

Assessment of the compliance of OSH competences with student expectations in the post-graduate programs offered by the Poznań University of Technology

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Abstract. In order to fulfill the duties associated with ensuring occupational safety at work, a broad range of competences are required that are critical to perform work and comply with relevant laws. One way to obtain such competences is to complete a post-graduate program of studies. The Poznań University of Technology offers precisely such an opportunity. Its post-graduate OHS program provides students with the knowledge and skills necessary to work in the field while satisfying their expectations. Student expectations are ascertained in surveys designed to assess the extent to which the knowledge and skills taught meet the needs they have indicated. The findings of such surveys are used to improve course design with a view to enabling the graduates to conduct OHS work in both the manufacturing and service sectors. However, to ensure that the courses designed to satisfy student expectations do not fail to teach the skills necessary in real life, criteria other than the survey results alone need to be adopted in defining program content.

1 Introduction

In order to ensure proper working conditions, including occupational health and safety, for workers, it is critical to either employ competent OHS experts or outsource the function to knowledgeable specialists. The Polish law allows a certain flexibility in fulfilling this obligation [1-2]. The adequate approach depends on the number of workers and the magnitude of risks in the working environment. Regardless of how the obligation is satisfied, persons in charge of occupational health and safety must be properly qualified. OHS officers are expected to have the competences that match their job descriptions and therefore need to have completed such occupational health and safety training as designed for such workers [2-3].

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To ensure that the workers responsible for shaping working conditions perform their duties effectively, it is vital that they improve continuously. The issue is seen as complex and challenging [4-8].

There is definitely a need to improve professionally on an ongoing basis to acquire new specialized knowledge that is necessary for the performance of work. Therefore, safety officers must stay abreast of the latest developments in science, technology, work design, and learn to use some of the latest safety instruments and solutions.

2 Aim of research

2.1 Scope of responsibilities of OHS services

The primary responsibility of OHS services is to oversee working conditions and advise the employer on ways to complete tasks associated with ensuring safety in the working environment. In view of the nature and scope of OHS duties, the relevant services require all-around preparation for their work, including the knowledge of the available technical and organizational solutions that help mitigate threats. The basic scope of the responsibilities and obligations of OHS services has been defined in the relevant laws. The job of an OHS officer or any person charged with the related responsibilities is to [2]:

- Identify any threats and untoward factors associated with the performance of work in their organization, assess the related occupational risks and propose measures designed to eliminate them,
- Prepare methods to assess safety including proposed technical and organizations measures aimed at averting any existing threats to worker health and lives and improving working conditions,
- Assess precepts, contribute to the development of workplace modernization and improvement plans and propose technical and organizational solutions aimed at boosting safety and hygiene levels at work,
- Formulate findings from surveys of occupational accident causes and circumstances as well as cases of occupational diseases,
- Have external experts oversee the ways in which work is performed and supervise surveys and measurements of factors that are deleterious to health or any other untoward conditions in the working environment,
- Collaborate with physicians providing preventative health care to workers, the social labor inspectorate and company trade unions regarding the performance of tasks associated with employee safety and health,
- Participate in drafting internal regulations governing terms of employment and work methods, including internal ordinances, rules and general instructions regarding occupational health and safety,
- Follow recommendations on compliance with ergonomic requirements applicable to specific workstations,
- Support the employer in assigning responsibilities to supervisors and managers to the extent of the duties associated with ensuring safe working conditions for their subordinates.

2.2 Opportunities for acquiring the required credentials and competences

In view of the scope and nature of OHS responsibilities, it is essential that OHS officers are provided with opportunities to stay up to date on changes in the field and any new methods and solutions for ensuring occupational safety and protecting worker health [9]. The easiest

and simplest way to acquire the necessary knowledge is to enroll in dedicated occupational health and safety training. Such training is offered to enable members of OHS services to [10]:

- Become familiar with any working environment factors found at workstations that may endanger worker health and safety during their work,
- Learn about the current laws and occupational health and safety regulations to the extent necessary to perform their duties and fulfill their OHS-related obligations,
- Acquire practical skills to perform work in ways that are safe for themselves and others, respond to emergencies and aid accident victims.

