



PROCEEDINGS OF THE
9th ANNUAL CONFERENCE
ON WORLD WIDE WEB APPLICATIONS

5-7 September 2007
Johannesburg
South Africa

Editor:

P.A. van Brakel

Publisher:

Cape Peninsula University of Technology
PO Box 652
Cape Town
8000

Proceedings published at
<http://www.zaw3.co.za>

ISBN: 978-0-620-39837-4

TO WHOM IT MAY CONCERN

The papers accepted for the 9th Annual Conference on World Wide Web Applications held on 5-7 September 2007 in Johannesburg have been peer-reviewed by external reviewers. The evaluation process was as follows:

Phase 1: A *Call for Papers* was published and abstracts received.

Phase 2: Abstracts were evaluated by an international committee and authors of selected abstracts invited to submit the full text of their papers.

Phase 3: Full text papers were received and blind-evaluated according to a set of criteria by the following peer-reviewers:

Prof J Brits (PhD)
Faculty of Information Sciences
University of Wisconsin
Milwaukee
USA

Mr M Erasmus (MBA)
Erasmus Associates
Pretoria

Mr AM El-Sobky (MA)
RITSEC
Cairo
Egypt

Dr David Raitt (PhD)
European Space Agency
Noordwijk
The Netherlands

Prof J Singh (PhD)
Dept of Information Science
Punjabi University
Patiala
India

Prof AM Singh (PhD)
Department of Information Systems and Technology
University of Kwazulu-Natal
Durban

Dr S Pather (PhD)
e-Innovation Academy
Cape Peninsula University of Technology
Cape Town

Ms C Strümpfer (MSc)
e-Innovation Academy
Cape Peninsula University of Technology
Cape Town

Prof PA van Brakel (PhD)
e-Innovation Academy
Cape Peninsula University of Technology
Cape Town

Dr RB Williams (DEd)
Hong Kong Baptist University
Hong Kong

Phase 4: Authors of those papers selected were notified that their papers (with or without amendments) were added to the final programme of the Conference.

Phase 5: Papers were reformatted to PDF and published digitally in the permanent Conference Website (<http://www.zaw3.co.za>)

Further enquiries:

Prof P.A. van Brakel
Conference Chair
9th Annual Conference on WWW Applications
e-Innovation Academy
Cape Peninsula University of Technology
Cape Town
+27 21 469-1015 (landline)
+27 82 966-0789 (mobile)

**Innovative training and support interventions
with respect to a commercial learning management system**

J.W. Fresen

jill.fresen@up.ac.za

E. Drysdale

estelle.drysale@up.ac.za

M. Kotzé

magdaleen.kotze@up.ac.za

M.D. Scheepers

detken.scheepers@up.ac.za

A.J.J. Jordaan

dolf.jordaan@up.ac.za

Department for Education Innovation
University of Pretoria
Pretoria
South Africa

Abstract

During 2006, the University of Pretoria embarked on an upgrade from WebCT Campus Edition to WebCT Vista 4, now called the Blackboard learning management system. The customised name for the system at the University of Pretoria is *clickUP*. The ethos behind the choice of name, besides the incorporation of the UP acronym, is to spread the idea of 'clicking up' teaching practice, 'clicking up' assessment strategies and 'clicking up' with ICTs. This paper reports on the problem of training and supporting existing and new users of the learning management system. The research methodology was to establish various task teams to handle all aspects of the upgrade. In particular, the strategies of the Training and Support task team contributed to solving the research problem. Innovations in the training strategy include lunch times sessions, just-in-time and customised training for lecturers, a help website, fact sheets and the use of props, analogies and storytelling during face-to-face training sessions. Participant feedback is exceptionally positive. The main support intervention was the establishment of an e-support office to support lecturers with technical and administrative tasks in the electronic environment and to provide one central point for assistance. The members of the team developed and matured in their understanding and usage of clickUP, including best practices which were incorporated in the training strategy. Important lessons were learned by the instructional design team, which are shared in this paper. It is possible for other training and support teams to modify many of these ideas and resources for their own needs.

Key words: Staff training, support, learning management system, story telling.

