Executive summary

This report describes the main task performed by University Fernando Pessoa (UFP) for the MAMUT project, an evaluation of the WellPath internet-based learning environment. It introduces the background at UFP and some of the studies previously performed, and the experiments that were conducted at UFP.

The experience already acquired at UFP is essentially based on the Laptop project, started in 1996. Several other projects were launched as a result thereof. Two lecturers at UFP were involved in the MAMUT project, and attended the online courses as a context to prepare the experiments.

UFP's objectives were twofold: 1) further test online learning environments and 2) do preliminar tests with Health Sciences students using the Pathology material available in WellPath. As described in this document, and as far as UFP is concerned, the results are satisfactory, and recommend further development.

For the MAMUT project, two groups of UFP students were involved in the experiments, totaling 23 students. The resulting questionnaires were then analyzed using the SPSS statistical package. The final section presents the analysis. The questionnaires are presented in the appendices.

1. Introduction

Many of the current education, learning and training issues are related with the need of flexible independent learning concerning time and place. The available Information and Communication Technologies (ICT) also allow new opportunities to innovate and propose Life Long Learning (LLL), on job training facilities, Open and Distance Education (ODL) and new forms of knowledge delivery even for the more traditional presential teaching.

With the evolving change into the way we work and learn in the new economy age there is also a strong demand for new paradigms of teaching and learning which focus into social interaction been one example the collaborative learning (Dillenbourg and Schneider, 1995). A great number of existing learning paradigms are based on constructivistic ideas (Brown et al., 1989). As stated by (Manderveld and Koper, 2000) the new learning paradigms focus on the following concepts:

- Education and training is learner centred (Kinzie, 1990)
- Learning as an active, constructive and goal directed process (Shull, 1988)
- Individual differences of students are taken into account
- The teacher and trainer is a facilitator and a coach (Wood and Wood, 1995)
- Learning is embedded in a social context

- Emphasis on performance assessment methods

(Manderveld and Koper, 2000) suggest that in order to support these new learning paradigms learning environments need to be rich, flexible environments, and they must be available anytime and anyplace.

Taking into account this characterisation, a higher level reasoning is needed to engage an existing learning community to the use of ICT and, in particular, to take advantage of World Wide Web (Web) based environments.

2. The case of Web-based Learning

McCormack and Jones proposed a broad definition for Web-based learning system in 1998. They considered it as an environment created on the World Wide Web in which students and educators can perform learning-related tasks. They add that it is not simply a mechanism for distributing information to students; but also performs tasks related to communication, assessment, and class management.

One of the existing resources in the Web for Web-based learning is the *Web based learning resources library* at http://www.outreach.utk.edu/weblearning/. They define Web-based learning as major subcomponent of the broader term "e-learning". Web-based learning is one of the tools with which education can be delivered. In traditional academic institutions, web-based learning systems are generally housed administratively in a "distance education" department alongside other at-distance delivery methods such as correspondence, satellite broadcast, two-way videoconferencing, videotape and CD-ROM/DVD delivery systems. All such systems seek to serve learners at some distance from their learning source. Many such systems attempt to serve learners interacting with the learning source at different chronological times (for example, email). Distance Education, then, is often referred to as those delivery modalities that seek to reduce the barriers of time and space to learning, thus the frequently used phrase "anytime, anywhere learning".

As defended by (Walkden and Sharp, 2000), the most effective learning system will be hybrids, using conventional settings with a mixture of some virtual features.

In particular a number of changes can be listed when paper-based learning resources are changed by the use of the electronic medium, as proposed by (Thompson and Boak, 2000):

- make available a range of items within a package;

- offer users diagnostic checklists, which the software can code and advise users, on the basis of their responses, which packages and which items within packages may be of most relevance to them;

- offer users choices from menus, so they can explore the packages and the items within packages: choose to ignore some, or to explore them in an order that reflects their own interests and priorities;

- invite users to write their own answers, suggestions, observations, into the package, and then quickly allow them to compare their contributions with system answers and suggestions;

- collate information that users provide in response to questions, and enable users to save it, print it, or send it to a tutor using some Internet facility (as the email);

- use media other than the printed word - illustrations, photograph, animations and sound.

