

## A research on the knowledge level and safety culture of students taking occupational health and safety course

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### Abstract

The safety culture plays an important role in reducing deaths and injuries in many sectors and educational institutions in developing countries. In this study, it was aimed to determine the occupational health and safety (OHS) course, which is taught as a compulsory course in Istanbul Aydın University before taking the course at the beginning of the term and after taking the course at the end of the term, the difference in occupational safety knowledge level and the level of perception of occupational safety culture. A total of 281 questionnaires were deemed valid. For the research, two different surveys were used to measure. Considering the results, there are positive differences in the knowledge level of the students before and after taking the OHS lesson. It has been determined that the safety culture does not change according to demographic information. OHS should be taught to every student in the universities.

Keywords: Occupational health and safety, Occupational safety education, Occupational health and safety lesson, Safety culture

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## 1. Introduction

Occupational health and safety (OHS) can be defined as a science that takes measures against the risk of work accidents and occupational diseases that may occur in the working environment and aims to minimise the possibility of occurrence of occupational accidents and occupational diseases or to endure a work accident and occupational disease.

It has been revealed for the first time in a report prepared by the International Atomic Energy Agency after the Chernobyl disaster in 1986 that worker violations and cultural factors have an important role in occupational accidents in OHS (Cooper, 2000). After this report, it was pointed out that the human factor is a key concept in ensuring safety. The Chernobyl disaster was attributed in part to a poor safety culture in the former Soviet nuclear industry, as well as in the Chernobyl factory (International Atomic Energy Agency [IAEA], 1988). It is aimed to increase the awareness of employees with occupational safety training and to prevent dangers that may arise from humans in advance. In this way, it is possible to prevent occupational accidents and occupational diseases by prioritising occupational safety. By preventing work and occupational diseases, job satisfaction and motivation will increase and the quality of life of employees will be improved (Topgul & Alan, 2017).

Occupational accidents directly affect the construction of social reality. It refers to a serious public health problem, especially for individuals in the young and working age group due to disability or death (International Labour Organization, 2016). According to the International Labor Organization (ILO), approximately 4% of the world's gross domestic product (GDP) is lost each year due to accidents and occupational diseases, health expenditures, pensions, absenteeism and rehabilitation (Melchior & Zanini, 2019; International Labour Organization, 2017).

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In general, work accidents occur due to a lack of knowledge or training of employees, lack of tools and equipment required to perform their duties, or recklessness (Sawacha, Naoum & Fong, 1999, p. 309). Another study by the National Safety Council Committee in the United States found that 18% of occupational accidents were caused by machinery, 19% by human welding, and 63% by the supply of these two sources (Camkurt, 2007). Occupational accidents are of great concern in Turkey due to their social and economic consequences. 98% of occupational accidents and occupational diseases are all preventable, and the way to prevent them is through the development of safety culture (Ceylan, 2012). Education plays a big role in creating OHS culture in our country and raising awareness about regulatory-preventive activities. As a result of errors caused by lack of training, numerous work accidents occur every year (Bilir, 2016).

The large number of occupational accidents occurring in our country, especially in mortality occupational accidents compared to developed and developing countries, can be considered an indication that we do not have enough safety culture. Even if adequate regulations have been made in the OHS legislation created by the laws and regulations related to OHS, it is very important to create safety awareness in society. Providing OHS in workplaces requires the community to be aware of safety work.

The word culture comes from the Latin word 'cultura'. Cultura is derived from the word 'Colere', which means to build, process and meaning (Temur, 2019). In 1952, when the word culture was considered a definition other than the translation meaning, it was evaluated by Kroeber and Kluckhohn as 'All forms of thought, emotion and behaviour expressed by symbols that show, form and convey the unique personalities of human clusters themselves' (Ozkan & Lajunen, 2003).

Over the past few years, the role that safety culture plays in shaping safe environments has been increasingly accepted by organisations in high-risk industries. Many high-confidence industries around the world are attracted to the concept of 'safety culture' as a way to reduce the potential for large-scale disasters (Gordon, Kirwan & Perrin, 2007).

Geller (1994) defined safety culture as 'In the general safety culture (TSC), everyone feels responsible for the safety and follows it daily'. Whereas, Lee (1996) defined safety culture as 'The safety culture of an organization is the product of the individual and group values, attitudes, perceptions, competencies and behaviour patterns, determining the commitment, style and competence of the institution to health and safety management'. On the other hand, Pidgeon (1991) defines safety culture as the 'safety culture as a set of beliefs, norms, attitudes, roles and social and technical practices that minimize the exposure of employees, managers, customers and members of the public to conditions considered dangerous or harmful'. Another definition for safety culture by the International Safety Advisor Group (ISAG, 1991) is 'The safety culture is the gathering of the characteristics and attitudes of the institutions and individuals who show that attention is urgent primarily according to the importance of nuclear power plant safety issues'.

