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ABSTRACT

The developments in information technology and multimedia give new opportunities to increase the efficiency and quality of skills education. This paper presents three applications developed in the Netherlands to enhance professional skills learning in different areas of psychology: (1) BioPsy, an application developed to teach and train the technical and practical backgrounds for conducting biopsychological experiments; (2) PAMA (Dutch term Psychologische Analyse van Menselijke Arbeid translated as Psychological Analysis of Human Task Performance), a digital learning environment in which students can develop professional skills to analyze, evaluate, and (re)design human work; and (3) Selection, an application that teaches the development of skills to conduct personnel selection procedures. The applications use multimedia to enliven the course and to improve students' learning of skills. This paper illustrates the innovative features of the applications. Results are presented of the evaluation of students' experiences with the programs and of learning progress as a result of working with the programs. (MES)

Computer based instruction of professional psychological skill acquisition

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Abstract: The developments in information technology and multimedia gives new opportunities to increase the efficiency and quality of skills education. Three different applications are presented that are developed to enhance the professional skills learning in different areas of Psychology. The areas that are covered consist of the instrumentation techniques in biopsyschology, job and task analysis, and selection and assessment in organizations. The applications use multimedia to enliven the course and to improve students learning of skills. The innovative features of the applications are illustrated in this paper. Furthermore, some results will be presented of the evaluation of students experiences with the programs and of the learning progress as a result of working with the programs.

1. Introduction

The acquisition of analytic and counseling skills is one of the preconditions to prepare psychology students for their professional career. Education of skills not only emphasizes the understanding of theories but also involves the qualitative understanding of concepts and the training of procedural knowledge. Training of skills is often regarded as highly work intensive. However, advances in information technology and multimedia have facilitated the possibilities to support skills acquisition and to promote self-instruction and computer-based instruction. Despite these new opportunities, only few applications exist that train psychological skills thoroughly.

In 1996, a large fund of the Department of Education of the Dutch Government (Dutch: Kwaliteits- en Studeerbaarheidsprojecten) stimulated several educational innovation projects to support the continuing development of ICT-based learning material and courses. Major goal of this fund was to encourage universities and colleges to innovate and improve their courses and thereby facilitating the flow of students through a four-year educational curriculum. A project, submitted by Lang & Meijman (1996) to enhance the professional skill acquisition in psychological education was granted. This project consists of four subprojects of which three will be presented at the WebNet99 conference.

BioPsy is an application that is developed to teach and train the technical and practical backgrounds of conducting biopsychological experiments. PAMA is a digital learning environment in which students can develop professional skills to analyze, evaluate and (re)design human work. The development of skills to conduct personnel selection procedures are taught with the application Selection.

This paper briefly outlines the structure of the projects and discusses the pedagogical background, the implementation of the applications and the evaluation of the courseware. In the associated poster and demonstration sessions, the applications will be presented.

2. Theoretical considerations

All courses are in addition to, or replace parts of the regular courses. Biopsy, for example, is an "add-on" module where students can study background information and make exercises. Selection provides the student with theory and exercises previously presented on paper and videotape, where the results are subsequently discussed in working groups. PAMA replaces regular instruction for a large part, integrating theory, examples and exercises in a digital environment.

Four general principles are present in all of the applications:

1. They are developed in a cognitive- and social-learning theoretical framework where students learn by example (modeling), practical exercises and feedback.
2. Several types of multi-media elements are presented in the applications, e.g. video- and audio-fragments, animations and illustrations.
3. Case-materials include real-life or simulated settings. This ensures transfer to real-life situations and makes the programs more attractive.
4. The programs allow students to proceed in their own pace and provides them with the possibility to choose extra exercises when wanted.

The theories of knowledge and skill acquisition underlying these principles consider learning as a result of a student actively understanding, selecting, comparing and judging information (e.g. Vygotski, 1978). This means that an active role is expected from students. The teacher's role is still important, but more a monitoring one, leaving more responsibility to the students. It is important for students to develop some metacognitive knowledge about the course subject, i.e., to develop general abilities they can apply to all problems they encounter, by learning by example. A consequence of this learning style is that an emphasis must be placed on learning in a meaningful context and that students can discuss the results with each other. All three programs provide a meaningful context by using real-life examples and cases. For example, in the program PAMA a time restriction in analysis time is included, just as in real life. Discussion between students is facilitated by working in couples and by creating the possibility for chatting or mailing.