These changes can provide an opportunity for innovation regarding education, learning and training. However a proper environment other than technology must be available and developed for creating a true learning community.

3. The NetLab environment

University Fernando Pessoa has set as a freshmen requirement in 1996, that every student must have a laptop computer. This requirement makes the University a very rich computer environment where every student has his own laptop computer to use and take care (there is also 50% of the teaching staff with computers too) (Gouveia, 1998c).

One of the most important goals of this project is to give to all students, from any major, a technological experience in order to start using computers in everyday tasks as students, and later, as professionals. The motivation is to introduce laptops as the next multipurpose tools and turn them an evolving substitute for the traditional “pen and paper” paradigm. From the NetLab project we intended to gather as much information as possible to migrate, in a later phase, to the use of PADs (Personal Access Devices), described by (Downes, 1998) as tools for on line education that combine the function of a book, a notebook, and a pen.

To offer more communication facilities between students, the University started a local area network with entry points in classrooms and other locations in campus. Also, the University offers free Internet access to its students and staff. These actions make possible the use of Internet as a huge digital information resource for student's activities, and a preferred way to interchange information, using some of the available Internet services provided by the University like the Web, electronic mail, news, and Internet Relay Chat.

The infrastructure was made possible with a Local Area Network and the Web (HTTP) Intranet servers used to develop materials to support teaching activity. The relocation of course materials was made possible because students have their own laptops, a near access point to the network and an unified interface to access information (the HTML browser). This way, all the success conditions are

available, for creating a high potential learning environment, rich in technology. The environment resulting of simultaneous presence of laptops, network entry points in multiple campus locations, and Internet facilities, is coined by the author as NetLab (Gouveia, 1998c).

The NetLab merits its original perspectives and foundations are presented in (Gouveia, 1996), and (Gouveia, 1998). Some material is also available on line at *http://www.cerem.ufp.pt*, including official data about the NetLab and at *http://www.ufp.pt/staf/lmbg/*, where a list of available papers can be retrieved.

4. The evolving use of NetLab

In a perspective of evolution in using Web facilities in better ways, we describe a usage path that start as an alternative way to spread information for students for dealing with scale and time restrictions. This means that a Web page can simple be seen as an opportunity to reach a higher number of students. It also is an opportunity to distribute information in an easy way where each student get it when he wants from the network in campus (with its laptop or in Intranet), or from outside campus, using an ISP (Internet Service Provider).

As a result of student's interaction and of using the Web facilities for different classes contents, it is possible to specify the Web pages as a growing set of functionality, as the ones listed bellow:

- use of Web pages as an alternative communication channel
- use of Web pages for class support material
- use of Web pages for organising the interaction rules between class, teacher and students
- use of Web pages to maintain a diary of the students/teacher relationship
- use of Web pages to maintain the class materials
- use of Web pages to built an historic log of each discipline
- use of Web pages to built case studies and practice exercises
- use of the Web pages to support assessment and even exams
- use of the Web pages to integrate each discipline within the group of disciplines that the author is responsible for, sharing available resources
- use of the Web pages to integrate students contributions
- start supporting interested people outside the class and even the school (from the net)

A discussion of the impact of using Web pages in classroom activity is given by (Gouveia, 1998a). The experience gathered in supporting these facilities introduces the need to discuss a roadmap where the use of Web pages can be integrated in a traditional class environment. The opportunity to make innovative use of these technologies and regain student's motivation exist, as discussed in (Gouveia, 1999). Based on UFP/CEREM experience we can risk that it has more to do with people than with technology, and even more with the traditional teacher role of simultaneous be a coach, a facilitator, an actor, and a friend as discussed in (Gouveia, 1998b).

We think that in near future, most of the teacher work will be preparing its materials and supporting studying activities before and after his appearance; the work time for teachers still will be the same, but spend (distributed) in a different way. For a more complete discussion of the impact of Web facilities on teacher's role see (Gouveia, 1998a), and (Gouveia, 1998b).

A more recent study discusses how the web support can be used as a presential teaching complement. Among the conclusions is that the use of the Web pages is no dependent of students computer and Web expertise (Gouveia, 2001).