In its holistic definition, safety culture is emphasised with terms such as 'shared', 'community', 'planned', 'together', 'employees' perceptions' or 'organization's beliefs and attitudes' (Guldenmund, 2000).

## **2. Method**

### **2.1. Research model**

The present research is a descriptive quantitative study involving 281 students. The model was aimed to measure the students' perception of safety culture level.

### **2.2. Population and Sample**

To achieve the aim of this study, the faculty of architecture and the faculty of communication and vocational school students who take the course of OHS with distance education one hour a week at Istanbul Aydin University are the participants of this study. Participants comprise a total of 281 volunteer participants, including 169 vocational college students and 112 faculty students.

When Table 1 is examined, it is understood that 44.5% of the participants were females and 55.5% were males. 57.7% of respondents were in the age group between 18 and 21, 32% were between 22 and 25 and 10.3% were in the age group of 26 and above. A large proportion of respondents studied architecture (24.2%), beauty and hair care (14.6%), and electricity (13.2%). 64.8% of the participants were numerical and 35.2% were equally weighted field students. 60.1% of the participants are studying in vocational schools of higher education and 39.9% were faculty

Table 1. Distribution of participants by demographics

		f	%
Sex	Women	125	44,5
	Men	156	55,5
Age	18-21	162	57,7
	22-25	90	32,0
	26+	29	10,3
Department	Electrics	37	13,2
	Build control	6	2,1
	Construction technology	1	0,4
	Machine	33	11,7
	Automotive	19	6,8
	Architecture <sup>a</sup>	68	24,2
	Industrial Design <sup>a</sup>	18	6,4
	Visual Communication <sup>a</sup>	13	4,6
	Advertising <sup>a</sup>	13	4,6
	Human resources	27	9,6
	Hair care and beauty services	41	14,6
Jewellery and jewellery design	5	1,8	
Field	Numerical divisions	182	64,8
	Equal weight divisions	99	35,2
Study Area	Vocational school of higher education	169	60,1
	Faculty	112	39,9
Total		281	100,0

<sup>a</sup>Undergraduate students.

### 2.3. Data collection tools

Quantitative research methods were used in the research. The data were collected by conducting a face-to-face survey with relevant people. In this study, a questionnaire about the TSC and OHS courses attempted by students were used. While the survey on the OHS course taken by the students was conducted twice before and after taking the course, whereas the occupational safety culture survey was conducted by the participants after taking the course.

#### 2.3.1. Demographics

In this study, 281 students were examined. 125 of them are women comprising 44.5% and 156 of them are men comprising 55.5%. The ages of the 162 students are between 18 and 21 comprising

57.7%, the ages of the 90 students are between 22 and 25 comprising 32% and the ages of the 29 students are more than 26 ages comprising 10.3%.

The most attended participants with 68 students constituting 24.2% were from the Department of Architecture followed by 41 students constituting 14.6% from the Department of Hair Care and Beauty Service. A total number of 37 participants from the Department of Electric, 33 participants from the Department of Machine, 27 participants from the Department of Human Resources, 19 participants from the Department of Automotive, 18 participants from the Department of Industrial Design, 13 participants from the Department of Visual Communication and department of Advertising, 6 participants from the Department of Build Control, 5 participants from the Department of Jewellery And Jewellery Design and 1 participant from Construction Technology.

### 2.3.2. TSC survey

The estimation of the reliability of a psychometric test was determined by Cronbach's alpha coefficient. The reliability of the scale is accepted as good if the coefficient is found to be equal to or greater than 0.70. On the other hand, results should be considered if there is a low value of alpha that could be due to a low number of questions in the scale, and a high value of alpha (>0.90) may suggest redundant items in the scale (Kilic, 2016).

Within the scope of the study, Cronbach's alpha coefficients were calculated, and the TSC and the confidence of OHS course surveys were examined. The alpha coefficient between 0.60 and 0.80 indicates that the scale is quite reliable, and the scale is highly reliable between 0.81 and 1.00 (Ozdamar, 2004). In addition, the reliability of coefficients between 0.7 and 0.9 for the Cronbach's alpha coefficient categories is considered 'good' (George & Mallery, 2003). The survey applied to people is designed to measure people's overall perceptions of safety and there are 17 questions, 5 of which are Likerts (1 = I absolutely disagree, 2 = I disagree, 3 = I'm undecided, 4 = I agree, 5 = I definitely agree).

As indicated in Table 2, the alpha coefficients calculated for the TSC survey are 0.88 (Cronbach's alpha = 0.88). The obtained coefficient indicated that the reliability of the measurement tool used was high due to internal consistency. It was understood that the answers obtained from the participants were consistent with each other.

