

18 Design, Implementation and Evaluation of PsyWeb, a Learning Environment in a Problem Based Learning Curriculum.

André Koehorst*, Wilco te Winkel[†], Frans Ronteltap*, Henk Schmidt[†]

* Learning Lab, Universiteit Maastricht, the Netherlands
{a.koehorst,f.ronteltap}@mmi.unimaas.nl

[†] Erasmus University Rotterdam, the Netherlands
{tewinkel,schmidt}@fsw.eur.nl

Abstract

In this article we describe the design and implementation of PsyWeb, a rich learning environment for the new problem based study in Psychology at Erasmus University Rotterdam. Experiences are reported for the first five (of eight) courses of the first year of the new study. Students' opinions have been collected as part of a survey at the end of each course. Results indicate that students are positive about PsyWeb. The overall appreciation shows a slight increase over time. Starting with the second course, usage of PsyWeb has been logged. Usage has been quantified in terms of the number of unique IP-addresses per day. Using this measure we assume that PsyWeb has a student reach between 25% and 100% per day. Usage shows a slight increase over the courses. The implementation of a series of additions to PsyWeb has been planned for the next year.

Keywords: computer-facilitated learning, learning environment, problem-based learning.

1. Introduction

The World Wide Web (WWW) has been the last in a long line of emerging technologies that has been applied to education. However, applying a new technology is not automatically a pedagogical innovation. Based on the observation that most efforts on technology-based innovation fail, Kearsley (1998) states that these efforts "...distracts us from the really important problems and issues that need to be addressed." The last few years there has been an enormous effort to implement WWW-technologies. Has this been just another distraction? There are indications that, at large, this is the case. After analyzing 436 web based learning environments, Mioduser et. al. (2000) summarized their findings as "one step ahead for technology, two steps back for pedagogy".

The history of education shows pedagogical innovations that do address 'important problems and issues'. One of these innovations is problem based learning (Barrows & Tamblyn, 1980; Schmidt, 1993), which claims to offer a solution to difficulties that students have in dealing with the application of knowledge in practical contexts, dealing with complex problems, and becoming life-long learners. Problem based

learning (PBL) has been around since the late nineteen sixties and there is some evidence that it lives up to its claims (Norman & Schmidt, 1992; Albanese, 1993).

Given a sound educational model, could ICT be used to improve educational practice? Koschmann et. al. (1996) argue that it can, and they propose a principled approach to the innovation of learning with technology. The underlying assumption of this approach is not the exploitation of the capabilities of a new technology, but that "Design should be informed from its inception by some model of learning and instruction". In their article, they present a case study in which this approach is applied to problem based learning (PBL). Using this approach Ronteltap & Eurelings (1986) identified several issues in PBL at the University Maastricht that could be addressed by the use of information and communication technology.

In September 2001 a new study in Psychology has been started at Erasmus University Rotterdam. This curriculum has problem based learning as its prime pedagogical method. The first year consists of eight courses of five weeks. Students follow only one course at a time. During a course students come together twice a week in tutorial group meetings, in which they discuss a problem and formulate a set of common learning issues. These learning issues are the starting point for self study, the results of the self study are discussed in the first half of the next meeting. The second half of this meeting is used to discuss a new problem. In the second year problems will increase in time and complexity, culminating in complete projects in later years. Besides PBL meetings, each course has other educational activities, like skills training and lectures, and during each course movies are shown that are related to the topics of the course.

The shape of the curriculum has been influenced by the belief that the WWW can be used to take PBL another step forward by providing students with a richer learning environment. This electronic learning environment is being developed under the name PsyWeb. For practical reasons, PsyWeb is incrementally developed. In the first year the general framework has been developed as well as the general content and services and the course specific contents for the courses of the first year. During this first year several projects have started to prepare the implementation of facilities that target specific

innovations, like a literature search, contextualization of theoretical concepts by means of documentaries, and on-line skills training .

In this article we describe the design of PsyWeb, the implementation of and experiences with this electronic learning environments during the first five courses of the first year of the new study.

2. Design & Implementation

A team of staff members formulated a list of general requirements for the learning environment. The three main requirements were:

1. The learning environment should use the semantics of PBL, e.g. a problem should be named “Problem”, not “Task” or “Assignment”.
2. Relevant information, learning resources and functionality should be available in the context of the problem that a student is working on.
3. Navigation should be simple, using ‘flat’ menu structures that are always available.