5. The WELLPATH environment

The online version of WellPath (URL: http://wellpath.uniovi.es) was used, as it had previously shown very good response times. Also, UFP had decided not to install WellPath locally, due to the cost of software it needed to acquire (UFP servers are Linux based).

Students were invited to use of the two accounts created for the project. Some of them created their own accounts. Access has been provided using one of the available University computer labs with the Microsoft Internet Explorer Browser and normal student permissions.

The computer lab has a number of computers side by side, connect to the Internet

6. Evaluation procedures

Some of the students (those with a technical background) were invited to select the Digital Image course. The Health Sciences students had more options, as most of the courses were from the medical domain.

The students were non-paid volunteers, randomly selected from a poll of students who answered a call for participation, posted in several University buildings.

One of the University computer laboratory was used, having a 2 Mbit/s internet access. Response times were very good, as most of the pages were cached locally as they were used.

The following steps were performed for each of the experiments:

1. The students were wellcomed, and a brief description of WellPath was made;
2. A pre-experiment questionnaire was distributed and filled by the students;
3. The students were invited to login the system (using one of two available accounts);
4. The students were invited to select a course, and to explore it as if they were attending it;
5. Browsing and navigating the courses was freelly allowed for 20 minutes;
6. The students were invited to fill a post-experiment questionnaire;
7. The students were thanked for their participation.

Snapshot of the students using WellPath

7. Data gathered

Two evaluation sessions have been performed. The first one involved eleven students and take place in 21st June. The second evaluation section involved twelve students and take place a week later, in 28th June. The two sessions were realised in these dates due to computer lab availability. As conditions remain the same for the two evaluation sessions, no distinction has been made between the two student groups.

As a result of the pre experiment questionnaire (appendix A.1), the following data summarises the data about the 23 students involved in the experiment:

- From the 23 students, 14 are male students and 9 are female. The male students account for 60.9% of the total number of students;
- Student age varies between 20 and 38 years, having 17 students (73.9%) ages between 21 and 26 years old;
- About computer use, just two students answered that use it few times, and one answers neutral. Also, one student consider itself as an expert. All the other 19 students (82.6%) use computers regulary;
- 13 students report that do not have any previous knowledge about the theme. Three reported a neutral knowledge and just one considers himself as an expert. For six students the theme is familiar;
- All the 23 students reported they are currently attending undergraduate studies;
- Concerning student major, 10 students are from technical areas and 13 students from health sciences;
- Most of the students (19 82.6%) reported to be in their fourth year. One is in the first year, another is in the second year and other two are in the third year;
- Concerning the motivation to participate in the evaluation the results are distributed. Two students report that want to know more about online training, six reported that want to know more about the theme, four reported that have some curiosity, five other are waiting to learn about the experiment, and other six students participate because they are invited.

8. Data analysis

Student major has been selected to create two distinct groups for data analysis in order to verify the impact of the WellPath environment considering student different backgrounds.

Taking into account the computer and theme expertise the two groups of students are the technical and the health groups. They have the following characteristics:

- The technical group report better computer expertise, being in the health group two students with little or no computer experience and other eleven that use it regulary. In the case of the technical students, none report to have little or no computer expertise. However just one report to be an expert.

- Considering the theme expertise and that for the technical group the proprosed theme was Digital Imaging; considering this, no major differences were reported. Although the health group report a superior number of students that have little or no knowledge of the theme. The four students that do not belong to the fourth year of their courses are from health related majors.

The following data summarises the post experiment questionnaire (appendix A.2) results. Notice that not all the tables have a count of 23 cases because for some of the questions, students do not provide valid answers.

Student group * The task of logging the system Crosstabulation

Count

		The task of logging the system				
		very easy	easy	neutral	difficult	Total
Student group	Technical	2	6	2		10
	Health	2	9		1	12
Total		4	15	2	1	22

As expected, the health group has more difficulties regarding the use of the system as a result of lower computer expertise, although the differences are minimal.