1. Introduction

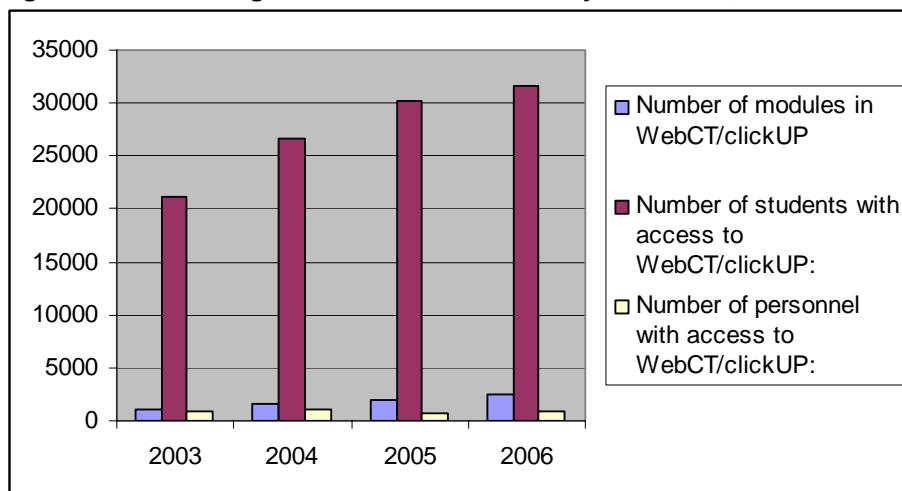
The University of Pretoria (UP), South Africa, is the largest contact institution in South Africa, with nine faculties, approximately 35 000 contact students and 3 000 faculty members. Although UP is classified as a contact institution, it has three government approved paper-based distance programmes in the Faculty of Education. The remaining undergraduate and postgraduate degree programmes are offered in a blended mode, with lecturers having the option to adopt information and communication technologies (ICTs) to the extent that suits them, their students and their subject area.

2. Situation analysis

The authors of this paper are project managers and instructional designers in a centralised support department, the Department for Education Innovation (EI). Their roles include consulting with lecturers to design and develop learning materials in the online learning environment (using a commercial learning management system), as well as in the use of offline support technologies, such as multimedia CD-Roms.

The UP has used WebCT for almost a decade and had built up a significant investment in the technology, as well as the human resource capacity to utilise it effectively. By 2005, approximately 30 000 students had online components in their courses, over 700 lecturers were registered users, and there were around 2 000 WebCT modules on the system (see Figure 1). The increasing demands on the system meant that it was becoming less stable and less sustainable. Newer enterprise systems had since emerged, based on database architecture, which enables greater control over the system, as well as integration with other campus IT systems. A feasibility study conducted during 2005 considered various alternatives, including open source software, or building an in-house system. The decision was made to upgrade to WebCT Vista 4, now the Blackboard learning management system.

Figure 1: WebCT usage statistics at the University of Pretoria, 2003 to 2006



The vendors assisted with the initial project planning, recommendations for the establishment of task teams and training of the instructional design team. The Communication task team brainstormed a marketing and communication strategy, which included a customised name for the UP learning management system, *clickUP*.

The ethos behind the choice of name, besides the incorporation of the UP acronym, is to spread the idea of 'clicking up' teaching practice, 'clicking up' assessment strategies and 'clicking up' with ICTs.

3. Research problem

Although the instructional design team retrieved training in the new learning management system, there was an obvious need to support and train existing WebCT users (lecturers and students). The purpose was not only for users to learn how to use the new version, but also for lecturers to re-conceptualise and re-design their existing WebCT modules, in order to convert them to the new system and to take advantage of the new functionalities.

The research problem was therefore to:

- establish support mechanisms and support materials for all users (lecturers and students) of the new learning management system;
- design, develop and present training sessions and training materials for existing and new users (lecturers and students) of the learning management system.

4. Research methods

A task teaming approach was used to manage all aspects of the implementation of the new learning management system (Dark & O'Brien, 2005:6). One of the task teams established was the Training and Support (T&S) team. This team was responsible for identifying target populations of people requiring training, such as lecturers and students involved in the pilot project, lecturers and students in general, peer e-learning developers, and education consultants. It was also obviously necessary to re-conceptualise and re-design all existing lecturer and student training programmes and support mechanisms.

The T&S team consisted of ten members of EI, including project managers, instructional designers and education consultants. During the pilot phases, the team met once in two weeks. Detailed minutes of each meeting were kept and made available to all team members via a virtual group on the University's intranet.

The following support mechanisms were designed and established:

- an e-support office;
- a Help website.

