

# TRAINING SYSTEM FOR OCCUPATIONAL HEALTH AND SAFETY WITH USING ELEARNING

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## ABSTRACT

Recently there has been a noticeable trend of rising awareness among the employers in Poland of the fact that training on occupational health and safety may to the quality and effectiveness of their business. Providing safe employment is beneficial to both the employer and the employee. Work safety has an influence among others on efficiency, which is in turn one of the fundamental factors affecting the profitability of business activity, especially at the time of crisis.

Work safety is important not only at micro but also macroeconomic level as lack of accidents affects the reduction of job costs, the state spends less on accident allowances or rehabilitation benefits. In the traditional approach to training focus was placed only on the training content regardless of the assessment of its effectiveness, and particularly the quality of training measured as the assessment given by the trainee.

This study presents a proposition of a new approach consisting in reviewing traditional training on occupational health and safety. This approach aims at improving the quality of training through an appropriately developed training system with the use of e-learning.

## KEYWORDS

*e-learning, ICT, occupational health and safety, traditional training*

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## 1 INTRODUCTION

To this end the following research problem must be formulated:

*Is it possible to develop a training system with the use of ICT and e-learning owing to which the state of occupational health and safety could be improved by raising the level of selected occupational health and safety competences among employees, in particular the least developed competences?*

## 2 THEORETICAL BASE

Developing the system, we base on:

a) Legal acts on the subject matter of the training on occupational health and safety:

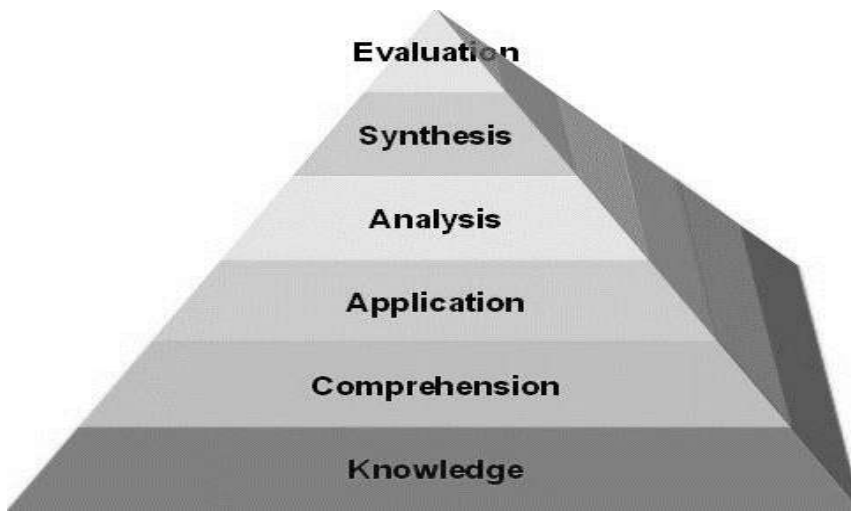
Regulation of the Minister of Economy of 18 July 2001 on the manner of checking the qualifications required for the operation and maintenance of technical machinery (Official Journal no. 79, item 849 as amended),

b) Definitions related to training on occupational health and safety in accordance with Regulation of the minister of Labour and Social Policy of 9 October 2007 amending the regulation on training in the scope of occupational health and safety (Official Journal no. 196, item 1420):

- training;
  - course;
  - seminary;
  - directed self-study;
  - teaching training.
- c) organisational unit providing educational activity in the area of occupational health and safety, which may be:
- lifelong learning centre;
  - practical training centre;
  - vocational training institution;
  - upper secondary school;
  - research and development unit, higher education institution or any other scientific unit.
  - association with its statutory aim to conduct activity connected with occupational health and safety,
  - legal or natural persons conducting educational activity on the basis determined in the regulations on freedom to conduct business activity if they conduct educational activity in the area of occupational health and safety.
- d) employee's scope of occupational health and safety competences for a given job position,
- e) published his first article on programmed teaching in 1954. Before Skinner, as early as 1920, programmed instruction was first attempted in Poland by S. Trębicki and in 1926 in the USA – by S.A. Pressey. Programmed instruction is based on an appropriately arranged programme containing interrelated logical doses of information on a given topic.