It is crucial for such measures to benefit the company by generating profit [6, 11]. To ensure that, OHS services must be adequately skilled in performing their professional responsibilities [11]. Considering the specific nature of their duties, members of such services need specialized education in occupational health and safety [4].

The most advanced path to obtaining occupational health and safety-related professional qualifications available in Poland is to enroll in a post-graduate program of studies in the field. Such programs are geared to updating and/or providing such specific knowledge and skills as are not available in undergraduate or graduate programs [12]. Post-graduate studies are designed for holders of lower-level higher education degrees. The laws of Poland restrict the number of institutions of higher learning permitted to offer post-graduate OHS programs to those that teach occupational health and safety, ergonomics and the related subjects to ensure worker protection in working environments with particular emphasis on deploying technical and organizational measures [9].

Market demand as well as the long-standing record and vast experience in teaching methodology and education in the fields of OHS, ergonomics and health protection held by the Poznań University of Technology has prompted the institution to offer a post-graduate program specializing in occupational health and safety.

2.3 Educating OHS workers at Poznań University of Technology

The presumption made by the Poznań University of Technology was that the graduates of its post-graduate program should walk away equipped with the competences needed to perform work in the field of OHS at least in the position of a Senior OHS Inspector. Access to employment in higher-ranking positions depends on the years served in occupational health and safety. Another presumption made was that the knowledge provided to the students must provide them with opportunities for promotion and continuing work in other OHS capacities, up to Chief Specialist, as long as the concerned individual has obtained all other required credentials [2, 4]. Since the job descriptions in such positions often extend beyond the traditional duties of an OHS officer, the University recognized the need to offer additional knowledge and skills. Such knowledge includes occupational health and safety management, the ability to analyze a company's operating expenses in connection with occupational health and safety issues, and business project planning.

Of equal importance, and considered in developing the curriculum, are the abilities to teach specific OHS skills to help others update their knowledge and acquire the necessary abilities. Such educational skills include human-factor-related, technical, legal, organizational and economic issues.

The thematic areas and knowledge content offered to students were selected to ensure their mutual correlation. Consequently, the graduates should be able to combine e.g. technical knowledge with organizational, legal and economic considerations while not forgetting about the central role of humans in shaping the working environment. The program of studies continually updates to account for legislative changes and, primarily, the expectations of post-graduate students. The thematic areas of the current post-graduate curriculum adopted by the

Poznań University of Technology in the field of occupational health and safety are summarized in Table 1. A large proportion of the classes are practical workshops designed to move beyond theoretical knowledge and help acquire actual working skills.

Table 1. Post-graduate occupational health and safety classes offered by the Poznan University of Technology.

No.	Name of course (thematic area)	Course description, format and number of hours
1	2	3
1	Fundamentals of occupational health and safety	Introduction to the material covered further into the program. lecture = 4 hours
2	Ergonomics in shaping working environment	A broad discussion of the ergonomic aspects of shaping the working environment. lecture = 10 hours
3	Work loads	Issues associated with musculo-skeletal loads at work linked to workstation design and equipment. lecture = 6 hours, laboratory = 6 hours
4	Working environment – preconditions for ensuring occupational health and safety	Issues associated with measurements, result interpretation and improvement measures, primarily for factors in the physical working environment. lecture = 12 hours, workshop = 10 hours
5	Human factor in shaping occupational safety	Issues associated with the impact of the human factor on the ability to ensure safe work performance. lecture = 6 hours
6	Ecology in shaping working environment	Discussions of issues and requirements associated with the environmental impact of business organizations. lecture = 10 hours
7	Comprehensive work strain analyses	Discussion of comprehensive methods of examining working conditions. lecture = 8 hours
8	Organizational safety systems	Issues linked to ensuring safety in organizational units (and consequently in enterprises). lecture = 6 hours, workshop = 8 hours
9	Interpersonal communication in OHS	A discussion of factors affecting vertical and horizontal communication and its effectiveness. lecture = 6 hours
10	Oversight over working conditions – recordkeeping by OHS services	A discussion of rules for overseeing working conditions and documenting work performance and working conditions with a view to ascertaining compliance with relevant laws and regulations. lecture = 6 hours, workshop = 14 hours
11	Occupational risk assessment and management	Focused on occupational risk and employer measures compliant with occupational risk assessment and management guidelines to ensure safety at work. lecture = 6 hours, workshop/project = 12 hours
12	Fire safety at the workplace	Issues associated with ensuring fire safety at the workplace. lecture = 6 hours
13	Economic aspects of improvements in occupational health and safety	A discussion of economic aspects of occupational health and safety, including the financial cost of safety deficiencies (enterprise losses). lecture = 4 hours