The following training mechanisms were designed and established:

- a training strategy document;
- formal training courses;
- informal lunch time sessions;
- just-in-time (JIT) and customised training.

All the above support and training interventions are discussed further below.

5. E-support office

The main support intervention was the establishment of an e-support office. Such an

initiative had been considered for a long time, even before the implementation of clickUP. The growing need to support lecturers meant that instructional designers were overburdened with technical and administrative tasks in the electronic environment. It also became clear that users would benefit by having one central point to request assistance.

The e-support office is now well established. It makes use of a dedicated email address as well as telephonic support. The functions of the e-support office are to:

- provide second line support in the electronic environment (after the first line assistance provided by the departmental reception desk);
- create new modules in clickUP (via the use of an online request form completed by lecturers);
- provide access to users as requested (e.g. Designer, Instructor, Teaching Assistant or Auditor access);
- open clickUP modules, when ready, to students so that they may access them via the student portal;
- refer any training or design needs to the applicable instructional designers.

6. Help website

Early in the pilot project, it became evident that a clickUP help website would be a useful mechanism to inform the campus community of the need for and progress with the clickUP implementation, as well as to provide information, training schedules and training resources. The site may be viewed at <http://www.click.up.ac.za>.

- **The seven steps**

Feedback from an early presentation of the clickUP Basic course was that it was too overwhelming and that a summary of the process (or a 'recipe') would be helpful. We developed 'the seven steps to getting started', which clearly describe the step-by-step process required, from application for the creation of a new clickUP module, to the organisation of the content and management of the completed course (see http://www.click.up.ac.za/getting_started.htm). The presentation of the clickUP Basic course was then aligned with the seven steps, which served to integrate the two mornings more meaningfully.

- **Fact sheets**

An novel form of handout was conceptualised, called a 'fact sheet'. Fact sheets are visual quick reference guides, no more than two pages, each focusing on one tool or topic in clickUP. Additional fact sheets continue to be designed and developed by members of the T&S team, as the need arises. Relevant fact sheets are distributed during face-to-face training sessions and are available on the help site for further reference (see <http://www.click.up.ac.za/lecturerresources.htm>).

- **FAQs**

Frequently asked questions which originated during the pilot project and continue to grow, are available on the website (see <http://www.click.up.ac.za/lecturerresources.htm>).

- **Self paced learning resources**

The local WebCT/Blackboard vendor (Eiffel Corporation) designed and developed visual training materials and demonstrations ('Cultivate') on the use of the learning management system. This material was purchased and made available to UP users. The material available includes student training material.

7. Training strategy

In previous years, the e-learning training strategy of the Department for EI was to provide training in the use of the learning management system to lecturers, but in general, the centralised team of instructional designers did most of the design and development of WebCT modules. With the ever-increasing demand to use the electronic environment, a major change in strategy was to equip lecturers to become more self sufficient in the design, development and facilitation of their online courses. As a result, extensive training and support materials were purchased, designed and developed, and made available on a clickUP help website (see next section).

It had long been an issue that lecturers are seldom able to attend full day training sessions, due to lecturing and other commitments. Another innovation in strategy therefore, was to present short lunch time refresher training sessions, for users who were familiar with WebCT Campus Edition. These 'brown bag lunches' introduced them to the new interface, and one-by-one to the new tools and functions in clickUP (see next section).

The existing staff training sessions for WebCT included Basic, Intermediate and Advanced (Designer) courses, as well as a generic Facilitation of e-Learning (FeL) course. In the light of the implementation of clickUP, the strategy was to maintain this stable of courses, but to re-conceptualise and re-design them. An innovation which proved to be highly successful was that the Basic and Intermediate courses were extended from one day to two mornings, which lessens the potential information overload. The Basic course now incorporates topics such as how to prepare course materials using a freeware pdf writer and image compressing software.

The newly designed FeL course was presented for the first time in April 2007 and was attended by 12 lecturers. It is based on Salmon's (2002) five stage model and includes a pre-course online component (1 week), a face-to-face workshop of four half-days, and four weeks online following the workshop. The credit requirement for the FeL is the completion of two assignments submitted online, whereas the other courses provide only attendance certificates. In all the training courses, there is a strong emphasis on the critical nature of prior planning in terms of curriculum, content, assessment and the structure and organisation of learning materials.

