat. For instance, as in face-to-face tutorials, they found ice-breaking activities useful; also, learners waited their turn to talk and used the 'hand up' button if they wanted to say something. However, they felt that in Lyceum they had to put an extra effort into stating things clearly for everybody to understand, and, at all times, had to keep in mind the absence of body language.

Because of the volatility of the connection to the Lyceum server, a slight discomfort for the tutors was caused by the absence of visual clues to reassure them they were still connected and could be heard. Incidentally, this concern was echoed by some of the students.

Tutors suggested a number of improvements to the Lyceum system, including the ability to monitor breakout rooms without having to visit them, and the ability to have private conversations with participants.

In terms of the effort required to prepare the teaching material for the Lyceum sessions, tutors stated that this took quite a long time as they were starting from scratch. However, they thought that they could easily re-use and adapt the material for future sessions, or even face-to-face tutorials, and this would reduce the preparation time considerably in the long run.

## 7. Conclusions and recommendations

In this concluding section, we reflect on the investigation in the light of the project's aims as stated in Section 2.

### 7.1 Perceived value of voice groupware for eLearning

Most students enjoyed the experience, and found it worthwhile. Technical problems were experienced by some students, which prevented them from taking part in the sessions. The students who were able to participate reported learning from their experience. They valued having audio, graphics and text all in the same environment and appreciated the opportunity to work on a common task as a team. The immediacy of the feedback available from tutors and peers, fast communication using voice instead of typing, the ability to share documents and images were among the most useful aspects of Lyceum, mentioned by both students and tutors.

Audio communication was preferred to typing by many students because it provided a more immediate means than having to keep up with constant stream of text messages. Since many of those students had experience of NetMeeting, they were able to

compare it with Lyceum and recognised that it is much easier to keep pace when voice communication is used instead of just text. Cerrato and Belisle (1995) comment on similar findings in their study:

> "Typing is not a spontaneous or easy way to communicate for most people, for it slows down the exchanges, obliges to a structuring of the information and provides little feedback."

On the other hand, tutors found teaching with audio more demanding. In particular, they felt under pressure to be quick in understanding and answering queries and questions from the students, with no time for consulting their notes or the teaching material. Although tutors did not think Lyceum saved them any teaching time, they thought the quality of teaching using Lyceum could be very good.

Overall, there was an agreement that voice groupware, and in particular Lyceum, could provide a valuable learning environment to support learners studying at a distance.

## 7.2 Documenting best-practice

To run successful eTutorials with voice groupware the following factors should be taken into consideration.

### 7.2.1 Warm-up sessions

We found that running warm-up sessions was particularly useful to create a level playing field. Although participation was voluntary, most students took part in them. We noticed that the few who didn't and just turned up at the first eTutorial were at a disadvantage, needed more support and experienced more technical problems.
Tutors and students were remarkably more relaxed and competent in their second eTutorials. Also, they seemed to cope much better with technical problems, not getting frustrated and even making jokes about them.

> **Recommendations**: Warm up sessions should be run to create a level playing field and to test the technology. Problems identified during warm up sessions should be addressed prior to the eTutorials. Sessions should be run regularly in order to improve the quality of participation and foster a sense of community.

### 7.2.2 Moderation

In all our sessions, one moderator, the tutor, was running the eTutorial and facilitating discussions and collaborations amongst the students. In a perfectly reliable conferencing system this should be enough. However, due to the volatility of current conferencing systems, and in particular of Lyceum, a second moderator would have been a valuable resource. In one of the sessions, the tutor was logged out of the system for several minutes. At that point the students were uncertain as to what to do. A second moderator could have taken over and carried on while waiting for the tutor to return. A second moderator could have also helped to supervise group work in the 'breakout rooms'.

> **Recommendations**: Make use of a support moderator to take over in case of unavailability of the main moderator, or to deal with latecomers or technical

problems. The role of the main and support moderators should be agreed in advanced. If breakout rooms are used, and depending on the number of participants, the two moderators could share the load of supervision.

### 7.2.3 Duration

Participating in Lyceum eTutorials can be very tiring. It takes a lot of concentration to carry out the collaborative activities online and in real-time, with visual and audio input and output occurring at the same time. This is compounded by the often imperfect audio quality and other common technical problems, relating to the instability of Internet connections and variations in traffic conditions on the Internet. These factors get in the way of the teaching and contribute to the fatigue. We found that a continuous online session of about one hour was just about right.

