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Rehabilitation Engineering Training – EVALUATION LEVELS AND EXAMPLES

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Abstract Disabled people represent a significant part of the human society. The negative effects of the social isolation and the employment difficulties of disabled persons can be significantly reduced by a proper educational program of rehabilitation engineering training. The present paper is a result of a collaboration between Germany and Romania, countries involved in two international projects having the main aim of the rehabilitation engineering training, particularly its evaluation, and the social integration of the disabled peoples.

Keywords: rehabilitation training**,** evaluation levels, ODL

1. Introduction

The role of rehabilitation engineering training in decreasing the isolation and dependence of persons with disabilities is great, particularly within vocational training programs. It is a real opportunity for communication and for the social integration of young people with different impairments who have a greatly reduced access to classical higher education.

In this paper, we refer to the rehabilitation engineering training (part 2), particularly the quality of it by using Web-based open distance learning - ODL (part 3). Some evaluation levels of rehabilitation engineering training are also presented (part 4).

The authors of this paper would like to take into consideration these evaluation aspects in two German-Romanian cooperation projects within the German DAAD program and the European Leonardo da Vinci one in order to improve the efficiency of the rehabilitation engineering training of the disabled young people in Romania as well as in other European countries (part 5).

2. Rehabilitation engineering

Rehabilitation engineering adapts personal computers and other equipment to make them accessible to persons with disabilities at school, home and on the job.

The main phases in a rehabilitation engineering process for a job are the following:

- analysis of the job with the duties that have to be undertaken by the person who is disabled,
- providing the adaptive equipment and its installation,
- training for the adaptive equipment,
- technical support.

Rehabilitation engineering training is one of the most important parts of the adaptation process of the disabled person to the new technology because they have to use a more complex system that generally is found in the mainstream with many more commands and peripherals. Users of adaptive equipment must receive proper training for both the mainstream and adaptive equipment (Pulkkinen J./Ruotsalainen M, 1998). Unfortunately training is often neglected or it is inefficient.

In the following, we would like to present some important factors for success of rehabilitation engineering training and levels of an evaluation of training programs and products. These can be applied to different types of training, e.g. conventional classroom training, distance training including virtual classrooms, on-the-job training or continuing training.

The classrooms have many benefits because the students learn from each other as well as from the instructor. The workers can learn in an environment without job stress and phones ringing. But classrooms have also disadvantages because they require workers to be trained away from the job for many weeks. In this case, a combination of classroom training and training on the job can be used. The last form also has advantages because the student is trained for the equipment he needs to know. Continuing training is used after the adaptive equipment has been installed and allows to the trainer or to the technical assistant to make fine–tuning at the equipment for a maximal efficiency of it.

3. Factors of success in ODL for disabled peoples

For many years the quality of ODL has referred only to the content of the teaching materials presented in different forms (print lectures, audio recorder, video, CD-ROMS etc.). The teaching materials are the basis of the learning activity, but a learning course means more than teaching material It represents the totality of what the students experiences within the lecture.

The purpose of an ODL system, particularly based on the Internet (e-learning system) and Web is to create learning conditions (UNESCO, 1995). The success of the system depends on:

- the modality of producing and projection of the learning course and teaching materials;
- adaptability of the educational process to the specific needs of the target groups.
- communication between disabled students and between disabled students and trainers;
- feedback stimulation and an efficient control of it.

The use of the Web and other computer-based tools facilitate access by disabled students to a wide range of written materials by presenting the contents in many accessible ways. These include electronic Braille, non-text equivalents of texts such as pre-recorder speech, icons, or audio/ video distribution models that can be transmitted by Internet. Making material available in a number of different formats allows students to choose the approach that best suits their learning style (Hersh M.A./Ionescu B.B, 2000ab). Web teaching materials can be set up to give student support, for instance through replies to frequently asked questions, as well as an email link to the course teachers and to the other students for replies to more specific questions. Interaction among students themselves in addition to that with the tutor and the collaboration in e-learning, in other words the formation of an OLD-community plays an important role within the training process.