8. Training innovations

The T&S team brainstormed various rather innovative training interventions, which have proved to be very successful. These interventions are described below:

8.1 Lunch time sessions

In order to meet requests from lecturers for shorter and more flexible times for training sessions, clickUP lunch time sessions were introduced during the pilot project. Since many lecturers had already used WebCT extensively, they required only short refresher sessions to introduce them to the differences and additions in the new version. A series of seven hands-on clickUP lunches was designed, each session focusing on one particular topic or tool (see <http://www.click.up.ac.za/schedule.htm>). The take-away lunch packets provided proved to be a great success.

During September, October and November 2006, the lunch time sessions were offered twice a month on the main campus and once a month on satellite campuses, with a total of 447 lecturers attending. The sessions continued after the termination of the pilot project and the full implementation of the clickUP system. Lecturers find them convenient and enjoyable and it emerged that repeated attendance at particular sessions reinforced the skills and knowledge required to use clickUP effectively.

8.2 JIT and customised training

In keeping with the training strategy of equipping lecturers to become more self-sufficient in the electronic environment, just-in-time (JIT) and customised training sessions are offered to individual lecturers and/or departments. Although e-learning project managers and instructional designers are able to negotiate and present such sessions themselves, there is a team of three instructional designers who specialise in this area.

8.3 Use of props

The experience of the team of instructional designers was that some of the new tools and features were difficult for a user to grasp fully, especially on first exposure. Therefore a set of props was collected to engage the lecturers more deeply, to add a sense of fun and to provide visual enrichment in the training courses. The props include:

- A tool set, to highlight the difference between Course Tools and Course Content;
- A set of physical hats, to highlight the different roles, namely a planner's 'thinking cloud', a builder's hard hat (Build tab), a professor's mortar board (Instructor tab) and a student's peaked cap (Student View tab);
- A physical plastic folder and a text book with a Table of Contents, to illustrate the difference between folders (unstructured) and learning modules (structured).

8.4 Use of analogy

The use of analogies can effectively communicate concepts to students and analogies are considered to be an important component in the repertoire of effective teachers and trainers (Treagust, 2006).

In training lecturers, it is vital to entrench the use of recommended best practices, for example, in the use of the File Manager. Users must understand the implications of uploading and downloading files, the need to create folders on the server in order to organise their files, and the need to overwrite outdated files so that the server does not become overloaded with useless files.

For this purpose, the analogy of the **clothing industry** was used and a poster was developed (see <http://www.click.up.ac.za/fm.htm>). The idea is that the Designer (the lecturer) prepares and designs his or her learning materials on their own 'machine'. They then transport the products from their machine, to the 'warehouse' by means of a 'truck' (Content Browser (Get Files) in the File Manager). They must previously have prepared a 'shelf' (folder) in the warehouse on which to store their products. However the products are not yet visible to the 'consumer' (the student) until they are displayed in the 'display window' (the Course Content Home page). This display window must also have been previously prepared, by creating folders (unstructured) or learning modules (structured). The analogy for the structured learning module is a **text book**, with a structured table of contents, including headings, subheadings and numbering which can be integrated with learning activities (e.g. chat, quiz, discussion, assignments). The analogy for the unstructured folder is a **shopping basket** in which items are placed in

no particular order (e.g. a collection of past exam papers or samples of student work).

8.5 Use of storytelling, pictures and metaphors

Storytelling is an ancient and powerful art. Stories are more powerful than case studies or examples and they can be used effectively as a teaching and knowledge creation tool (Mbigi, 2005). Mbigi (2005:41) goes on to say “In storytelling, dry facts are reduced and angled around a particular strategic theme and the woven into a tapestry of a heroic, collective, mythical story. In so doing elements of fantasy, attracting attention, novelty and inquisitiveness contribute to making the message memorable and easier to remember.