This team also formulated what should be available in the electronic learning environment. Requirements were formulated regarding general and block specific information and services. Block specific requirements covered general information about the course; the current problem and other problems; online learning resources and literature suggestions; information about and on-line resources for practicals and skills training; a bulletin board with last-minute information; a course schedule; a feedback facility; information about students and staff and an assessment facility. Requirements for general information and services for the student covered study progress information; general information about the study; information about the educational organization and a study specific search engine. Additional requirements were formulated for additional roles in the curriculum (tutor/coach, member of planning group, librarian and administrator).

Based on these requirements a decision was made about a platform to implement the learning environment. After review of several learning environments, it was decided to use basic web technology to implement the overall structure of the learning environment and the general information and services. For course specific information the Electronic Blockbook system was selected. This system has been developed at Universiteit Maastricht to provide course specific information and services for PBL-courses. The system was developed with flexibility and adaptability as design goals. It allows a flexible structure and semantics at course level and a custom interface at the curriculum level. In order to be used for PsyWeb, a customized interface was implemented and several other adaptations to the software were carried out,

including the support of a different software package for the creation and editing of contents.

The interface of PsyWeb is shown in figure 1. The screen is partitioned in three areas: a horizontal menu on top of screen for navigation of global information and services; a vertical menu structure on the left of the screen for navigation through course specific information and services, and a working area, where information and services are displayed (the white areas containing the text and the photograph).

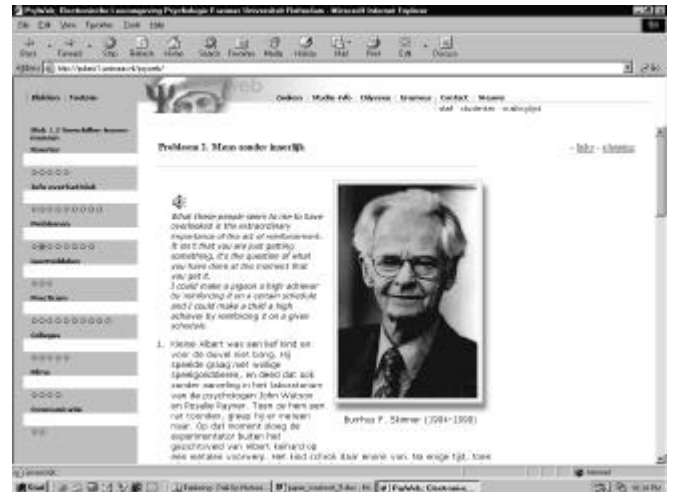


Figure 1: The PsyWeb Interface.

Two staff members of EUR have been developing PsyWeb. They have implemented services and materials, updated PsyWeb, have sought on-line available resources, acquired licences and settled authoring rights when necessary and informed and supported students and teaching staff. PsyWeb was hosted at Universiteit Maastricht, where employees of the Learning Lab provided technical support and consultancy.

Psyweb has not only been used for educational purposes, it has also fulfilled a social function. The student association ‘Odyssey’ has a place in PsyWeb and ‘Ithaca’, the associations e-journal, is made accessible through PsyWeb. The association also has access to the news facility.

3. Evaluation

3.1. Method

Subjects are the cohort of first year students that were enrolled in the study psychology. Student numbers for the different courses varied from 89 to 66. Lower numbers are mainly caused by exemptions. Demographics were available for 87 students that are currently enrolled. Of these students 60 are female, 27 are male. Ages range from 18 to 43, with a mean of 21, a median of 21, and a mode of 20.

The study "Psychology" has a quality management system: each course is evaluated by means of a survey. The survey

consists of 55 items which cover all aspects of a course. In this paper we have included the data collected in the first five periods of 2001-2002, we will only consider the ten items that are about PsyWeb. These items are:

1. PsyWeb had added value over the paper study guide.
2. PsyWeb was a useful supplement to the other information services in this course
3. I could easily find the information I needed.
4. The content was up-to-date.
5. The screen lay-out was pleasant.
6. The contents of PsyWeb was suitable for the education.
7. PsyWeb was accessible when necessary
8. The content was free of errors
9. Rate PsyWeb with a school grade.
10. What did you miss or appreciate with regard to PsyWeb?

Items 1 to 8 are rated on a Likert scale, 1 corresponding to “totally disagree” and 5 corresponding to “totally agree”. Item 9 is scored on a 10-point scale, from 1 (worst) to 10 (perfect), which corresponds to the rating used for school grades in the Netherlands. The tenth item invites students to write a short comment. The survey is paper based, the data are processed by the OECR, the educational expertise center of EUR. All students were required to fill in an evaluation form in order to be admitted to the test at the end of the course.