However, there is only a limited amount of work that can be carried out in a one hour session. During the first eTutorial, we were rather ambitious about the amount of material we expected to cover. After over an hour online, albeit much disrupted by technical problems, the tutor had only managed to go through seventy percent of what was planned and had to cut the eTutorial short.

**Recommendations**: For optimum performance and to limit fatigue, a continuous online session should not exceed an hour. If longer sessions are required, comfort breaks should be included. The material to cover during a session should be carefully tailored not too exceed the time limit. For particularly complex or lengthy topics, a series of short related eTutorials is a better solution than overloading the participants within one session. A combination of off- and on-line activities over an extended period of time could also be considered.

### 7.2.4 Session scripts

The tutors were encouraged to prepare session scripts. Each script provides a detailed plan of the session, including the set of activities, their sequencing, the tools required, and prompts to help the tutors moderate the session smoothly. The scripts were very valuable for the tutors during the sessions, acting as memory aids and helping with time keeping. They also allowed the two tutors to rehearse the eTutorials amongst themselves and to run comparable sessions with different groups of students. An example of a session script is provided in Appendix B.

**Recommendations**: Make use of session scripts to plan and rehearse the eTutorials. Each script should summarise the activities to be performed, their sequence, the tools used and should include prompts for the moderators, including opening and closing statements.

### 7.2.5 Pre-session work

Lyceum eTutorials are difficult to improvise and, to be successful, preparation is crucial. In particular, it is important to plan their length, content and structure. As technical problems are common, flexibility is needed in structuring the material and it is important to allow for loss of time. There is a need for the tutors to be familiar with the technology; rehearsing the sessions is also helpful.

> **Recommendations**: eTutorials should be carefully prepared, and whenever possible rehearsed. Session structure should be flexible. The tutors should be familiar with the technology and appropriately trained in its use.

### 7.2.6 Technical workarounds and support

Technical problems were common in our trial with Lyceum. Some students experienced problems installing and testing the system. To overcome this, we provided some technical help wherever possible ourselves and re-directed the more 'difficult' cases to the OU's computing support helpdesk.

During the online sessions, we could provide only limited technical support – we were already very busy observing and recording the sessions. The first eTutorial was particularly problematic: it was the most crowded; three students experienced very severe problems and, in the end, had to abandon the session. However, they were very persistent and tried very hard to get online for over three quarters of an hour. This was very disruptive for the tutor and the other students. For subsequent eTutorials, we told students they should give up if they were unable to establish a stable connection within ten minutes of the start of the eTutorial. This seemed to work quite well, although it was still disappointing for those who had to drop out.

> **Recommendations**: Expert support should be made available to the users for the installation and testing of the system prior to participation to eTutorials. Some online technical help would be beneficial during the sessions to deal with unexpected problems. Basic training in the use of the system should be provided prior to the eTutorials. Strategies to cope with technical failures during a session should be agreed.

## 8. Feasibility of large-scale deployment

Reliability seems to be the major obstacle to a large-scale deployment of the technology on the course. Of course, there is also an issue of whether such technology would meet the needs of all students and tutors. This question is still unresolved, although the trial has shown that some students could benefit from it. Therefore, rather than a full-scale deployment of the technology on the course, we should think in terms of offering it as an optional component, with the understanding that not everybody may be able or willing to benefit from it.

Particular skills and training are required to become proficient in running eTutorials with voice groupware. It is not realistic to expect that all tutors on the course should develop such skills or should be interested in doing so. A more cost-effective solution would be to train a small, but committed group of tutors, say, eTutors, who are genuinely interested in running eTutorials.

As students can participate in the sessions irrespectively of their physical location, regional based support for online tutoring is not required and different models could be considered. For instance, a small group of eTutors could run eTutorials regularly, on a national basis, with students pre-booking participation.

Because of the considerable effort required, the preparation, and distribution of material and other resources for eTutorials should be co-ordinated centrally by the academic course team. Of course, tutors should be encouraged to adapt and improve the material, but they should not be required to produce it from scratch.

A Lyceum specific helpdesk should be made available to students and tutors. It should support basic installation and testing tasks, but also provide baseline instructions in using the system Online expert help would also be beneficial: tutors should not be expected to solve their students' technical problems during an online session.
.