Programmed instruction distinguishes the following types:

- linear programming (B.F. Skinner) which consists in dividing the instructional material into merit-related and logically interrelated portions of information (steps) where filling the gap with the correct answer the student moves on to another portion at which point he compares (checks) the answer he has given with the programmed answer,
  - branched programming (created by N.A. Crowder), consisting in applying doses of information, selecting one of the several answers in the programme and checking it where apart from the correct answer the student finds out about why that particular answer was true,
  - mixed programming, which has different variants, e.g. the block method which was developed in Poland by Cz. Kupisiewicz. It boils down to the subsequent exposure of blocks of content, interwoven with blocks aimed at revising, systemising, extending and testing.
- e) Bloom taxonomy of educational objectives.



**Figure 1** Bloom taxonomy of educational objectives

The proposed occupational health and safety training system is designed according to the ADDIE Model (Analysis, Design, Development, Implementation, Evaluation). The main assumption of the model is the iteration of the process of constructing a course.

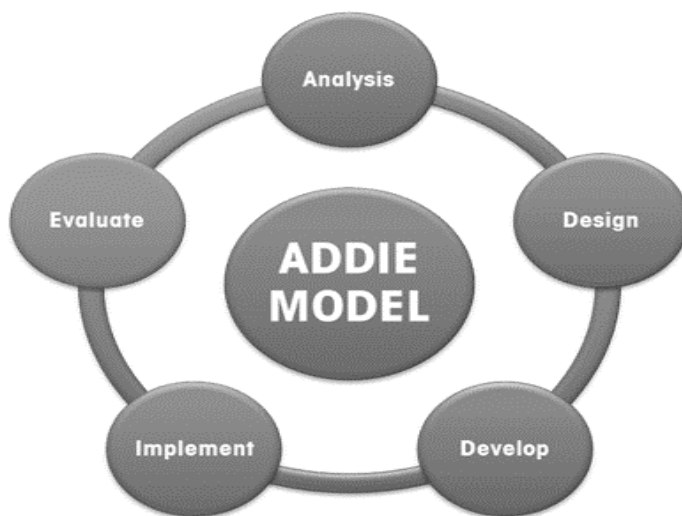
The ADDIE model consists of the analysis phase, the assumptions and conditions, course design, course development component, implementation and evaluation. Construction of a good e-course, which runs under the ADDIE model, is an ongoing process. After the evaluation stage, there is the next stage of analysis, which starts the next phase of work on the course and which is aimed at creation of a bug free, efficient and user friendly product.

**Table 1** Phase of Instructional System Design (ISD)

Phase	Name	Operation
1	Analysis	<p>On this stage, the conditions, in which the created training will be functioning, should be determined. The analysis includes:</p> <ul style="list-style-type: none"> <li>• determination of the scope of the project;</li> <li>• selection of the technology, in which the training will be made;</li> <li>• characteristics of the target group - who the recipient of the content is, what the current knowledge and training needs are;</li> <li>• determination of the objectives of the training - what messages, competences or skills are to be acquired by the course participants as well as determination of the signs of achievement of these objectives;</li> <li>• determination of limitations and obstacles in distribution of materials, e.g. bandwidth of Internet connections, possibility to attach soundtrack;</li> <li>• planning of the frameworks of the project.</li> </ul>

Collection of the data needed for the analysis may be performed through surveys, questionnaires or interviews with the final recipients or with persons responsible for the training (lecturers, coaches, employers). Analysis is one of the most important stages in the entire **project** cycle since all decisions made in further phases depend on the findings made during Analysis.