Student group * The task of using the system Crosstabulation

Count

		The task of using the system				
		very easy	easy	neutral	difficult	Total
Student group	Technical	2	5	3		10
	Health	2	10		1	13
Total		4	15	3	1	23

Concerning the system, seems that the health group has found using the system more easy than the technical group. This may be expected considering that the health group may have more theme expertise (not clearly shown in the pre experiment questionnaire). The same remarks can be made for the remaining post experiment questions.

Student group * The task of acquiring information from the system Crosstabulation

Count

		The task of acquiring information from the system				
		very easy	easy	neutral	very difficult	Total
Student group	Technical	1	6	3		10
	Health	6	5	1	1	13
Total		7	11	4	1	23

Student group * The task of reading information from the system Crosstabulation

Count

		The task of reading information from the system			
		very easy	easy	neutral	Total
Student group	Technical	1	6	3	10
	Health	4	8	1	13
Total		5	14	4	23

Student group * The task of searching information from the system Crosstabulation

Count

		The task of searching information from the system				
		very helpful	quite helpful	neutral	quite unhelpful	Total
Student group	Technical	2	4	2	2	10
	Health	8	4			12
Total		10	8	2	2	22

Student group * The task of interact with the system Crosstabulation

Count

		The task of interact with the system			
		very easy	easy	neutral	Total
Student group	Technical		8	1	9
	Health	3	8	2	13
Total		3	16	3	22

Student group * The task of navigation within available information Crosstabulation

Count

		The task of navigation within available information				
		very helpful	quite helpful	neutral	quite unhelpful	Total
Student group	Technical	2	4	3	1	10
	Health	4	8		1	13
Total		6	12	3	2	23

Student group * The system help structure Crosstabulation

Count

		The system help structure			
		very helpful	quite helpful	neutral	Total
Student group	Technical	3	4	3	10
	Health	6	6	1	13
Total		9	10	4	23

Student group * The system available tools Crosstabulation

Count

		The system available tools				
		very helpful	quite helpful	neutral	quite unhelpful	Total
Student group	Technical	2	5	2	1	10
	Health	5	7	1		13
Total		7	12	3	1	23

Student group * About reusing the system Crosstabulation

Count

		About reusing the system			
		very helpful	quite helpful	neutral	Total
Student group	Technical	4	5	1	10
	Health	5	6	2	13
Total		9	11	3	23

Notice that all the 23 students reported at least to be neutral when asked if they consider to reuse the system. The two groups have similar response patterns which is an interesting observation.

A third questionnaire (appendix A.3) has been made to gather further information about how students consider the use of the WellPath system. A group of five additionnal questions have been proposed and three open questions are added. Questionnaire focus is on the way students think about the system interface and what students think to have learn from using the system.

Student group * Rating the system Crosstabulation

Count

		Rating the system				
		very helpful	quite helpful	neutral	very unhelpful	Total
Student group	Technical	4	4	2		10
	Health	6	5	1	1	13
Total		10	9	3	1	23

When asking about how each student rate the system, similar responses have been obtained when compared with the last question of the post experiment questionnaire (the one about considering the reuse of the system). These results confirm the good acceptance of the system by all students regarding they belong to the health or the technical group. This question can be seen as a control question to confirm student answers.

Student group * Rating system clues for operation Crosstabulation

Count

		Rating system clues for operation					
		very helpful	quite helpful	neutral	quite unhelpful	very unhelpful	Total
Student group	Technical	3	3	3	1		10
	Health	6	6			1	13
Total		9	9	3	1	1	23

Notice that the technical group has more dispersed values. This may result from having less knowledge concerning the choosen themes and may affect their ability for using the system.

Student group * Rating the system icons and interface Crosstabulation

Count

		Rating the system icons and interface					
		very helpful	quite helpful	neutral	quite unhelpful	very unhelpful	Total
Student group	Technical	2	3	5			10
	Health	7	3	1	1	1	13
Total		9	6	6	1	1	23

The same observations can be made from the folowing two questions. Overall, this can indicate that be familiar with content can help on using the system and get a better opinion about the interface.

When asking students to rate the system use, again most of the students rate it as easy or very easy, which indicates that they were able to use the system and like using it.