Although all three programs are built around the same theoretical principles, some differences can be distinguished. These differences can best be described by the distinction between "whole" versus "part" learning. Partial learning is the breakdown of knowledge and skills in separate, selfcontaining elements which are presented to the student. These elements are studied, step by step, and in the end the student is instructed to combine those elements. Selection and BioPsy are examples of this approach. PAMA fits the description of whole learning better, as it provides the student with elements that are more intertwined with each other. This means that contrary to Selection and BioPsy, PAMA requires more the creation of a mental map of the subject matter and the combination and integration of the elements as they encounter them. Students are not completely left on their own to do this, as the program provides them with references to additional information and hints. Students have to search for this information themselves and it is expected that they not only learn from the information they find but also from the search-process self. In this context another distinction can be made between "explicit" and "implicit" learning. In contrast to e.g. Selection, where all relevant information is accessible in the program and is made explicit what has to be learned, PAMA focus more on implicit learning. In PAMA, the student has to create its own knowledge base and theoretical framework in addition to the information provided by the program. One of the tasks where this becomes apparent is in the construction of a personal textbook with all the documents and assignments a student has discovered and finds relevant. The assignments are constructed in such a way that the student individually discovers the necessity of a stepwise procedure and thereby improving theoretical and methodological insight.

Flexibility for the students is achieved by providing the program in a network environment. Selection and Biopsy and part of PAMA are traditional OS specific applications distributed via an Intranet, and a part of PAMA via the OS independent Internet. In addition, all programs are available on CDROM. Apart from the fact that different learning styles affect the pace of a student, practical issues are also at stake, especially in higher education: a significant amount of students have part-time jobs or are restricted in some other way to attend classes on a regular basis.

Although the possibility exists for students to use the programs individually, they will be encouraged to form teams of two. This enforces a way of collaborative learning where students exchange experiences, perspectives and discuss alternatives. The program PAMA is most advanced in this perspective, in that it provides different means of discussion like Internet newsgroups, mailinglists and chat. The student's own input is important in these fora, the teacher only monitors these discussions and stimulates them when necessary.

3. BioPsy

Students who specialize in Experimental Psychology are confronted with a substantial amount of technical information necessary to conduct biopsychological experiments in the laboratory or in field studies. Although mathematics at high school level is a precondition to enter psychological education, several students have difficulties understanding these technical aspects. BioPsy is developed to support

those students who are confronted with deficiencies in knowledge of physics and electronics. It is also developed as a remedial teaching tool for those students who have become a bit unacquainted on the technical area. The application is additional to face-to-face teaching with the lecturer and can be completed at any convenient time. Multi-media elements are used to enliven the course material.

The application consists of three different modules of retrieval and acquisition of information. The first module is the search-module in which the student can search on specific terms or within specific topics. All matches of the search term are displayed and can be sequentially selected and examined by the student. Several videos, animations and images are included in the application to support the course material. Students can also exercise the principles of signal processing in a simulation environment through the manipulation of filter and sampling parameters.

In the second module, the student can follow an introductory course on biopsychological experiments. This module is presented in a classic book-structure. The complete course consists of six books:

a. Electronics
b. Biopsychological signals
c. Controlling experiments
d. Personal Computer
e. Safety and accidents
f. Processing of signals

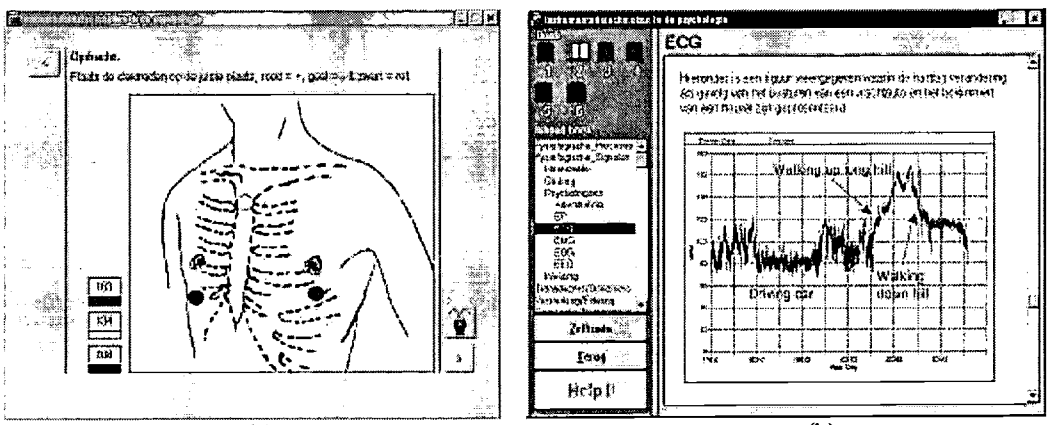
The progress of the course can be saved and retrieved. After studying a book the student can answer some multiple-choice questions to test the degree of acquired knowledge.