<b>2</b>	<b>Design</b>	<p>In this phase, proper measures are selected for the objectives and conditions of the training determined during Analysis. On the basis of the materials from the substantial expert, contents, interactions and multimedia are selected.</p> <p>Preparation of the basic objects is the starting point for planning of the division into lessons, modules and topics. The result of this stage may be development of documentation putting together the technical strategy and the visual concept of the design. This specification may also acquire the form of a scenario or prototype, i.e. simplified outlines (paper or electronic) of the interface, outlay of the content on the screen, manners of navigation and the schemes of the course of the training.</p>
<b>3</b>	<b>Develop</b>	<p>It is the most technical stage since it includes preparation or acquisition of the necessary training elements - texts, films, animations, interactions, games, simulations. The scope and the content of these materials is determined in Design phase. During Development, they are developed and integrated. At the end of this steps, the tests of conformity with the specifications and standards are performed.</p>
<b>4</b>	<b>Implement</b>	<p>In this phase, the course is installed in the environment that will be used by training participant. Final start-up may be preceded with functionality tests. As of the moment of distribution of the prepared materials, the teaching and learning process commences. The training participants obtain access thereto and their actions may be supported by mentors as well as substantial and technical experts.</p>
<b>5</b>	<b>Evaluate</b>	<p>Functioning, form and content of the prepared training is assessed. All preceding stages of course creation may be subject to evaluation. The conclusions and observations are used for improvement of both the methodological &amp; technical side of the product and the process of its creation.</p>



**Figure 2** ADDIE model

This results in designing training content being an ongoing process. This model organises the work of a project team which must be composed of team members playing the role of a project manager, substantive expert, methodologist, IT specialist and multimedia art specialist.

Depending on the type of instruction, organisation and aims of evaluation there may be conducted analysis of teaching effectiveness by means of various models, e.g. the models developed by Kirkpatrick, Phillips, Brinkerhoff, Bushnell and others. During the process of evaluation of teaching data of various kind will be collected and next divided into groups according to categories and levels.

In our e-learning environment the following test will be used:

- preliminary didactic tests (pretests),
- didactic tests taken during the learning process,
- final didactic tests (posttests),
- retention tests taken three months after the course completion (retests).
  - possibility of using ICT and e-learning in the scope of occupational health and safety training.

### **3 MAIN AIM OF RESEARCH**

The aim of proposed research is developing and evaluating a training system in the scope of occupational health and safety with the use of ICT and e-learning. It is based on an e-learning course containing a didactic module aiming at developing the employee's competences in the scope of occupational health and safety. It is enhanced by elements of programmed instruction which involves the principle of gradual increase of difficulty level.

The developed training system with the e-learning component would manage the employee's training by means of an LMS (Learning Management System) based on the principles of programmed instruction according to an algorithm proposed by the present authors.

The training system would comply with Polish legal acts in terms of the subject matter of the training related to occupational health and safety.

The expected result would be the improved state of occupational health and safety through an appropriately developed training system. The authors assume the level of occupational health and safety will rise in firms and institutions where the system will have been used.

### **4 TRAINING SYSTEM DESIGN**

#### **Analyse – analysis of the current state of the studied area of problems**

At this level the constructed system's teaching aims as well as expected results will be developed. Survey research will be conducted in relations to the knowledge and use of ICT tools and e-learning in Silesian Province in selected work places/institutions/firms among employees in various positions, also representing training sections. A decision will be made on what mechanism will be selected for presenting new content in the scope of training (e-learning platform, if so what platform? Or another multimedia tool). Also conducted among the employees in selected work places/institutions/firms will be analysis of the level of competence in the scope of occupational health and safety and the state of health and safety at work.

#### **Design – designing a training system**

At this stage the teaching aims of the created system, its schedule, duration and pace will be developed. Charts and diagrams showing the manner of presentation and scope of study will be created. Methods and conditions of participants' assessment will be determined. The method of system evaluation as well as the methodology of data collection for analysis and the way of presenting final reports will be specified.