1	2	3
14	Occupational health and safety – laws and standards	Labor law issues, as enshrined in international, European and national law, as well as relevant standards. lecture = 10 hours
15	Technical and organizational aspects of shaping working environment	Technical and organizational requirements determining proper working conditions. lecture = 10 hours
16	Safety in the operation of work machinery, equipment and tools	Issues associated with ensuring occupational safety when operating machinery, equipment and tools. lecture = 12 hours
17	Health protection. First aid in the working environment	Issues associated with providing paramedical first aid to victims. lecture = 4 hours, workshop = 8 hours
18	Introduction to occupational health and safety management	Issues associated with the systemic shaping of working conditions. lecture = 6 hours, workshop/ project = 8 hours
19	Teaching methodology for OHS training	Issues whose awareness is critical for proper worker training and instruction. workshop = 10 hours
20	IT for shaping occupational safety	Discussion of the software used to shape occupational safety, including occupational safety management. lecture = 4 hours, workshop = 6 hours

3 Evaluation of the effectiveness of the OHS program

A survey of the effects achieved in developing competences was conducted among the students of two editions of the post-graduate occupational health and safety program, as held in the academic years 2014/2015 and 2015/2016. The survey, which extended to a total of 79 persons, produced 41 complete responses which could then be used for further analysis. Three of the respondents were employed in an OHS service based on their prior credentials. The remaining 38 intended to take such employment immediately upon completing the post-graduate program.

Each of the respondents was given three options for answering questions regarding the usefulness of specific thematic areas (courses) designed to prepare them for actual employment. They could mark a specific area as:

- useful (+),
- moderately useful (+/-),
- useless (-),

Each respondents were familiar with the job descriptions of OHS officers, which they learned in prior lectures. The participants were asked not to assess the way the knowledge was taught and focus solely on the usefulness of a given area, as covered in their course.

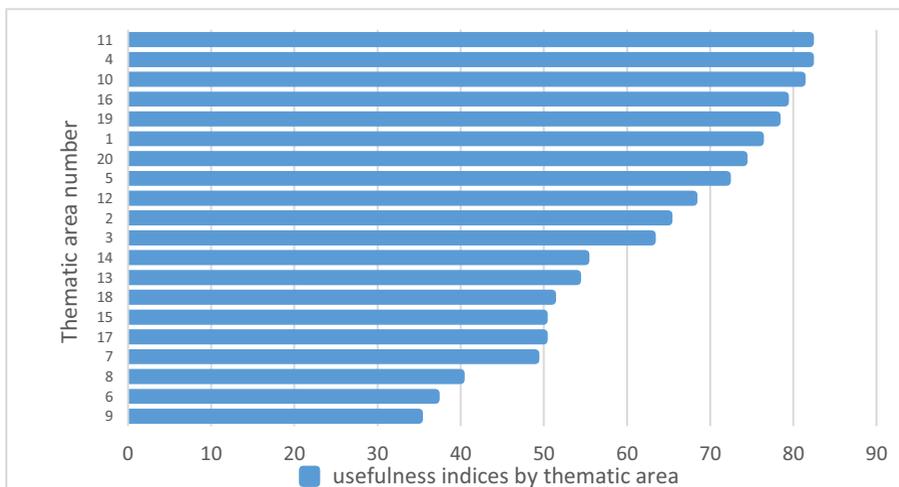
Based on their responses and in keeping with the formula below, a usefulness index was developed that, in the respondents' view, reflected the usefulness of the specific areas in their future jobs:

Usefulness index = 2 points × number of assessments (+) + 1 point × number of assessments (+/-) (1)

The resulting indices of the usefulness of specific areas covered in the program enumerated in Table 2 and presented in Figure 1.

