TRENDS OF SPECIALISTS COMPETENCE IN WORK SAFETY

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Abstract. Formation of safe work environment and running of work process depend on the cooperation of employers, employees and work safety specialists. Therefore, an engineer along with a work safety specialist is obliged to provide safe work environment and process. Qualitative staff teaching/learning and instructing is a particularly important aspect of the work safety specialists and also engineers' competence because the engineers often carry out instructing at work, teaching safe work methods. It is stated in the study that at least one third of the specialists are not competent enough in instructing. The necessity of the work safety specialist competence conception understanding is topical also because of implementation of European Qualification Framework where learning outcomes are defined in terms of knowledge, skills and competence. Comprehension and aspirations to implement five pillars of Education for Sustainable Development described in UNESCO documents could improve the education of the work safety specialists. Conceptions of competence and their relation to the European Qualification Framework are evaluated in the study. Five pillars of Education for Sustainable Development significance in the education of work safety specialists expert evaluation was carried out. Suggestions on instructing quality improvement were worked out on the basis of instructing quality observations and questionnaires.

Keywords: work safety, work safety specialists, competence, pillars of education for sustainable development.

Introduction

The labour and work terminology has a philosophical background substantiated by Hannah Arendt. She uses the following terms: labour, work, action [1]. According to Arendt the philosophical meaning of the work is the most humanistic one and responds nowadays tendencies of education for sustainable development. Therefore, the concepts of labour protection and labour safety should be reassessed critically in order to promote sustainable development and the terms: *work safety*, *safe work* and the *work safety specialist* are the most appropriate ones.

Investigations on safe work which promotes keeping of abilities and life quality are necessary both from humanistic and economic aspects. The last one is of high importance because of inevitable increase of the age of retirement in many European countries.

Interaction of human inner environment (endosystem) and outer environment (ecosystem) goes on in every activity [2]. Mutual compliance of inner and outer environments and interaction of their indices is a guarantee of safe work. Therefore, the human capability to state non-compliance and divert it in time changing one or both environments or activities is highly important. An appropriate competence dependent on education and experience has an impact on the capability. It should be considered that the type of activities has changed crucially and psychoemotional factors dominate in many works and they are not assessed appropriately in many cases. Therefore, the development of psychosomatic medicine is also important because it is a means of better understanding of the interaction of a body, psyche and social factors and their role in stating the causes, forecasting and prophylaxis of human psychical and somatic diseases interferences including professional diseases and injuries. The psychosomatic approach bases on a balance principle and a conception about a body and psyche processes simultaneity and equality. The competence of work safety of other specialists including engineers is vitally important to assess the above mentioned conditions nowadays and in future, and it can be provided by education of sustainable development. This is the reason why the study is devoted to two aspects: competence and understanding of pillars of education for sustainable development.

One of the approaches towards competence understanding focuses on its quality and level. Hoffman [3] marks that the approach could be important for the needs of companies. This approach usually considers professional standards and other normative documents. Here, dynamic development of the company and adequately the competence level demands should be matched in a nowadays enterprise. But it is worth mentioning that this approach covers also competence proving in action and personal attributes development. It comprises knowledge, skills, attitudes, etc.

The content of the work safety specialists training programmes has to consider the types of competence which are significant for every specialist nowadays, safe work conditions in companies and legislation, and pillars of education for sustainable development. Nowadays education tendencies require that work safety specialist's competence conception understanding should be linked with five pillars of Education for Sustainable Development (ESD) [4], the European Qualification Framework [5] and the Professional Standard of the Senior Specialist Labour Safety.

ESD supports five fundamental types of learning (pillars of ESD) - learning to know, learning to be, learning to live together, learning to do and learning to transform oneself and society [4], which have to promote reaching of appropriate learning outcomes. The European Qualification Framework defines learning outcomes in terms of knowledge, skills and competence [5]. The Framework updates the initial competencies with the purpose to make them valid for a longer period of time.

Qualitative staff teaching/learning and instructing in work safety problems is an important aspect both for work safety specialists and engineers because the engineers often carry out instructing at work, teaching safe work methods.

The empirical study on this linkage significance is carried out considering the work safety specialist and engineer expert evaluation with the purpose to improve the competence features of the work safety specialists.

Materials and methods

Three groups (A, B, C) of experts participated in the study – from eight to ten persons in each group. An equal number of inquiry forms from each group (six more qualitative) were used for further processing in order to get mutually comparable data. The criteria of expert (inquiry forms) choice were the following: education, scientific degree, professional and educational work experience, active participation in the learning/study process during the period of expertise as well as their assent to participate in the expert evaluation process. All the experts in addition to their work load were enrolled in postgraduate or non-formal education groups. Considering the study context work safety specialists and engineers were chosen as experts. The group A consisted of six work safety professionals. They carried out an expertise in October 2010. The experts had the EQF 6th level qualification [5]. They also had regular participation in professional programmes of continuous education. The experts' work experience was from 10 to 40 years. Management of work safety courses was a part of their duties. All the experts were the university students for the second time in the programme of work safety according to the EQF 7th level.