#### **Develop – developing a training system**

At the stage of development, a course will be created, and its particular modules and lessons will be filled with study materials: texts, instructional films on occupational health and safety, tests, etc. For the purpose of constructing the course the charts and diagrams created during the design stage will be used.

## 5 STRUCTURE OF THE PROPOSED E-LEARNING COURSE

The e-learning course in the scope of occupational health and safety will be placed on the e-learning platform of the University of Occupational Safety Management in Katowice, Poland or an institution where research will be conducted (provided it owns one). The course will have a hierarchical and modular structure and consist of several standard blocks:

- introduction to a distance course;
- thematic module;
- summarising module.

The proposed structure of the thematic e-learning course will be as follows:

- Introduction to the distance course: Course description, Literature, Glossary of Terms, Forum, Registration Questionnaire, Legal acts on Occupational health and safety.
  - Thematic module: Pre-test (a diagnostic test); Information material on the studied area; Thematic lessons containing a didactic module, Block of Tasks; Testing and checking knowledge; Block of interactive communication between the tutor and the students and between the students themselves; Additional information materials on the studied area; Checking knowledge.
  - Summarising module: Examination test; Final questionnaire, Reflexive (evaluation) survey.
- The platform will consist of 3 most important parts:

- Administrator's panel,
- Tutor's panel,
- User's panel.

The course features the following components/modules of the platform: Questionnaire, Lesson, Quiz, Assignment, URL, Forum, Chat, Glossary.

Each lesson will be a multimedia programme. All items of information, advice and instruction will be transmitted in the written form. The employee will navigate throughout the course by means of hypertext. During the period of the course the employee's work will be assessed. Through automatically generated reports the tutor will have access to information on how well the employees have developed particular competences.

## 6 IMPLEMENTATION OF THE E-LEARNING COURSE

The stages of design and development will be followed by the system implementation. After the course preparation and before the system evaluation begins a pilot experiment is planned which including consultations with methodologists, health and safety trainers in order to find out about their remarks and comments. The aim of this stage will be:

- to search for imprecise statements in training materials placed in the course and included in the tests,
- to examine the functioning of the didactic module which develops the employees' health and safety competences,
- to find out the level of comprehension of test tasks and verify their content,
- to verify the appropriate order of questions in a test,
- to verify the duration of the course and the tests.

### Evaluation of the training system

What follows next is the main research within the framework of which will be selected:

- the experimental group (EG) – to be working with the use of the e-learning course,
- the control group (CG) – to be working without access to the e-course.

The development of the employees' competences will be measured three times:

- by means of the pretest prior to the training commencement,
- by means of the posttest at the end of the training,
- by means of the retest three months after the training completion.

For analysis of the results of the main experiment the following methods will be applied:

- t-Student test for uncorrelated groups,
- t-Student test for correlated groups,
- Pearson coefficient of correlation.

Towards the end of the experiment survey studies will be conducted among the employees (participants of the experimental group EG) as well as the trainers, methodologists evaluating the course and prepared methodological materials for trainers and course users.