Student group * Rating the system use Crosstabulation

Count

		Rating the system use				
		very easy	easy	neutral	difficult	Total
Student group	Technical	2	6	2		10
	Health	6	6		1	13
Total		8	12	2	1	23

Notice that when asking students how easy was to use the system, none respond that it was dificult as oposed to the previous question. However, a small number of students reported it as very easy. This may indicate that the system is easier to learn than use.

Student group * Rating how system use was easy to learn Crosstabulation

Count

		Rating how system use was easy to learn			
		very easy	easy	neutral	Total
Student group	Technical	1	8	1	10
	Health	5	6	2	13
Total		6	14	3	23

The last three questions challenge students to add their own comments. The first question is about what the system provides as new to the student considering the theme. The second question is about how the student consider the use of the system to learn about the proposed theme. The third question requests for other comments that the student may have about WellPath.

Student group * Learn anything Crosstabulation

Count

		Learn anything		
		YES	NO	Total
Student group	Technical	7	3	10
	Health	12	1	13
Total		19	4	23

As expected, the health group has a higher number of students that report to learn something new. However 70% of the students from the technical group report the same. Overall, the great majority of the students report to learn something new from using the system. This may indicate that using such a system is good enough by the fact that students can use it and further, they were able to state they learn something new!

Selected student comments are:

- The information is easy to understand. With time and motivation is possible to use the system to know more about the theme;
- Even if we are not very inside of the subject, we can learn easily with the system;
- I do not have enough time to explore it;
- I learn a lot browsing the system, but to really learn requires me much more time;
- Information is presented in a simple way and is easily understandable.

Student group * System can be used to learn about the theme Crosstabulation

Count

		System can be used to learn about the theme		
		YES	NO	Total
Student group	Technical	9	1	10
	Health	13		13
Total		22	1	23

When asked if the system can be used to learn about the theme, it is interesting to verify that all students from the health group answer yes and 90% of the technical group also have the same opinion. Also, when compared with the results from the previous question, it is possible to say that although a higher number of students report to have learn something new with the WellPath system, a higher number of them report that the system can be used to learn about the theme.

Selected comments regarding students opinion on how the system can be used to learn about the proposed theme are:

- The system is most useful when someone has already some knowledge about the theme;
- There is potential to allow someone enlarge its knowledge using the system;
- Information and links are easy to use;
- When we want to know more about the theme, the system allow us to explore and discover information;
- The system is easy to navigate and the information is good and well organised. Good content;
- It seems that the use of photos, text and hipertext help me to learn;
- It’s a fast and accurate source to obtain information;

- Content presents information in a simple and straighforward way;
- Content is easy to understand, in a not to much technical language with very useful imagens;
- The system is easy to use and this motivates a lot;
- For those who do not know much about the theme and want to learn, this is a good way of doing it.

Student group * Remarks about the system Crosstabulation

Count

		Remarks about the system		
		YES	NO	Total
Student group	Technical	5	5	10
	Health	1	12	13
Total		6	17	23

When asked students to provide their own comments about the system, the technical group (50% of them) contributed in higher number when compared with the health group. Most of their comments are related with technical aspects of the system.

Selected comments provided by the students are:

- It was good for traditional presential teaching considering such a system. Can be a way of fostering Its own knowledge and sharing it;
- It will help in decrease physical dependence to the classroom;
- Icons are not easy to understand and should have more interactive facilities;
- The system deserves to be explored. Could be used in our day-to-day classes as complement;
- The system could have Portuguese and English versions.

From observation of students interaction with WellPath seems that in general all users were able to explore system information. In some cases, students help each other in reaching a particular image, animation or content.

Further research need to be conducted in order to study interaction patterns in exploring WellPath information. From the preliminary observations seems that there is no unique ways of browsing WellPath information and that each student follows a personal path within the system offer.

Snapshot of a group of students using WellPath with two students helping each other

9. Final remarks

The WellPath system have been used with no difficulties by 22 of the 23 students engaged in this evaluation. Also, a higher number of students consider the system useful. They also consider useful to reuse it. As a control question, similar results were obtained when were asked to rate the system overall.

No clear distinctions were reported by students when considering two groups: the health group more related with the themes being presented in WellPath and the technical group more related with the technologies being used by the system.