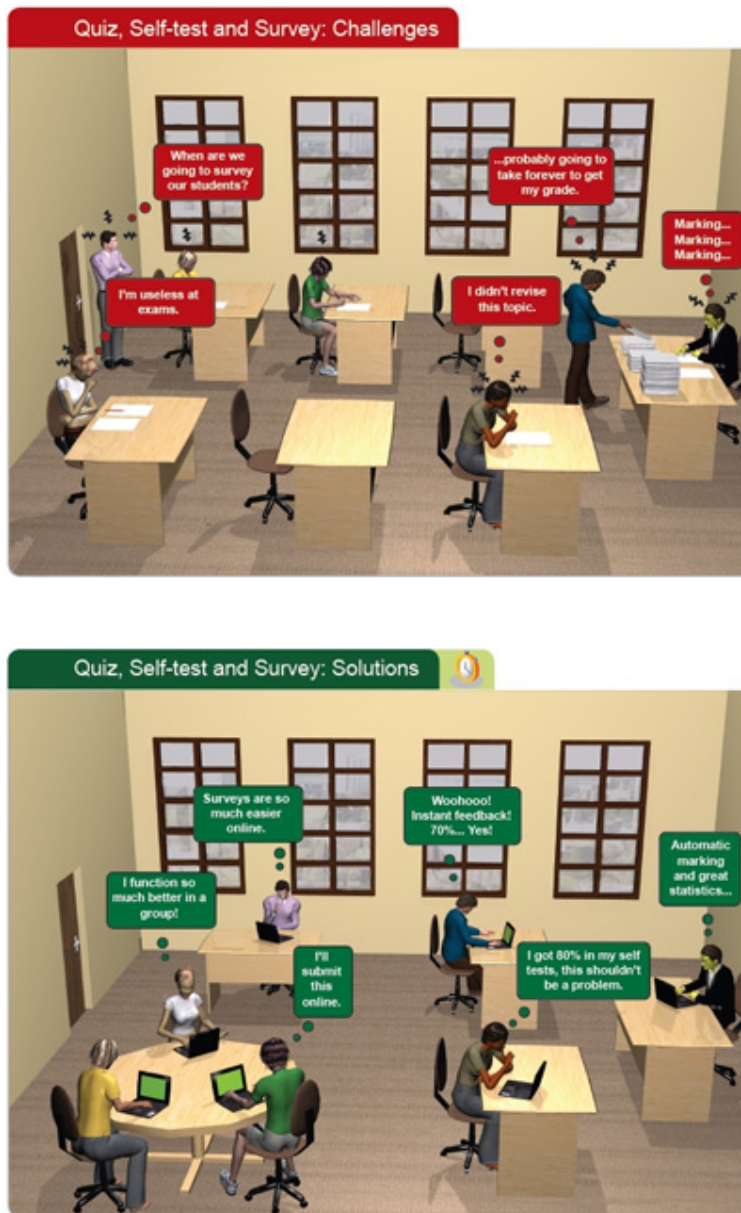
In the FeL course, we capitalised on the pictures and stories presented by Salmon (2002) in describing her 5-stage model. These pictures and the story of student Lou’s journey through the land on online learning certainly made the stages more meaningful and more memorable for both the presenters and our listeners.

Figure 2: Sample picture depicting Stage 4: Knowledge construction. Source: Salmon (2002)



A picture is worth a thousand words is a proverb (supposedly of Chinese origin) that refers to the idea that complex situations can be represented with just a single still image, or that an image may be more influential than a substantial amount of text (Wikipedia). Pictures appeal to visual learners and promote long term memory retention. In our training courses, we use a small sample of the pictures and surrounding stories created by Eiffel Corporation in their ‘Cultivate’ training materials (see www.cultivatelearning.com: “Why stories”). These pictures present ‘before’ and ‘after’ scenarios (appropriately colour coded in red and green respectively). The ‘after’ scenario portrays how online tools and functions can streamline and optimise time-sensitive situations, such as submission of assignments, testing, grading, feedback to students and the provision of information.

Figure 3: Sample of a 'before' and 'after' scenario. Source: Captivate (Eiffel Corp, 2007)



Metaphors too, are a powerful, yet underestimated technique to use in teaching and training. According to Tamari (Wikipedia) “A metaphor is worth a thousand pictures and an allegory is worth a thousand metaphors”. We find that, as trainers, in striving to teach by demonstrating and modelling best practices, thinking about and using metaphors can be captivating and effective. Peelle (1983:1) uses a metaphor to describe the power of a metaphor:

Metaphors cultivate the mind . . . They prepare furrows for planting ideas, which in time grow to mature understanding. If the climate is too arid for learning or if work has been neglected for too long, metaphors can break through an unreceptive crust to more fertile ground where the nutrients of teaching can be absorbed.

In the FeL course presented in April 2007, we presented a section on teaching metaphors (Nagel, Blignaut & Cronjé, J. C., n.d.). In the online part of the course an assignment required lecturers to conceptualise their own teaching metaphors, whether it was in connection with their area of *content* (e.g. music, zoology etc.) or whether it was for the *process* of learning (e.g. a soccer match, an orchestra, a journey etc.) Much interesting debate arose between lecturers in different disciplines, including a useful reference on the need for caution when using metaphors (Chew & Laubichler, 2003).