## **7 EXAMPLES OF CURRENT TRAINING ON OCCUPATIONAL HEALTH AND SAFETY IN POLAND**

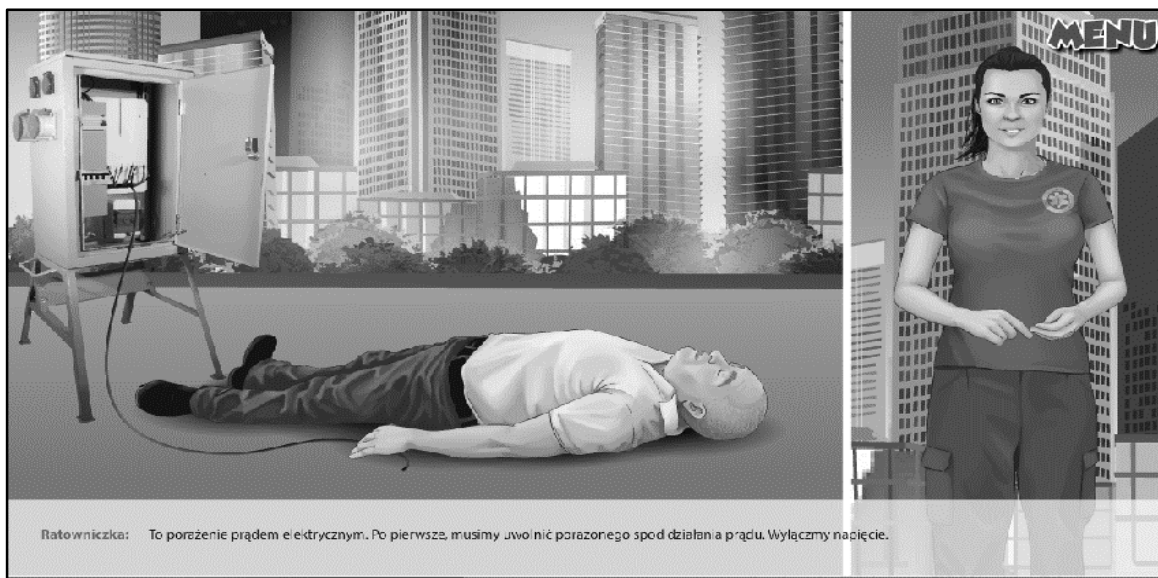
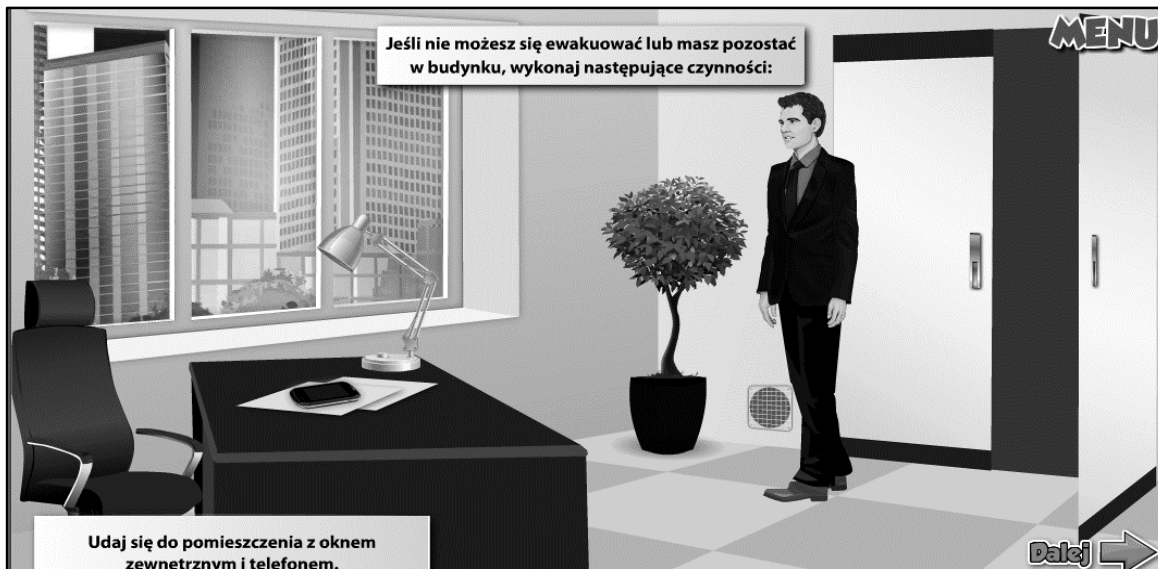
- **[HTTPS://WWW.SEKA.PL/DEMO-BHP/](https://www.seka.pl/demo-bhp/)**

Seka is the leader in organisation of occupational health & safety courses in poland. since the beginning of its activity, it has trained over 1,000,000 persons. Its offer includes e-learning occupational health & safety courses in polish and english versions for three groups of positions:

- periodic training for administration & office employees,
- periodic training for employers and other persons managing employees,
- periodic training for engineering & technical employees.