Usage of PsyWeb has been studied by means of log file analysis. The measure for usage is the amount of unique IP-addresses per day. An IP-address uniquely identifies a computer from which a web service is accessed. We assume that each unique IP-address roughly corresponds to one student. Log files have been collected starting with the second course. Log files are analyzed using SPSS.

3.2. Results

The survey has been filled in by all enrolled students at the end of a course. This yielded respectively 81, 82, 72, 73 and 66 usable evaluation forms. Result for the survey are summarized in table 1. Except for item 7 (accessibility) in course 5, all results are positive.

	Course 1	Course 2	Course 3	Course 4	Course 5
Item 1	3,49 (1,00)	3,29 (1,11)	3,36 (0,97)	3,70 (1,09)	3,79 (0,89)
Item 2	3,91 (,957)	3,61 (0,90)	3,51 (0,99)	4,05 (0,78)	3,33 (1,26)
Item 3	3,78 (,886)	3,49 (1,03)	3,60 (0,94)	3,84 (1,00)	3,67 (0,97)
Item 4	3,81 (,963)	3,61 (1,03)	3,83 (0,77)	3,79 (1,09)	4,11 (0,95)
Item 5	3,89 (,795)	3,70 (0,70)	3,64 (0,74)	4,12 (0,71)	3,30 (1,11)
Item 6	3,41 (,913)	3,23 (1,02)	3,27 (0,87)	3,41 (1,04)	3,53 (1,07)
Item 7	3,75 (,788)	3,63 (0,84)	3,58 (0,96)	3,97 (0,82)	2,86 (1,18)
Item 8	3,75 (1,028)	3,32 (1,24)	3,75 (1,06)	3,77 (1,21)	3,86 (0,84)
Item 9	7,18 (,884)	7,2 (1,05)	7,55 (0,81)	7,53 (1,09)	7,61 (0,78)

Table 1: Summarized results of survey

Figure 2 shows the overall rating over a period of five courses. The rating shows a slight increase over time.

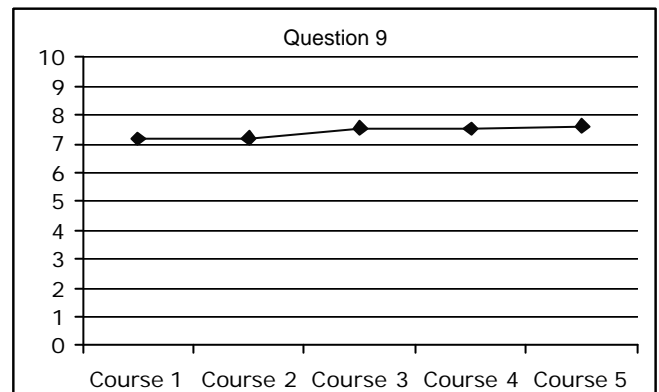


Figure 2. Overall rating over a period of five courses

Analysis of the comments reveals 211 negative and 160 positive remarks. The top three topics of negative comments were on-line articles, college sheets and accessibility. Together these make up 62% of all negative remarks. The quantitative results on these topics are summarized in table 2.

	Course 1	Course 2	Course 3	Course 4	Course 5	Total (n)	Total (%)
Articles	2	4	11	9	1	27	24
College sheets	2	7	13		1	23	20
Accessibility	3	9	8	1		21	18

Table 2: Quantitative summary of negative comments

The top three topics of positive comments were on-line articles, usability and news. Together these make up 51% of all positive remarks. The results on these topics are quantitatively summarized in table 3.

	Course 1	Course 2	Course 3	Course 4	Course 5	Total (n)	Total (%)
Articles	1	2		21	2	26	23
Usability	5	2	3	5	3	18	16
News	4	2	6		2	14	12

Table 3: Quantitative summary of positive comments

Log files have been analyzed by unique IP- addresses per day. Analyses of the log files show that the amount of unique IP-addresses varies from 31 to 95 on working days.

Figure 3 shows the average amount of unique IP-addresses per day per course. This amount is significantly different for the courses $F(3,97)=13.788, p=.000$, and there is linear increase over courses ($p=.000$).