The group B experts - six work safety professionals carried out an expertise in February 2011. The experts had the EQF 7th level qualification as well as they participated in professional programmes of continuous education. The experts' work experience was from 6 to 20 years. Management of work safety courses was a part of their duties. All the experts were the university students for the second time in the programme of work safety on the EQF seventh level. Considering the experience with the experts of the group A and their suggestions, the experts of the group B received more detailed instructions on the tasks and process of the expertise.

The group C consisted of six engineers awarded Dr.sc.ing. An expertise was carried out in October 2010. All the experts were university academic staff including three professors and three assistant professors. The experts' total work experience was from 14 to 52 years, and at university - 10 to 40 years. All the experts participated in the professional continuous education programme *Innovations in Tertiary Education Didactics*.

The objective of experts was to evaluate five fundamental types of ESD supported learning (pillars of ESD), which are used for getting of competence in all types of learning including also safety of work. The pillars are the following: *learning to know, learning to be, learning to live together, learning to do and learning to transform oneself and society* [4]. Understanding of the pillars covers understanding of the competence types. The basic interrelated types of competence are: core, meta, individual (self-, sociocultural), social, professional. They are through composed with reflection and methodical competences, which relate to all types [6].

Carrying out ordinal scale measurement, i.e., characterizing the pillars by a relative rank, experts had to state the rank of significance of the pillar at first. Then they had to evaluate the instant situation

de facto of the implementation and adoption of ESD pillars in formal, non-formal as well as informal education. One of the conditions was that it was not compulsory to differentiate evaluation of ESD pillars, e.g., each pillar could have a rank 3 or pillars could be grouped according to similar evaluations (fractional ranking), e.g., two pillars were assessed as the most significant ones and their rank was 1.5.

All participants were told the description of ESD five pillars repeatedly before the expert evaluation. Inquiry forms contained a brief description of the pillars [4].

Learning to know, knowledge, values and skills for respecting and searching for knowledge and wisdom: learn to learn; acquire a taste for learning throughout life; develop critical thinking; acquire tools for understanding the world; understand sustainability concepts and issues. Education for Sustainable Development (ESD): recognizes the evolving nature of the concept of sustainability; reflects the ever growing needs of societies; acknowledges that fulfilling local needs often has international effects and consequences; addresses content, context, global issues and local priorities.

Learning to be, knowledge, values and skills *for personal* and family *well-being*: see oneself as the main actor in defining positive outcomes for the future; encourage discovery and experimentation; acquire universally shared values; develop one's personality, self-identity, self-knowledge and self-fulfilment; be able to act with greater autonomy, judgment and *personal responsibility*. ESD: builds on the principles and values that underlie sustainable development; *deals with the well-being* of all three realms of sustainability – *environment, society*, and economy; contributes to a person's complete development: mind and body, intelligence, sensitivity, aesthetic appreciation and spirituality.

Learning to live together, knowledge, values and skills for international, intercultural and community cooperation and peace*: participate and co-operate with others* in increasingly pluralistic, multi-cultural societies; develop an understanding of other people and their histories, traditions, beliefs, values and cultures; tolerate, respect, welcome, embrace, and even celebrate difference and diversity in people; respond constructively to the cultural diversity and economic disparity found around the world; *be able to cope with situations of tension*, exclusion, conflict, violence, and terrorism. ESD: is interdisciplinary; no discipline can claim ESD for its own, but all disciplines can contribute to it; builds civil capacity for community-based decision-making, social tolerance, environmental stewardship, *adaptable workforce and quality of life*.

Learning to do, knowledge, values and skills for active engagement in *productive employment and recreation*: be an actor as well as a thinker; understand and act on global and local sustainable development issues; *acquire technical and professional training*; *apply learned knowledge in daily life*; be able to *act creatively and responsibly in one's environment*. ESD: is locally relevant and culturally appropriate; must become a concrete reality for all our daily decisions and actions; is about helping *build a sustainable and safe world for everyone*.

Learning to transform oneself and society, knowledge, values and skills for transforming attitudes and lifestyles: work toward a gender neutral, non-discriminatory society; develop the ability and will to *integrate sustainable lifestyles for ourselves and others*; promote behaviours and practices that minimise our ecological footprint on the world around us; be *respectful of the Earth and life* in all its diversity; act to achieve social solidarity; promote democracy in a society where peace prevails. ESD: integrates the values inherent in sustainable development into all aspects of learning; *encourages changes in behaviour* to create a more viable and fairer society for everyone; *teaches people to reflect critically* on their own communities; empowers people to assume *responsibility for creating and enjoying a sustainable future* (*Italics by authors*).