## 7.3 Identifying potential problems with Lyceum and areas for improvement

Undoubtedly, the low reliability of Lyceum was the main problem we encountered during the trial. This caused frustration in both tutors and students and, especially connection problems impaired severely their ability to teach. As a result, improving the reliability of Lyceum was at the top of tutors' agenda.

Related to this was a lack of confidence in the ability of the system to sustain communication. Hence, during the sessions participants would have appreciated some visual clues to inform them on the current state and quality of their, and the other participants' connection to the server. Note that, although the Lyceum client displays a participants list, this is of little use in case of failures: in some sessions, the participants' names still appeared in the list after they had been disconnected; or the voice codecs remained active even after a complete failure of the client's GUI.

As well as improving its reliability, based on our findings, we would recommend the following improvements to Lyceum.

- A facility to share the participants' desktop and applications. This is particularly important in computing education when there is often a need to look at commercial and other software in operation. This would also allow the sharing of slides, e.g., as PowerPoint presentations.
- A private voice or text chat channel, to allow tutors to have private conversations with their students.
- A facility to monitor breakout rooms from the outside, including the ability to send messages to participants in those rooms. For instance, during the trial it was quite tedious for the tutor having to visit each room to reconvene a plenary after a groupworking exercise.
- The ability to save and restore the content of the text chat window. In some of our sessions, a few students were able to hear, but not be heard, and they used the text chat for their input to the conference. Students also used the text chat for making jokes without interrupting the tutor. The ability of saving and restoring the content of this window is particularly helpful when a user is temporarily logged out of the system.
- The ability to record the sessions server-side - including audio, text chat and the content of collaborative tools - and make the recordings available on demand for a later viewing.
- The ability to exchange files.
- A visual feedback on the state and quality of the connection to the server.

# ACKNOWLEDGMENTS

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## Appendix A – Sample materials

Sample of the material prepared by the tutors for the eTutorial on Smalltalk collection classes.

---
START OF SAMPLE MATERIAL
---

## Collections Tutorial

*Learning Objectives*

By the end of the tutorial, each student will have a strengthened understanding of:

–  How to choose which type of collection to use for a simple application, given a choice of set, dictionary, array, sorted or ordered collections.

–  How to write simple Smalltalk code to manipulate collections.

–  How to create own class for holding a collection of objects.

*Tools*

-  Lyceum software

-  Voice and text chat

-  Multiple Whiteboards (prepared and active multi-user)

-  Headset

-  Windows notepad (prepared script for copy'n'paste)

-  Scratchpad for notes

*Preparation Material for Students*

–  A List of Collection Classes to be familiar with Set, Dictionary, Array, OrderedCollection, SortedCollection

–  A sample 'non-block argument' method for the student to analyse and write the comment for:
```
countVowels: aString
"Deliberately missing comment…"
| vowelCount  index |
vowelCount := 0.
```

```
            index :=1.
            [index <= aString size]
                  whileTrue: [(aString at: index) isVowel
                        ifTrue:[vowelCount:= vowelCount+1].
                        index := index+1].
            ^vowelCount
```

−   Have a pack of playing cards ready at hand at the tutorial.  Here is the code
    structure for two new classes - PlayingCard and PackOfCards.

```
PlayingCard subclass of Object
----------------------------------------------------------------------
      instance variables:
            face -- This variable records the number of
                  the card, ie. Ace, Two etc.
            suit -- This variable records the suit of
                  the card, ie. Hearts
      instance methods:
            face:
            face
            suit
            suit:
      class variables:
            no class variables
      class-instance variables:
            no class-instance variables
      class methods:
            no class methods

PlayingCard class comment
----------------------------------------------------------------------
      PlayingCard is a subclass of Object, and models a
      playing card, by face and suit, such as the Ace of Spades


PlayingCard instance methods code
----------------------------------------------------------------------
face
^face

face: aString
      face := aString

suit
^suit

suit: aString

suit := aString
----------------------------------------------------------------------


PackOfCards subclass of Set
----------------------------------------------------------------------
      instance variables:
            no instance variables
      instance methods:
            showCards
```

```
        findCard:of:
        sortSuit
        deal:
        initialize
        collectSuit:
class variables:
        no class variables
class-instance variables:
        no class-instance variables
class methods:
        no class methods
```

PackOfCards class comment
--------------------------------------------------------------------
        PackOfCards holds a reference to all the cards in the
        pack excluding jokers