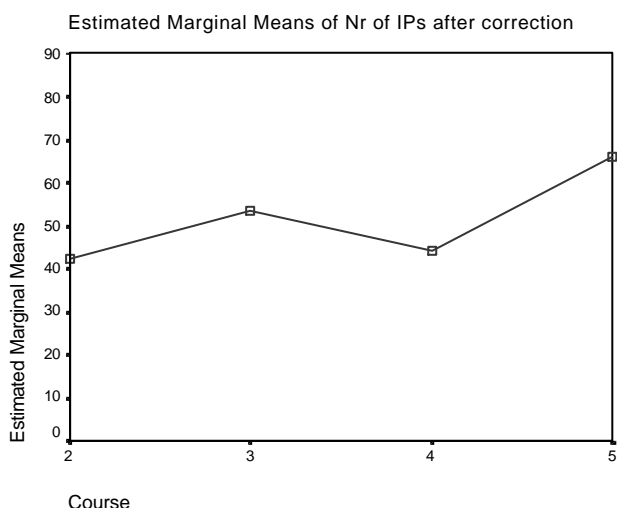


Figure 3. Average amount of unique IP-addresses per day per course

Figure 4 shows the average amount of unique IP-addresses per day of the week. Analysis shows a significant difference between days, with a peak for Wednesday ($F(6,97)=11.273, p=.000$).

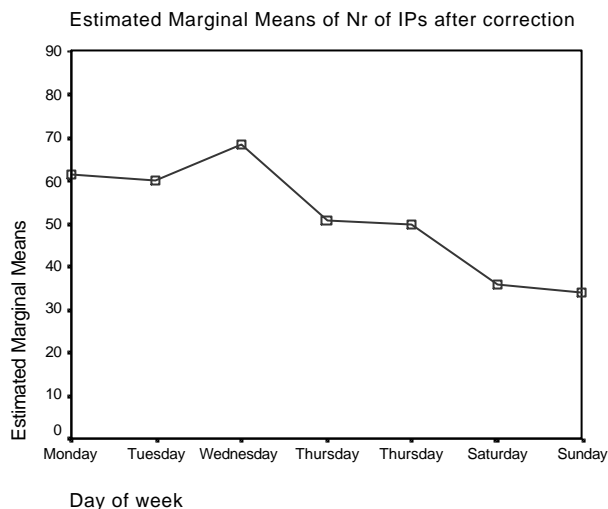


Figure 4. Average amount of unique IP-addresses per day of the week.

Figure 5 shows the average amount of unique IP-addresses per week in a course. There is not a significant difference between weeks.

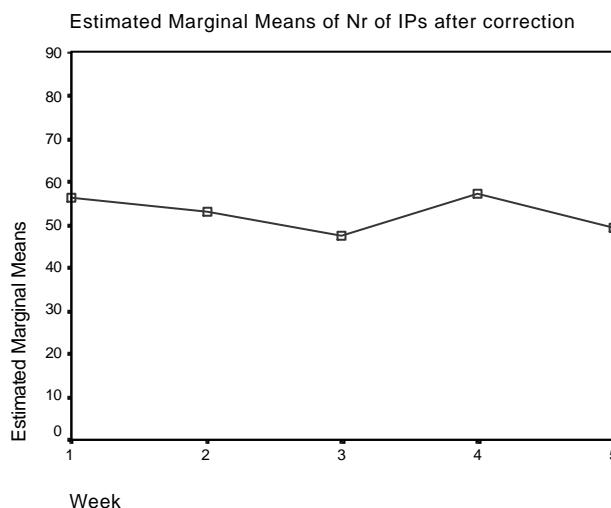


Figure 5. Average amount of unique IP-addresses per week

4. Discussion and conclusion

The general framework for PsyWeb has been implemented and the contents learning environment is co-developed with the curriculum. So far, the design goals for PsyWeb have been met. Evaluation shows students are satisfied, and the overall appreciation shows a slight increase over time, from 7,2 for the

first two courses to 7.6 in the fifth period. When assuming that each unique IP-address corresponds roughly to one student¹, this means that PsyWeb has a student reach between 25% and 100% per day, with a mean of 69%. During weekends and holidays PsyWeb has a student reach between 16% and 65%, with an average of 37%. Usage also shows a slight increase over time. An explanation for higher usage on Wednesdays could be that training and practicals are then scheduled. These activities are often supported by PsyWeb. Absence of a peak of activity in the last week of a course is positive. One of the goals of PBL is that students study evenly, and do not prepare at the last moment for a test.