Table 2. Usefulness assessments by thematic area.

No.	Name of course (thematic area)	Number of assessments			usefulness index
		+ 2 points	+/- 1 point	- 0 point	
1	Fundamentals of occupational health and safety	36	4	1	76
2	Ergonomics in shaping working environment	30	5	1	65
3	Work loads	24	15	2	63
4	Comprehensive work strain analyses	41	0	0	82
5	Human factor in shaping occupational safety	31	10	0	72
6	Ecology in shaping working environment	11	15	15	37
7	Comprehensive work strain analyses	17	15	9	49
8	Organizational safety systems	10	20	11	40
9	Interpersonal communication in OHS	10	15	16	35
10	Oversight over working conditions – recordkeeping by OHS services	40	1	0	81
11	Occupational risk assessment and management	41	0	0	82
12	Fire safety at the workplace	28	12	1	68
13	Economic aspects of improvements in occupational health and safety	25	4	12	54
14	Occupational health and safety – laws and standards	26	3	12	55
15	Technical and organizational aspects of shaping working environment	15	20	6	50
16	Safety in the operation of work machinery, equipment and tools	39	1	1	79
17	Health protection. First aid in the working environment	20	10	11	50
18	Introduction to occupational health and safety management	15	21	2	51
19	Teaching methodology for OHS training	38	2	1	78
20	IT for shaping occupational safety	36	2	3	74

**Fig. 1.** Distribution of thematic area indices.

The survey helped identify what the student felt were the most useful thematic areas of education as well as the fields they thought were the least valuable for their future jobs. The areas considered the most useful for the proper performance of work were:

- /11/ Occupational risk assessment and management (82 points),
- /4/ Working environment – preconditions for ensuring occupational health and safety (82 points),
- /10/ Oversight over working conditions – recordkeeping by OHS services (81 points),
- /16/ Safety in the operation of work machine, equipment and tools (79 points).

Among the areas evaluated as the least useful, the respondents selected:

- /9/ Interpersonal communication in OHS (35 points),
- /6/ Ecology in shaping working environment (37 points),
- /8/ Organizational safety systems (40 points),
- /7/ Comprehensive work strain analyses (49 points).

The usefulness indices varied considerably across the areas covered in the program. This is due largely to differences in the perception of their importance and, indirectly, to the way the students imagined the nature of their future jobs. Low usefulness indices of specific courses should not be, considered as justifying their removal from the curriculum as future OHS officers have to be fully prepared for fulfilling their OHS-related duties. It is, however, essential to re-examine curricular design and modify curricula to meet student expectations to the extent reasonable.

4 Conclusion

As organizations are bound to comply with relevant laws, OHS officers must have specific competences and credentials, including a diploma certifying completion of a higher education program or specialty in occupational health and safety or at least a certificate of completion of a post-graduate program in OHS. Furthermore, within one year of commencing their work, OHS specialists are required to complete periodic training tailor-made to suit their specific needs. The rules applicable in Poland do not provide detailed descriptions of such programs of studies. However, the scopes of knowledge and skills that are offered should be sufficient to enable the students to carry out their job duties adequately.

A prerequisite for effectively educating occupational health and safety specialists and especially self-employed safety inspectors in places of business is to establish a proper teaching structure and offer instruction covering an adequate scope of material. OHS experts require broad knowledge on the functioning of various fields of industry and services [2]. In addition to meeting formal requirements, occupational health and safety workers need to be properly versed in occupational safety, health protection and ergonomics as well as possess an overall technical expertise. The scope of the knowledge they are offered needs to meet their expectations while fulfilling the formal requirements that must be satisfied to enable them to carry out their jobs.

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