In the third module the student can apply the knowledge in different exercises that are related to a real experiment. Approximately twenty-five exercises are constructed for two different experiments, a classic reaction-time experiment and an experiment in which the electroencephalogram (EEG) is measured . Crucial aspects of these experiments are trained to prepare students in actual experimentation.

In the reaction-time experiment subjects have to design a memory-search task and the necessary technical and experimental prerequisites. Emphasize is placed on designing the experiment, preparing the stimulus material and programs, instructing the subjects, registering heart rate and heart rate variability and analyzing and interpreting the results.

The second experiment consists of a semantic task in which meaningful and meaningless words are presented in normal daily sentences. During this experiment the EEG is measured from which Event Related Potentials (ERP) have to be computed. Focus in this experiment is on the registration of the EEG-signals and the necessary steps to calculate ERP's. The two experiments are a good reflection of the technical problems that are encountered in biopsychological experiments.

The program BioPsy is demonstrated at the WebNet 99 conference (Poster/Demonstration of R.J. van Ouwerkerk, T.F. Meijman & L.J.M. Mulder).



(a) (b)

Figure 1: In the exercise module of BioPsy students have to place electrodes on the appropriate spots of the body (a). Illustrations are used to enliven the material in the course module (b).

4. PAMA

The acronym PAMA is made up of the initial letters of the Dutch terms "Psychologische Analyse van Menselijke Arbeid" and can be best translated as "Psychological Analysis of Human Task Performance". The PAMA courseware provides an introduction to the theory and practice of work and organizational psychology. The course offers work and organizational psychology undergraduates a computer-based interactive exercise of the analytical skills relevant to the execution of a psychological analysis of human task performance.

PAMA consists of three modules. The first module provides an introduction to models of workload and recovery, work satisfaction, work and physical and psychological health, et cetera. It draws on recent theory and research to offer students a perspective on work and organizational psychology. The second module provides students with models, theory, and methods of psychological analysis of human task performance, and provides students with practices of professional skills. It offers students a method of analysis that should be followed to perform an adequate analysis of work activity. It also includes the available instruments and techniques for performing a psychological analysis. The third module is designed to support the development and advancement of professional skills that are required as a work psychologist. Assuming that the power of a real-life case will make learning more attractive and effective, the actual skills can be practiced in a predefined and elaborated case that focuses on the job of nurse at a department of nephrology and kidney transplant. All materials provided by the application are the sources for carrying out the job analysis.

The modules one and two are made available in a digital learning environment that can be approached via the Internet. The introduction to theory and research is included in electronic books and can be printed to form a conventional paper textbook. However, the electronic book contains additionally educational material. The book of module one in particular includes several concrete examples to illustrate the subject-matter, and also exercises and assignments, whereas modules two provides students with the opportunity to develop and practice their skills. Therefore, the second module calls attention to several psychological instruments for job and task analysis that can be explored and exercised, and several data-sets are available that provide the opportunity for students to consider the methodological and statistical aspects of job analysis. All in all, this requires the students to explore the literature on work and organizational psychology and it will prompt them to adopt an active, self-employed role in gathering additional subject-matter. Moreover, the modules allow the student to be responsible for his or her own learning to match the prior knowledge and learning style. As a consequence, each student composes his or her own unique textbook. As a side-effect, he or she will be able to visualize and increase his or her knowledge about the theory and research on work and organizational psychology and the methodology of psychological analysis of human task performance.