Results for appreciation and usage indicate that PsyWeb does not suffer from a fading novelty effect. It should be noted however, that this study only covers the first five courses of a total of eight in the first year. It is planned to complete the overview in this paper by supplementing it with a study including the data for the last three courses.

The implementation of PsyWeb successfully shows that the Electronic Blockbook system can be adapted to support problem based learning courses in a curriculum outside the university in which it was developed. Adaptation was required and realized beyond what the designers of the system had envisioned, which proved that flexibility and adaptability are worthy design goals .

The current study only incorporates quantitative data on usage of the learning environment, these data shed no light on what PsyWeb is really about: how students use it in their learning process. Additional research has been planned to gain insight in this area.

Next year PsyWeb will be extended with motivational content. Also, the implementation of a series of ambitious additions to PsyWeb, that have been prepared in the last year, will start. It has been planned that in the beginning of the next academic year, a custom search engine will be operational and that the first psychological documentaries will be available for on-line, on-demand viewing. Later that year a start will be made with on-line psychological experiments, and facilities for computer supported collaborative learning will follow. This way we hope to improve PBL step-by-step.

Acknowledgements

Development of the E-Blockbook system was partly sponsored by the initiative "Innovatie Wetenschappelijke Informatievoorziening" of SURF.

PsyWeb is partly sponsored by the Erasmus University ICT fund.

The EBlockbook and PsyWeb are team efforts which have only been possible by the contributions of the many people involved, in particular Eveline Osseweijer, Ton Derix, Marcel Kentgens and Jo Beerens.

References

- Albanese, M.A. (1993). Problem-Based Learning: A Review of Literature on Its Outcomes and Implementation Issues. *Academic Medicine*, 68 (1), pp. 52-81
- Barrows, H. S. & Tamblyn, R. M. (1980). *Problem-based learning : an approach to medical education*. New York: Springer Publishing Company.
- Kearsley, G. (1998). Educational Technology: A critique of Pure Reason [On-line]. Available: <http://home.sprynet.com/~gkearsley/critique.htm>
- Koschmann, T., Kelson, A.C., Feltovich, P.J. & Barrows, H.S. (1996). Computer-Supported Problem-Based Learning: A Principled Approach to the Used of Computers in Collaborative Learning. In T.Koschmann, *CSCL: Theory and Practice of an Emerging Paradigm*. Mahway, New Jersey: Lawrence Erlbaum Associates, Publishers.
- Mioduser, D., Nachmias, R., Lahav, O. & Oren, A. (2000). Web-based Learning Environments (WBLE): Current Pedagogical and Technological State. *International Journal of Research in Computers in Education*, 33(1), pp. 55-76.
- Norman, G.R., & Schmidt, H.G. (1992). The psychological basis of problem-based learning: a review of the evidence. *Academic Medicine*, 67 (9), pp. 557-565
- Ronteltap, C. F. M., Eurelings, A. M. C. (1996). *User requirement analysis of POLARIS*, Universiteit Maastricht.
- Schmidt, H. G. (1993). Problem-based learning: An introduction. *Instructional science*, 22(4), pp. 247-250.

Notes

- ¹The relationship between an IP-number and a student is not very hard, but as long as students have anonymous access it is the best approximation we have.

Appendix: Questions in Dutch and their translation in English

Questions in Dutch

1. PsyWeb heeft meerwaarde ten opzichte van een papieren blokboek PsyWeb has added value over the paper study guide.
2. PsyWeb was een goede aanvulling op andere informatievoorzieningen in dit blok.
3. Ik kon gemakkelijk de informatie vinden die ik nodig had.
4. De schermopmaak was prettig.

5. De inhoud van PsyWeb sloot goed aan bij het onderwijs.
6. De inhoud van PsyWeb bevatte geen fouten.
7. De inhoud van PsyWeb was up-to-date .
8. PsyWeb was toegankelijk wanneer ik het nodig had.
9. Waardeer PsyWeb met behulp van een schoolcijfer.
10. Wat heeft u gemist of gewaardeerd met betrekking tot PsyWeb?

Translation in English

1. PsyWeb has added value over the paper study guide.
2. PsyWeb was a useful supplement to the other information services in this course.
3. I could easily find the information I needed.
4. The content was up-to-date.
5. The screen lay-out was pleasant.
6. The contents of PsyWeb was suitable for the education.
7. PsyWeb was accessible when necessary.
8. The content was free of errors.
9. Appreciate PsyWeb with a school grade.
10. What did you miss or appreciate with regard to PsyWeb?