In the EU Memorandum of Lifelong Learning [7] three forms of education are described: formal, non-formal and informal. The basic competence of work safety is got both in formal and non-formal education. The form of non-formal education is quite typical for specialists of various branches including engineers trying to get the competence of work safety and practice as work safety specialists in small companies. Considering rapid technical and technological development as well as the necessity to adapt to appropriate work conditions informal education or learning is significant. It happens during daily work because the specialists learn both consciously and unconsciously. Therefore, the following questions were formulated: 1) What are ESD pillars de facto and prospective significance in the implementation of ESD? 2) What are the possibilities of ESD pillars adoption

during studies: formal and non-formal education? 3) What are the possibilities to adopt ESD pillars outside an educational establishment: at work, in life – informal education?

The experts individually evaluated the five pillars of ESD at first, characterizing the pillars by relative rank as well as commenting them in a written way. The comments were processed by content analysis. Unstructured interviews were included in the expert evaluation analysis with the purpose to find out a clear view on the priorities of the pillars.

The following data analysis statistics were used: Kendall's coefficient of concordance W and the coefficient significance level p were used to characterize the level of unanimity of the experts' opinions [8]. In order to determine the level of significance of the discordance in experts' opinions the chi-square test was applied. The priority groups of pillars were selected by means of data evaluation in a group because with the chi-square test statistically significant sums of rank differences were not stated in several cases.

Results and discussion

The results of expert evaluation are summed up in Table 1. The sum of ranks is obtained counting the ranks of six experts in each group. Theoretically the sum of ranks can be from 6 to 30, on average – 18, e.g., if the evaluation of one of five pillars is unanimously the most significant one by all the experts, the sum of ranks is 6. The sums of ranks are significantly different in the case of unanimous evaluation. The sums of ranks are close to average value of all five pillars in the case of non-unanimous evaluation. Unanimity of all expert groups together is the following: the minimal sum of ranks is 18, the maximal – 90 but the average – 54. Kendal's coefficient of unanimity features total unanimity of each expert group W=1 in the case of unanimity, and W=0 in the case of non-unanimity. Kendal's coefficient of unanimity level of statistical significance featured by p. Kendal's coefficient of unanimity is statistically significant if $p<0.05$ (5 %).

Statistically significant evaluation on five pillars is from the group C experts answering the questions 1 and 2 as well as the groups A and B experts answering the question 2. The sum of ranks obtained from all the three expert groups is statistically significant regarding the questions 1 and 2. Statistically significant five pillars evaluation regarding the question 3 is not obtained in any case. The differences of evaluations unanimity can be explained considering the experts understanding of education for sustainable development as well as their competence. The group C expert competence is very high, therefore unanimity of its evaluations (W value) is comparatively higher. In its turn, the group B experts were introduced to the methods of evaluation considering the experience with the group A, and it promoted obtaining of comparatively more unanimous evaluations.

The data evaluation allows to state that relatively better understanding is on the question *What are possibilities of ESD pillars adoption during studies: formal and non-formal education?* The experts recognise unanimously that priority learning forms for getting competence at present in formal and non-formal learning and study process are *learning to know* and *learning to do*. The evaluation of other three pillars is statistically more significant ($p<0.01$) than the mentioned two ones. Analogue evaluation is obtained evaluating the prospective significance in the implementation of ESD. That kind of evaluation responds to the tendencies of the 21st century incompletely, which are stated in the Report to UNESCO International Commission on Education for the Twenty-first Century [9]. Learning *to live together* is marked as the most important among the four forms of learning. In turn, in the UNESCO Education for Sustainable Development strategy [4] the four types of learning are complemented by the fifth *learning to transform oneself and society*. After evaluation of the ranks, interviews and comments it can be stated that the study participants as work protection specialists and higher school academic staff evaluate the type *learning to live together* insufficiently. Safe work can be implemented only in the cases of the safe work and appropriate branch specialists cooperation, and their common concern is the development of safe environment and implementation of the employees teaching/learning process. The staff of groups and teams of employed often is varied: male and female of different ages, ethnic origin, etc. The variety will also increase in the case of inclusion of people with special needs. The authors' observations allow concluding that there is a lack of the use of possibilities in the teaching/learning process with the purpose to get appropriate social competence. Small group work and project methods are used little in a part of lessons. Possibilities of working out of shared course or final papers (Bachelor or Master thesis) are never or rarely used.

Working out the theses concerns crucially higher responsibility of students on shared results and can have positive impact on the development of social competence.