All the chapters with texts, the video and audio fragments and the exercises are present in a SQL-database for the Internet. A webserver translates the queries into readable html-pages, dynamic lists and multi-media elements. Teachers can dynamically add, delete and change the order of the educational material at the beginning of a course. Dependencies between chapters and exercises can be assigned to include restrictions in the accessible material. Also the correction of answers on open questions by the teacher is supported in the system. The login procedure of the student is secured by using a challenge response user authentication. The student can view all the material and can send answers on questions and exercises to the database to be reviewed by the teacher later. The student's progress of the course is tracked and administrated. This information is used in the evaluation stage of the project to determine individual learning strategies. In figure 2 the general layout of the digital learning environment is depicted.

Unlike the former modules, the third module will be available via the Intranet. Using a case-based learning application, the course provides the opportunity for students to act as a work analyst and to learn that job analysis is a complex task and involves efficient planning. In this module, students are presented with a case that requires them to perform a psychological analysis of human task performance. They are expected to apply their knowledge (acquired by examining modules one and two) to analyze the job of nurse at a department of nephrology and kidney transplant at the Academic Hospital Groningen in the Netherlands. As a result, all the basic knowledge should be integrated to facilitate execution of the psychological analysis of human task performance. This requires that students study all relevant materials in modules one and two as they pursue the case in module three. The relevance of the subject-matter in modules one and two is apparent, because students become aware of a need for accurate knowledge when proceeding with module three. This provides students with a course that reinforces what they have learned and encourage them to apply that knowledge in a virtual setting of a work and organizational psychologist.

All necessary information will be available via the Intranet and consists of reports and documents, auditory interview fragments, video-fragments, and data from questionnaires and behavioral observations, but also includes information that is irrelevant to the case. Furthermore, students will be required to carry out a complete analysis in a fixed (but fictitious) amount of "analysis time" and retrieving any information will reduce the remaining time. Thus, students need to carefully plan each step in the analysis and to consider which information is relevant. By doing so, they become aware of a need for an efficient research method, which makes the module a challenging exercise.

The job analysis involves several steps. In each step, the student is required to submit a plan. After the plan is checked by the application, the student is provided with feedback. The courseware was programmed to compare the submitted plan to a previously fixed analysis planning and to provide the student with different forms of preprogrammed feedback. So, the student is repeatedly receiving positive reinforcement regarding his or her skills as well as constructive feedback for rectifying any identified inadequacy. As soon as the plan meets certain requirements, the student can proceed and act according to the plan. After finishing each analysis step, and before proceeding, the findings should be summarized in a short written report. In conclusion, a full written report on the complete job analysis should be prepared that consists of the short reports prepared in each analysis step.

The program PAMA is demonstrated at the WebNet 99 conference (Poster/Demonstration of F.L. Oldersma, M.N. Hoebe, R.J. van Ouwerkerk, A.H.G. de Vries-Griever & T.F. Meijman).

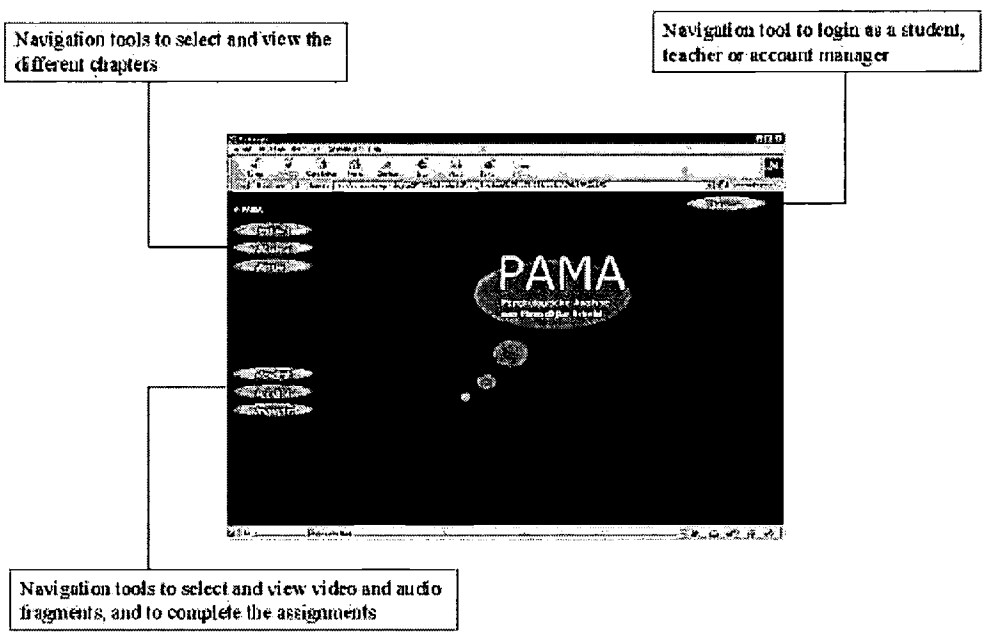


Figure 2: Introduction screen of the digital learning environment of PAMA. Several navigation tools are present to view and process information.