Overall, results can indicate that be familiar with content (theme) can help on using the system and get a better opinion about the interface. Results can also may indicate that the system is easier to learn than to use.

Overall, the great majority of the students report to learn something new from using the system. This may indicate that using such a system can be justified by the fact that students can use it and be able to learn from it.

As the number of students that participate on this evaluation is small, it will be useful to consider more studies involving a greater number of students. Also, considering other themes, allow to confirm available study results. More statistical analysis studies can provide insight even when just considering the already gathered data. Among the possible data analysis is the use of nonparametric tests as the ones used on a similar study, reported in (Gouveia and Feliz, 2001).

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Appendix A: Questionnaires

A.1 Pre experiment questionnaire

1 Sex:

M ____

F ____

2 Age:

_____ (*number*)

3 Computer use expertise:

I have never used	1
I have used it a few times	2
Neutral	3
I use it regularly;	4
I am an expert;	5
I don't know	6

4 Theme expertise:

I have never heard about the theme	1
I have heard something about it	2
Neutral	3
The theme is familiar to me	4
I am an expert	5
I don't know	6

5 Degree level:

Undergraduate studies	1
BSc degree, (3 years)	2
BSc degree, (4-5 years)	3
MSc degree	4
PhD degree	5
I don't know	6

6 Course and study year:

_____ year _____

7 Motivation to participate:

Want to know more about online training	1
Want to know more about the subject	2
Just curiosity	3
Waiting to learn about the experiment	4
Just because I was invited	5
I don't know	6

A.2 Post experiment questionnaire

1 How did you consider the task of using logging the system?

very easy	1
easy	2

neutral	3
difficult	4
very difficult	5
don't know	6

2 How did you consider the task of using the system?

very easy	1
easy	2
neutral	3
difficult	4
very difficult	5
don't know	6

3 How did you consider the activity of acquiring information from the system?

very easy	1
easy	2
neutral	3
difficult	4
very difficult	5
don't know	6

4 How did you consider the activity of reading information from the system?

very easy	1
easy	2
neutral	3
difficult	4
very difficult	5
don't know	6

5 How did you consider the activity of searching information from the system?

very helpful	1
quite helpful	2

neutral	3
quite unhelpful	4
very unhelpful	5
don't know	6

6 How did you consider the task of interact with the system?

very easy	1
easy	2
neutral	3
difficult	4
very difficult	5
don't know	6

7 How did you consider the way as the system allows navigation within the available information?

very helpful	1
quite helpful	2
neutral	3
quite unhelpful	4
very unhelpful	5
don't know	6

8 How did you consider the system help structure?

very helpful	1
quite helpful	2
neutral	3
quite unhelpful	4
very unhelpful	5
don't know	6

9 How did you consider the system available tools?

very helpful	1
quite helpful	2

neutral	3
quite unhelpful	4
very unhelpful	5
don't know	6

10 How do you consider to reuse the system?

very helpful	1
quite helpful	2
neutral	3
quite unhelpful	4
very unhelpful	5
don't know	6

A.3 About the system look and feel

1. How would you rate the system overall?

very helpful	1
quite helpful	2
neutral	3
quite unhelpful	4
very unhelpful	5
don't know	6

2. How do you rate the clues to operate the system?

very helpful	1
quite helpful	2
neutral	3
quite unhelpful	4
very unhelpful	5
don't know	6

3. How do you rate the visual icons and interface facilities in the system?

very helpful	1
quite helpful	2
neutral	3
quite unhelpful	4
very unhelpful	5
don't know	6

4. How do you rate the system use?

very easy	1
easy	2
neutral	3
difficult	4
very difficult	5
don't know	6

5 How do you rate your own learning about the system use?

very easy	1
easy	2
neutral	3
difficult	4
very difficult	5
don't know	6

6 Did you learn anything new about the theme from using the system?

YES	_____
NO	_____

If YES, please specify:

7 Do you think that the system can be used to learn about the theme?

YES _____

NO _____

If YES, please specify:

8 Do you have some remarks about the system?

YES _____

NO _____

If YES, please specify:

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