PackOfCards instance methods code
--------------------------------------------------------------------
collectSuit: aSuit
"Collect together all the cards of the suit aSuit"
        "code to be discussed at tutorial"


deal: numberOfPlayers
"Deal out the pack of cards to the numberOfPlayers"
        "code to be discussed at tutorial"


findCard: aFace of: aSuit
"Return the card that matches aFace of aSuit. Remove that card from
the pack"
        "code to be discussed at tutorial"


initialize
"Populate the Pack with cards. Create an array for card faces and
another array for card suit, then create a new instance of
PlayingCard for each combination of face and suit.  Add each card to
the Pack"

| newCard suits index faces suitIndex |
faces := Array new:13.
faces at: 1 put: '01'; at: 2 put: '02'; at: 3 put: '03'; at: 4 put:
'04'; at: 5 put: '05'; at: 6 put:'06'; at:7 put: '07'; at: 8 put:
'08'; at: 9 put: '09'; at: 10 put: '10'; at:11 put: '11'; at: 12 put:
'12'; at:13 put: '13'.
suits := Array new:4.
suits at:1 put: 'Spades'; at:2 put: 'Hearts'; at:3 put: 'Diamonds';
at: 4 put: 'Clubs'.
suitIndex := 1.
4 timesRepeat: [
                index :=1.
                13 timesRepeat: [newCard := PlayingCard new.
                                   newCard suit: (suits at:
suitIndex);
                                   face: (faces at: index).
                                   self add: newCard.
                                   index := index+1].
                suitIndex := suitIndex + 1]


sortSuit
"Return the cards of the suit in order"
        "code to be discussed at tutorial"sortSuit2
```

5. The Block Argument Alternative

```
countVowels2: aString
"Deliberately missing comment…"
     | vowelCount |
     vowelCount := 0.
     aString do: [:each | each isVowel
               ifTrue:[vowelCount:= vowelCount+1]].
     ^vowelCount
```

6.  Accepting that the LB implementation converts to integer and involves the ASCII format, we'll simply apply comparison of Char.

```
isVowel
"Return true if receiver is a vowel, false otherwise"
|vowelSet|
vowelSet := Set new.
vowelSet add: $A; add: $E; add: $I; add:$O; add: $U.
vowelSet do: [:each | each = self asUppercase
                                  ifTrue: [^true]].
^false
```

```
isVowel
"Return true if receiver is a vowel, false otherwise"
^'aeiou' includes: (self asLowercase)
```

7. Pack of cards

```
findCard: aFace of: aSuit
"Return the card that matches aFace of aSuit. Remove that
card from the pack"
     self do: [:each |
               each face = aFace & each suit = aSuit.
                        ifTrue:[self remove: each.
                                      ^each]]
```

8. collect suit, sort suit and deal

```
collectSuit: aSuit
"Collect together all the cards of the suit aSuit"
     | selectedSuit |
      selectedSuit := Set new.
     self do: [:each | each suit = aSuit
                    ifTrue:[selectedSuit add: each.
                            self remove: each]].
     ^selectedSuit
```

```
sortSuit
"Return the cards of the suit in order"
      ^self asSortedCollection: [:each :next | each face
<next face]