9. Feedback from participants

At the end of each training session, whether it is a lunch time session or a formal training course, participants are invited to complete an evaluation survey in clickUP. This not only provides valuable feedback, on which the training team reacts, but also exposes participants to the survey tool and its academic possibilities.

The survey is short and simple and consists of the following five items:

1. List any *burning questions* which you may still have.
2. What did you *not* enjoy about the course?
3. What did you enjoy *most* about the course?
4. What did you find most *valuable*?
5. What are your *suggestions* for improvement?

The responses are summarised here for three offerings of the clickUP Basic course during January 2007. The course consists of two mornings – therefore two surveys were completed by each participant. The numbers of items that were not answered, or had a response of “none” or “nothing”, are shown in Table 1. It is noteworthy that for questions that could indicate a shortfall or negative aspect of the course (items 2 and 5), or for unanswered (‘burning’) questions that might have remained (item 1), the number of non-responses is particularly high, whereas for positively phrased questions (items 3 and 4), there were significantly lower numbers of non-responses. This indicates that there was little to complain about or to improve, and that participants were keen to express their positive feedback.

Table 1: ClickUP Basic course: Number of ‘non-responses’ (either not answered, or nothing to report)

Item: Date of course	1 Burning questions	2 Did NOT enjoy	3 DID enjoy	4 Most valuable	5 Suggestions
15 Jan (day 1)	11	7	2	3	8
16 Jan (day 2)	14	11	1	2	9
24 Jan (day 1)	15	9	2	2	12
25 Jan (day 2)	12	10	6	6	13
29 Jan (day 1)	20	10	2	2	13
30 Jan (day 2)	22	14	4	2	16

Low numbers of non responses

9.1 Burning questions

This item was generally not answered, or answered in the negative. The following comments led to the creation of the seven steps, which have hopefully reduced some of the uncertainty:

- “What is the first starting point if I am using my computer in my office?”
- “I am still not sure how to start with my own modules.”
- “Do I now go on my computer and be able to add my modules?”
- “Will I remember everything?”

9.2 Aspects not enjoyed

In general, it was only physical aspects of the venue (e.g. too hot; too cold) that were cause for complaint. One of the courses was attended by 30 participants and there were some complaints about the size of this group and the background conversations that occurred while the presenters were talking. One comment that the presenters took note of was “Too many instructors talking and showing on the screen at the same time”.

There were the inevitable differences of opinion about the pace of the course, with participants making comments such as:

- “Speed up the process”;
- “The slow pace, although I know there are people at different skills levels”;
- “Sometimes the speed with which the concepts were explained was a bit too quick”;
- “The time allocated was ok”;
- “The presenters had a good feel for the group and we finished early”;
- “Presenters (sometimes) too fast and by trying it out I got lost”;
- “Sometimes a bit fast, but I am a bit slow”; and
- “The course is very intensive, I guess one has to start using it ASAP for it to stick.”

9.3 Aspects most enjoyed

Some positive comments were made about the innovations of props and analogy. In general, participants felt that they had learnt a lot, e.g.:

- “Fun, interactive, great learning experience”;
- “Loved the hats, liked the structure - knew where we were going with this”;
- “The metaphor of the clothing design and the truck”;
- “Overview of clickUP tools”;
- “Summary at the end, that the important concepts were repeated”;
- “The different hats – physically”;
- “Have learned the basics of clickUP, which I knew nothing of before”.

There were many comments about the expertise, enthusiasm and patience of the presenters, for example:

- “Enthusiasm, patience of presenters”;
- “Excellent presentations”;
- “Good presenters”;
- “Course was presented very well”;
- “The presenters were comfortable and communicated very well!”

There was general consensus that the format of two mornings is preferable to one full day. There was also agreement that the learning management system in general, and some of the tools in particular, contribute to increased convenience and opportunities

for both lecturers and students: “there are big possibilities to use clickUP as an online support system for students”.

In the FeL course, for the first time, an international expert on building online communities (Nancy White) participated (as a kind favour) in online discussions for one week. The responses from participants regarding this experience were overwhelmingly positive, e.g.