5. Selection

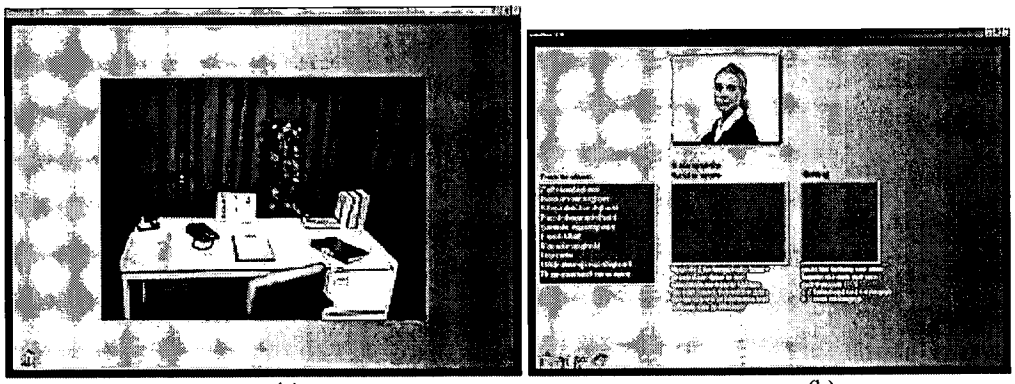
The application Selection is aimed primarily at students who are educated in the psychology of assessment and selection of other people at work. The program considers the process of selection (the activities involved) and the content of selection (the techniques, tools and methods used). The process and skills for professional consultancy are taught in a self-instruction course. The student acts as a junior adviser who has to select the most eligible secretary from a group of applicants. The entire selection procedure is stepwise completed by the student in which he or she is instructed and advised by a (virtual) senior consultant.

The selection procedure consists of nine consecutive steps. The first step of the program aims to clarify the question of the client. In the next step the content of the function is determined which is further specified in function requirements in the third step. After this step the necessary predictors are

determined. The tests that contain the predictors are selected (step 4) from a pool of tests and presented to the candidates (step 5). In step six the test scores of the candidates are interpreted and weighted. On basis of these results a few selected applicants are invited for a selection interview. The final suitability of the applicants is rated and determined in step eight. In the final step a rapport is written in which a candidate is recommended to the client.

The program makes extensively use of video- and audio-fragments that can be viewed or listened to by the student. Also several psychological aptitude tests are present to guide the selection process. After each step the student is provided with feedback on the results and he or she can correct the responses.

The program Selection is demonstrated at the WebNet 99 conference (Poster/Demonstration of M.N. Hoebe, K.I. van Oudenhoven-van der Zee & R.J. van Ouwerkerk).



(a) (b)

Figure 3: The interface of Selection (a) that is used by the student is structured as an office environment in which several input devices can be used to collect and retrieve information e.g. calendar to make appointments, a phone to consult the senior etcetera. Several screens (b) are present in which the student can view video fragments, and can select and drop relevant items.

6. Evaluation

All applications that are developed in this project are evaluated by students. The evaluation is based on the students' attitudes towards the software, their ratings of usability and their learning as a result of the applications. The first step in the evaluation is a heuristic evaluation in which the content and usability of the interface of the application is rated. In a follow-up study the attitude towards the applications and the progress or decline in learning efficiency is examined in more detail. Two groups are compared: a group of students that did not work with the application and a group that worked with the application. The differences in test scores is used to determine the effectiveness of the innovation. The amount of time spent on mastering the skills provides information on the efficiency of the application. The group of users of the application further evaluates the usability, transparency, consistency and attractiveness of the application.

7. References

Lang, G. & Meijman, T.F. (1996) *Enhancing the professional skills education in the study of Psychology*. University of Gronuingen: Internal Report

Vygotski, L. (1978) *Minds in Society: The Development of Higher Psychological Processes*. Cambridge, MA: Harvard University Press.

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