The quality of ODL for the disabled is very complex, because it refers not only strictly to the educational process but also to the connected activities (administration, promoting, marketing etc.) The quality of the e-learning courses must be recurrently revised, taking into account the feedback's results and the trainee's suggestions. Also, for a successful e-learning, the trainees must benefit by comments with regard to their individual's progress obtained, relate to the results provided by the educational program. Evaluation activities play a main role during the training process, in order to assure an efficient learning process. It is important not only that tutors evaluate correctly the student's progress, but to involve students in the training evaluation and to be open to their suggestions of improvement. Flexibility, one of the main advantage of the e-learning process, make possible for trainers to update their materials whenever there is need for it, in order to respond to the specific demands of the disabled (Hamburg I./Ionescu B.B, 2001).

4. Evaluation Levels

As a base for the evaluation of the training, we consider the four-level model presented by Kirkpatrick in his paper "Techniken zur Evaluation von Trainingsprogrammen" which already becomes a standard in the U.K. (Shale D, 1990):

- The first level refers to the evaluation of the reaction of training program participants. A positive reaction is a good precondition for a successful learning; negative reactions make it difficult (reaction level).
- The evaluation of the learning process (where activities like knowledge extension, improving existing computer skills and obtaining new ones for the adaptive equipment, changing attitudes of disabled people to the work tasks, etc. are happening) takes place within the second level (learning level).
- In many rehabilitation-training programs, one of the goals is to change disabled behavior within the company and in student life and this will be evaluated on the third level (behavior level). It is supposed that the change will be supported by a favorable climate of working and learning in the company.
- On the fourth level, the effects of the training program referring to the training goals are evaluated, e.g. effects on the integration of the disabled person in the work within the company, on his communication with colleagues, on the improving quality of the products he works on (results level).

Although this fourth level is very important for the success of the rehabilitation-training program, it is seldom attained, because these effects are difficult to evaluate. If it is not possible to get exact results, some indicators about the success of the rehabilitation-training program should be determined.

We propose to extend the model of Kirkpatrick in some directions. First to begin the evaluation with an analysis of different existing versions of the training product, e.g. the adaptive technology that has to be installed and used (product level) in order to choose an "optimal one". As a final level of the evaluation we propose to also have a return-on-investment level, because of the financial difficulties which many companies (particularly the small and medium ones – SMEs) have. The return-on-investment evaluation level could be realized by studies in the companies and by keeping in touch with the companies throughout different Internet applications, such as those projected in our Leonardo cooperation program.

We synthesize evaluation levels and some questions of evaluation in the table presented in the annex of the paper.

5. Examples

Since 2000, Romania has initiated a project titled "The vocational training by ODL of young people with a locomotory disadvantage - EURO H 2000 -", in collaboration with other three European countries – Germany, Hungary, U.K. (Scotland), project which now is being implemented and is financed by the European Union.

One of the objectives of "EURO H 2000" project is to provide rehabilitation engineering training for two main target groups: young people between 14-28 years old with mobility

impairments including those with vision and hearing deficiencies and employers and workers in job centers and training centers for young people, initially in the partner countries and eventually throughout the EU. Other target groups that the project wants to reach are: the Government, non-governmental organizations, the parents of the people with disabilities and the main public formed by people without disabilities (Ionescu B.B/Hamburg I./Ionescu A./ Muscan M, 2001).

Within the "EURO H 2000" project, different workpackages regarding adaptive technology are carried out. Workpackage 1 of this project includes a mail inquiry about the disabled persons' access to the adaptive technology and the data basis in Workpackage 2 provides information about both the needs of the consumers (disabled persons) and the companies that supply technical equipment, as well as about visual, verbal and other methods of accessing computers by the disabled persons. The discussion forum also analyses the product level, and the feedback got from the workshops is expected to bring some enlightening on this matter. The phases of the rehabilitation engineering process for a job are represented in the project, the first two workpackages, besides other tasks, analyses the duties of the jobs that are likely to be undertaken by the disabled persons, while Workpackage 3, 4 and 5 include all four phases, analysis of the jobs, providing adaptive equipment, training and technical support.

On the base of a comparative study of the employment situation of the disabled people was identified the specific content of the training modules necessary for them in order to become a qualified work force to satisfy the increase need of the society for new resource. The main aim of the workpackage 3 is to develop training modules for:

- employers and workers in training centers and job centers
- young people with a locomotory disadvantage, including those with hearing or vision impairment.

"EURO H 2000" project provides three different types of training modules for the disabled peoples:

- Basic computer skills, introduction to the web and distance learning
- Technical and vocational modules
- Modules on assertiveness training and the rights of the people with disabilities at work.