deal: numberOfPlayers
"Create a collection to hold one hand for each player,
each of which is a collection of cards. Deal out the pack
equally to the players' hands.  Return the collection of
hands"
      | index hands |
      hands := Array new: numberOfPlayers.
      1 to: (hands size) do: [ :count | hands at: count
put: Set new].
      index :=1.
          self do: [:each | (hands at: index) add: each.
                          index := index + 1.
                          index > (hands size)
                                ifTrue: [index := 1]].
      ^hands
```

---

END OF SAMPLE MATERIAL

---

# Appendix B – Sample session script

Sample of session script used by the tutors for the eTutorial on Smalltalk collection classes.

---

START OF SAMPLE SCRIPT

---

*Outline Tutorial*

| | Action | Tool | Remarks |
|---|---|---|---|
| 1 | Welcome                              students brief on 'other' staff presence | Audio | |
| 2 | Outline Objectives of tutorial | W/B | |
| 3 | Recall prep material - discuss usage of <br><br> Set An unordered collection of elements, each of which is unique. <br> Dictionary Subclass of Set. Only contain instances of class Association (key + value). <br> Array Indexed fixed size collection with elements of any class. <br> OrderedCollection Indexed expandable collection with element order determined by insertion point. <br> SortedCollection Indexed expandable collection with element order determined by a sorting criterion. | Audio <br> W/B | |
| 4 | Recall prep material countVowels - ask for submission of comments | Audio <br> W/B <br> (students) | |
| 5 | Introduce block argument version of countVowels - ask students to analyse and compare with original | Audio <br> W/B | |
| 6 | isVowels is used a lot here, where would it be located (character) and how could it have been constructed? | Audio <br> W/B | sample 'plain English' method comment <br> two sample methods - let students try to write one first of all |
| 7 | Sometimes need to find and extract an element from a collection. Consider a pack of cards: pick up your pack and go through it till you find the queen of hearts. Remove that card. | Audio | |
| 8 | how can we write code to do the same? <br><br> now remove an entire suit? Spades <br><br> and to sort that suit? <br><br> deal the cards to a number of players? | Audio <br> W/B | sample 'plain english' method comment |
| 9 | Review: <br> Collection choice | Audio | |

|   | Simple Code for Collections Own Class |   |   |
|---|---|---|---|
| A | Any questions? | Audio | sign off |

END OF SAMPLE SCRIPT

## Appendix C – Evaluation questionnaire

Evaluation questionnaire for the eTutorial on Smalltalk collection classes. This was distributed as a Microsoft Word form to be filled and returned electronically.

START OF QUESTIONNAIRE

# M206 Lyceum Feedback Questionnaire

**Please enter your name:**

## Part A: your previous experience

We would like to know about your experience of using Lyceum or other similar conferencing applications before this M206 eTutorial. Please indicate which of the following you have used by placing a tick in the corresponding boxes:

| Application | used for text chat | used for audio conference | used for OU course work |
|---|---|---|---|
| Lyceum | ☐ | ☐ | ☐ |
| NetMeeting | ☐ | ☐ | ☐ |
| other (please specify:        ) | ☐ | ☐ | ☐ |

## Part B: using Lyceum for the eTutorial

| | |
|---|---|
| **Did you enjoy using Lyceum to learn about Smalltalk collections?** | Yes ☐       No ☐ |
| **Was the eTutorial worth participating?** | Yes ☐       No ☐ |
| **Did the eTutorial contribute to your understanding of Smalltalk collections?** | Yes ☐       No ☐ |

**B.1. What did you learn from the eTutorial? Anything new? Please elaborate:**

B.2. During the eTutorial, were there any points at which you were confused by the software? Please explain:

B.3. During the eTutorial, were you comfortable communicating with the other students and the tutor through Lyceum? Please elaborate:

B.4. In general, did you find that Lyceum could support the conversation between the participants? Please elaborate:

B.5. Did you feel you could interrupt and make your views known to the group effectively? Please elaborate:

**B.6. In your opinion what was the best thing about Lyceum as a learning tool?**

**B.7. What was the least helpful aspect of Lyceum in terms of its potential to promote learning?**

| | |
|---|---|
| **The activities included in the eTutorial were challenging.** | Yes☐　　　　No☐ |
| **The activities carried out during the eTutorial are likely to promote learning.** | Yes☐　　　　No☐ |
| **During the eTutorial it was clear what one had to do.** | Yes☐　　　　No☐ |

**B.8. Which of the activities included in the eTutorial did you find most and least useful?**

## Part C: usability of Lyceum

Please indicate the degree of your agreement with the following statements by placing a tick in the associated cell. The key for column headings is as follows:

**SA** Strongly agree　　　　**A** Agree　　　　**U** Undecided
**D** Disagree　　　　**SD** Strongly disagree　　　　**N/A** Not applicable

| Lyceum… | SA | A | U | D | SD | N/A |
|---|---|---|---|---|---|---|
| doesn't always do what I was expecting | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| has an intuitive interface | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| is easy to operate | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| helps you learn | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| is initially difficult to operate | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| has an effective help facility | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| makes you feel in command when using it | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| gives you good feedback when using it | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

**Please rate the quality of the following elements of Lyceum:**

| | *Very good* | **Good** | **Average** | **Poor** | **Very poor** | **Not used** |
|---|---|---|---|---|---|---|
| Audio | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Whiteboard | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Text chat | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Concept map | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Document tool | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Image capture | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |
| Use of icons and labels | ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

**Do you have any comments you would like to make about the software and/or the eTutorial as a whole?**

*Thank you for filling in this questionnaire!*

END OF QUESTIONNAIRE