“a) I am in 'live' contact with an expert who has built rapport with me
In your narrated presentation:
I really liked the quirky photo, taken from an odd angle,
I have been impressed with the information you shared,
I have been touched by your warmth,
I've been inspired by the personal touches in the presentation, and
I have learnt and I have changed.

b) I am watching this expert at work:
For the first time, I actually enjoy a tool (discussion), that up to now I found most frustrating. That may be because:
* My skills with the tool are improving (e.g. in what order to read the threads)
* You are modelling how it can be done, e.g.
- quoting the contribution you are answering to, in the new posting
- adding resources (other links, references)
- using meaningful headings (I did not realise up to now, that when Replying to a message, I can actually change the title....)

c) I am involved, because of:
- quality content
- being challenged: Questions, questions”.

The most insightful comment received was that the FeL facilitators modelled how online learning can be effective in a blending learning situation, in which face-to-face and online components need to be balanced and optimised in terms of their particular benefits. The learning community was so effective and the online chats and discussions so valuable, that the participants were sorry when the scheduled four online weeks ended.

9.4 Most valuable aspects

Some of the more interesting responses to this item are the following:

“Am going to spend a lot of time playing with this so let my boss know I am actually working.”

“Web actively integrated in learning.”

“It's not a train smash!!” (this in response to a presenter's comment that “It's not a train smash if your design doesn't work for students – you can always adapt it or re-design it”);

“Not to be afraid of click up.”

“How to go out and plan my course and do it on clickUP!”

“It's amazing what you can do with technology!”

“Everything (including clickUp) might seem overwhelming, until you really start working on it.”

“Everything was quite valuable to me”.

Many positive comments were made about the value of first preparing one's course materials, by creating pdf files, optimising images and compressing file sizes. This affirmed the decision to include these topics and activities in day 1.

9.5 Suggestions for improvement

Overall there were two valuable suggestions for improvement, namely using real courses for the participants to build on (or allowing them to bring their own real-life materials) and to separate participants into those who used WebCT before and new users, or alternatively those with more advanced computer skills and those who are relative novices. This latter aspect has also manifested itself in terms of an 'age' issue. Our presenters are young, computer-savvy and immersed in the clickUP system which they use in their everyday practice. Older participants sometimes feel disillusioned by the extent of the learning curve for them and have expressed this privately to the presenters. In future, the briefing session will touch on the issues of varied computer skills and the readiness of different generations to adopt mashing technology.

10. Conclusion

The Training and Support team was one of various task teams established to plan and implement the upgraded learning management system *clickUP* at the University of Pretoria, South Africa. As the team progressed in its planning, various innovative training and support interventions were conceptualised and implemented. These innovations proved to be effective and popular, as evident in the participant feedback.

The members of the team developed and matured in their understanding and usage of the learning management system, including best practices which were incorporated in the training strategy. Important lessons were learned by the instructional design team, which are shared in this paper. Many of the ideas and resources will be easy for other training and support teams to modify for their own needs.

11. References

Chew, M.K. & Laubichler, M.D. 2003. Natural enemies – metaphor or misconception? *Science*, 301:52-53. Available WWW: www.sciencemag.org (accessed 26 April 2007).

Eiffel Corporation. 2007. Cultivate: self paced training materials. Available WWW: <http://www.cultivatelearning.com> (accessed 30 May 2007).

Dark, P. & O'Brien, J. 2005. *Vista implementation project definition document for the University of Pretoria*. WebCT Professional Services Organisation, WebCT (UK) Ltd.

Mbigi, L. 2005. *The spirit of African leadership*. Randburg, South Africa: Knowres.

Nagel, L., Blignaut, A.S., & Cronjé, J. C. (n.d.). Reviewing metaphors for online learning. Manuscript submitted to *Journal of Computer Assisted Learning*.

Peelle, H.A. 1983. Computer metaphors: approaches to computer literacy for educators. *Computer Education*, 7(2):91-99.

Salmon, G. 2002. *E-tivities: The key to active online learning*. London: Kogan Page.

Treagust, D. F. 1993. The evolution of an approach for using analogies in teaching and learning science. *Research in Science Education*, 23(1):293-301.

White, Nancy. Full Circle Associates, Seattle, Washington. Available WWW: <http://www.fullcirc.com> (accessed 22 April 2007).

Wikipedia. A picture is worth a thousand words. Available WWW: http://en.wikipedia.org/wiki/A_picture_is_worth_a_thousand_words (accessed 31 May 2007).