The project also provides training in the use of eye and mouth control, text-speech conversion and screen magnification packages, to allow use by trainees with visual or hearing impairment. Although the project refers mainly to people with mobility impairments, the category of people with vision and hearing disadvantages occupies a special place within the project. For the people with hearing impediments the presented materials will be designed using a very good graphic, for the people with vision problems the lectures will be projected so that these people could benefit from their sound interface. The texts for blind people who do not have a PC at home will be written in Braille alphabet.

Besides lectures, we intend to offer to disabled students e-books that could help them to develop their knowledge horizon and which can form a personal library. We intend to offer them two main categories of e-books:

- E-books that are a transposition of well-known books written by authors from the entire world;
- Psychological e-books, which will contain examples of social interaction situations and processes and will provide psychological problems, which could be solved by the disabled persons.

The project reaches its climax in Workpackage 6, the Euro-H Center, a distance-learning center designed to support (during an undetermined period of time and for an undetermined number of disabled persons), rehabilitation engineering training process in all phases, including the evaluation of its efficiency. The center will have both a physical and virtual location and will be designed to be fully accessible and to offer free training to the peoples with disabilities and on a sliding scale to the others (***CePTIC-SNSPA, 2001).

The evaluation on the first three levels (reaction levels, learning level and behavior level) is achieved in "EURO H 2000", within different activities included in the project. For example, the evaluation of the behavior level is realized by training workshops and modules for employers and workers in job centers, providing information about the practical steps required making their workplaces accessible to the people with disabilities and encouraging more positive attitudes towards employing of those people. Also, the evaluation of the behavior level is realized during the training modules regarding the increasing of the self-confidence and communication's abilities of the disabled people. The fourth level (results level) is evaluated by Workpackage 7, that even tries to find the solutions of different problems raised by the difficulty of evaluating the exact results. The main aims of this workpackage are developing evaluation and dissemination activities of the project. The maximum benefit will be obtained from the project work by ensuring that the outputs have maximum possible distribution and implementation.

Some objectives of the DAAD-cooperation REHA of the IAT with the Technical College from Turnu Severin and University of Craiova from Romania, are the followings:

- to develop and evaluate technological solutions to aid people with hearing loss to work and learn with computers and to use the Internet,
- to develop systems for the exchange of engineering information,
- to provide research results in rehabilitation engineering,
- to develop training materials and programs explaining the use of new technological services, particularly those based on the Internet,
- to evaluate their own products of the project and those of other European projects and to provide cooperative arrangements with other project teams.

The project team consists of two professors and two disabled students from the Technical College from Turnu Severin, two Romanian experts in rehabilitation training and one researcher from the Institute Arbeit und Technik, Gelsenkirchen.

At the moment the team members discuss and evaluate the cost-effectiveness of the technological aids for the various groups of people (with moderate hearing losses, with severe or profound hearing losses, with both vision and hearing loss). One of the technologies to be adapted and trained is about automatic speech recognition.

6. Conclusions

The rehabilitation engineering training has an important role in the qualification of the disabled peoples. Permanent evaluation activities increase the quality level of the training process.

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Annex

EVALUATION LEVELS	QUESTIONS OF EVALUATION
1. PRODUCT LEVEL	-The training methods and the adaptive equipments respond in totality to the specific needs of the target groups?
2. REACTION LEVEL	- Which is the cognitive and evaluation's component with regard to the knowledge, ideas and persuasions relate to the training process? - The emotional component determines a positive or a negative reaction of the disabled people during the training program? - The student's behavior is focused on the action's intention, on physical and psychic's mobilization during the training activities?
3. LEARNING LEVEL	- Which is the initial level of knowledge, experience and computers skills of the disabled people? - Which is the student's progress during the training process? - Which is the relation between the distance learning methods used, the learning results obtained to the end of the training modules and the objectives

	provided?
4. BEHAVIOR LEVEL	- The rehabilitation engineering training process generates more positive attitudes to the employers and to the general public with regard to the disabled people's competence?
5. RESULTS LEVEL	- All objectives of the rehabilitation training program were realized? - The effects of the training process are those provided by the educational program?
6. RETURN-ON-INVESTMENT LEVEL	- Does exist to the end of the project an increasing of the disabled people's employment in (well paid) jobs ? - The employers are satisfied with the intellectual level, behavior, qualification and skills of the disabled peoples to their workplace?