Table 1

Five education pillars of expert evaluation of ESD

Expert groups, number of experts *n*	Evaluation criterion	Pillars of education (learning)					Coefficient of concordance *W*	Significance level *p*
		Learning to know	Learning to do	Learning to live together	Learning to be	Learning to transform oneself and society		
1. What are ESD pillars de facto and prospective significance in the implementation of ESD?								
A. Work safety professionals, *n*=6	The sum of ranks	10.5	17	18.5	23.5	20.5	0.28	>0.05
	The rank of the sum	2	1	3	5	4		
	Priority groups of pillars	I		II			-	-
B. Work safety professionals, *n*=6	The sum of ranks	12	12	20	21.5	24.5	0.38	>0.05
	The rank of the sum	1.5	1.5	3	4	5		
	Priority groups of pillars	I		II			-	-
C. Engineers-pedagogues, *n*=6	The sum of ranks	7	14	22.5	20	26.5	0.68	<0.01
	The rank of the sum	1	2	4	3	5		
	Priority groups of pillars	I	II	III			**-**	**-**
All groups, *n*=18	The sum of ranks	29.5	43	61	65	71.5	**0.85**	**<0.05**
	The rank of the sum	**1**	**2**	**3**	**4**	**5**		
	Priority groups of pillars	**I**	**II**	**III**			**-**	**=0.10**
2. What are the possibilities of ESD pillars adoption during studies: formal and non-formal education?								
A. Work safety professionals, *n*=6	The sum of ranks	7	16	22	23	22	0.56	<0.01
	The rank of the sum	1	2	3.5	5	3.5		
	Priority groups of pillars	I	II	III			-	-
B. Work safety professionals, *n*=6	The sum of ranks	10.5	9.5	20.5	28	21.5	0.69	<0.01
	The rank of the sum	2	1	3	5	4		
	Priority groups of pillars	I		II			-	-
C. Engineers, pedagogues, *n*=6	The sum of ranks	9	11	17	23.5	29.5	0.85	<0.01
	The rank of the sum	1	2	3	4	5		
	Priority groups of pillars	I		II	III		-	-
All groups, *n*=18	The sum of ranks	26.5	36.5	59.5	74.5	73	0.89	<0.01
	The rank of the sum	**1**	**2**	**3**	**5**	**4**		
	Priority groups of pillars	**I**		**II**			-	<0.01
3. What are the possibilities to adopt ESD pillars outside an educational establishment: at work, in life – informal education?								
A. Work safety professionals, *n*=6	The sum of ranks	**20.5**	**12.5**	**16.5**	**17.5**	**23**	0.19	>0.05
	The rank of the sum	**4**	**1**	**2**	**3**	**5**		
	Priority groups of pillars	**III**	**I**	**II**		**III**		
B. Work safety professionals *n*=6	The sum of ranks	17	17.5	12	19	24.5	0.23	>0.05
	The rank of the sum	**2**	**3**	**1**	**4**	**5**		
	Priority groups of pillars	**II**		**I**	**II**		-	-
C. Engineers (pedagogues) *n*=6	The sum of ranks	24.5	10	17	16	22.5	0.36	>0.05
	The rank of the sum	5	1	3	2	4		
	Priority groups of pillars	**III**	**I**	**II**		**III**	**-**	**-**
All groups, *n*=18	The sum of ranks	**62**	**40**	**45.5**	**52.5**	**70**	0.60	>0.05
	The rank of the sum	**4**	**1**	**2**	**3**	**5**		
	Priority groups of pillars	**II**		**I**		**II**	**-**	**-**

All the groups of experts mark *learning to live together* as a priority in informal education at the same time. Non-unanimous evaluation of the possibilities of informal education is an evidence of insufficient understanding of the type and importance of informal education. The interviews allow

concluding that the methods of informal education in the teaching/learning process are acquired insufficiently, e.g., social learning and its promoting factors. It is worth mentioning that informal learning is particularly important in getting of social competence.

Insufficient legislation and practice of recognition the competence informally reduce the importance of informal education but at least investigations in this field have increased in previous years.

The conclusion from the content analysis of the work safety specialists' expert evaluations is that there are dominating concepts which point to shortcomings of development of competence and types of education: pedagogical competence, reflection ability, non-formal and informal education.

Conclusions

1. Competencies as a topical pedagogical category are quite complicated from the point of view of the structural approach and the pillars of education for sustainable development serve as benchmarks in their development.
2. The conclusion from the results of the expert evaluations, interviews and observations is that work safety specialists understanding of importance of the main learning pillars of education for sustainable development in getting competence is insufficient. At first, it relates to learning to live together and its acquiring possibilities in the teaching/learning process.
3. The importance of informal education is not understood sufficiently in the process of work safety specialists' competence development.
4. Pedagogical competence of work safety specialists is insufficient and investigations of its developmental model formation are topical at present.

Acknowledgements

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