These training are developed in articulate software. they contain:

- a) screens with active infographics;
- b) screens with a tutor and animation presenting the training contents;
- c) screens with exercises;
- d) screens with interactive photos;
- e) animated screens with interactive fire protection manual;
- f) screens with first aid provision manual.



- [HTTP://WWW.KNO.KOWEZIU.EDU.PL/REPOZYTORIUM-KURSOW.HTML](http://www.kno.koweziu.edu.pl/repozytorium-kursow.html)

### Online vocational education course repository

The repository consists of 169 online courses on Moodle platform for vocational education developed within the system project of the National Centre for Supporting Vocational and Continuing Education ‘**Model of the system of implementation and popularisation of distance education in lifelong learning**’.

The objectives of the project were as follows:

- popularisation and promotion of distance education in vocational education and continuing education,
- ensuring of high quality of distance education services through development of the standards for designing and conducting of e-learning courses,
- activation of institutions for implementation of distance education,



- improvement of the competences of the personnel of the educational institutions in the field of implementation and use of distance education.

The courses are dedicated mainly to the participants of qualification vocational courses but the individual course modules (presentations, films, podcasts, tests) may be also used successfully during school classes.

> Jakie obowiązki ma pracodawca wobec pracowników?

Zatrudnianie pracowników, to jednak nie tylko pomoc, lecz także **zobowiązania**.

Pracodawca ma obowiązek dbać o bezpieczeństwo pracowników i zapewnić im warunki pracy niestanowiące dla nich zagrożenia.

Zatrudnianie pracowników jest jednoznaczne z przyjmowaniem odpowiedzialności za ich bezpieczeństwo.




> Jakie akty prawne regulują kwestię zatrudnienia?

Aktem prawnym regulującym kwestię zatrudnienia jest Kodeks Pracy. Opisuje on wszystkie relacje pomiędzy pracodawcą a pracownikiem.  
Instytucjami kontrolującymi jego przestrzeganie są:

- 1. Państwowa Inspekcja Pracy
- 2. Państwowa Inspekcja Sanitarna
- 3. społeczna inspekcja pracy.

ustaw kursor na wybranym elemencie, aby uzyskać więcej informacji.



## CONCLUSION

The authors have presented the proposition of research consisting in the design and evaluation of a training system in the scope of occupational health and safety with the use of ICT and e-learning at the heart of which is an e-learning course which contains a didactic module developing the employees' health and safety competences. It is enhanced by elements of programmed instruction which involves the principle of gradual increase in difficulty level. The presented proposition was developed on the basis of the experience gained during the research conducted as part of the PhD dissertation on the use of e-learning in mathematics teaching. It is also extension of one of the dissertation's final conclusions which postulate adaptation of the designed system of education not only at school or academic level but also in the scope of training on a variety of subjects in various business sectors, enterprises or in our case in the area of occupational health and safety. Working on an outline of the prepared project the following barriers have been identified in reference to the realisation of the project:

- lack of awareness among the managers and employees of enterprises of the need to educate and be taught how to learn,
- lack of awareness of the fact that e-learning constitutes an important element of raising competitiveness of the enterprise, management of knowledge and information,
- lack of ability and rules of e-learning based education with Focus on self-study, self-directed learning in particular,
- to the authors' knowledge there have not been developed any methodology of evaluation of the effectiveness of e-learning in the scope of occupation health and safety training, which would allow to collect and systemise appropriate data and evaluate the e-learning process.

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