### 2.3.3. OHS course survey

As stated in Table 2, the alpha coefficients calculated for the OHS course survey before the first application, i.e., before the students taking the course and after taking the course as the last application, are 0.80 and 0.81, respectively. (Cronbach's alpha = 0.80: 0.81). The resulting coefficients indicated that the measurement tools used had a high level of confidence due to internal consistency. The answers obtained from the participants were found to be consistent with each other.

Table 2. Cronbach alpha coefficients

Measurement Tool	Number of items	Cronbach Alpha
General Safety Culture Survey	17	0,88
Occupational Health and Safety Course Survey (First)	11	0,80
Occupational Health and Safety Course Survey (Last)	11	0,81

As seen in Table 3, the survey consists of a course syllabus for one semester. It consists of 11 questions in 3-Likert form. (1 = Disagree, 2 = Undecided, 3 = Agree).

Table 3. Occupational health and safety course survey questions

Item	Measuring Tool
1	I know the concept and purpose of occupational health and safety
2	I know the rights and responsibilities of employers and employees according to labour law.
3	I know the rights and responsibilities of employers and employees according to the OHS Law.
4	I know the objectives of ISO 9001, ISO 14001, ISO 45001 Management systems
5	I have information about the dangers and risks that I may encounter in the work environment.
6	I know how to protect myself from fire and what to do in an emergency
7	I know the risks arising from electricity and how to protect
8	I know the definitions of work accidents and occupational diseases and what to do when such situations occur.
9	I know what the OHS risk factors are (physical, chemical, biological, psychosocial, ergonomic)
10	I know the meaning and importance of warning signs and the importance of personal protective equipment.
11	I know the differences between first aid and emergency medical care.

#### 2.4. Data analysis

For the purpose of the study, the coefficients of distortion were based on determining the distribution of scores obtained from the surveys used in the research. The distortion coefficients  $\pm 3$  and  $\pm 10$  indicate that the normal distribution assumption is met (Kline, 2011). The coefficients calculated for the scores obtained from the surveys were included in the specified range and the normal distribution assumption was met. In this direction, data were analysed using parametric analysis techniques.

Dethralistic analysis techniques were used to examine the scores obtained from the TSC survey. Independent sample t-test was applied to compare the scores obtained from the survey by gender, departmental and school variables, and one-way variant analysis was applied to compare them by age variable. In comparison with the scores obtained from the first and last application of the OHS course survey, a dependent sample t-test was used. Data were analysed using SPSS 25.0 statistical package program.

### 3. Findings

When Table 4 is examined, it is understood that the scores received by the participants from the TSC survey vary between 17 and 85, while the average score is calculated as 64.40 ( $S_s = 11.02$ ). According to the average score obtained, it can be said that the participants' perceptions of the TSC are high.

Table 4. Decisive values of scores obtained from the general safety culture survey

Variable	N	Minimum	Maximum	Average	Ss
General Safety Culture	281	17	85	65,40	11,02

According to Table 5, it is understood that the mean points obtained from the TSC survey did not differ significantly by gender [ $t(279) = -1.74$ ;  $p > 0.05$ ]. It can be said that the perceptions of the TSC of the male and female students included in the study are similar.

Table 5. Mean scores, standard deviation and t-test results obtained from general safety culture survey according to gender

Variable	Sex	N	Average	Ss	t	P
General Safety Culture	Women	125	64,12	11,22	-1,74	0,08
	Men	156	66,42	10,78		

When Table 6 is examined, it is understood that the mean points obtained from the TSC survey did not differ significantly by age [ $F(280; 2) = 0.08$ ;  $p > 0.05$ ]. Students in 18 and 21, 22 and 25, 26+ age groups were understood to have similar perceptions of TSC.

Table 6. Mean scores, standard deviation and anova results obtained from general safety culture survey by age

Variable	Age	N	Average	Ss	F	p
General Safety Culture	18-21	162	65,39	11,27	0,08	0,93
	22-25	90	65,18	10,34		
	26+	29	66,10	11,97		

Table 7 gives the mean points obtained from the TSC survey that did not differ significantly by department classification [ $t(279) = 0.68$ ;  $p > 0.05$ ]. It can be said that the perceptions of the TSC of the students studying in the numerical and equally weighted-based departments included in the research are similar.

Table 7. Scores, standard deviation and t test results obtained from general safety culture survey according to section

Variable	Field	N	Average	Ss	t	p
General Safety Culture	Numeric	182	65,73	11,38	0,68	0,50
	Equally Weighted	99	64,79	10,34		

When Table 8 is examined, it is understood that the mean scores obtained from the TSC questionnaire do not show any significant difference according to the school where they are educated [t (279) = 0.51; p > 0.05]. It can be said that the TSC perceptions of the Vocational School of Higher Education and faculty students included in the study are similar.

Table 8. Mean scores, standard deviation and t test results obtained from general safety culture survey according to school of education

Variable	Study Area	N	Average	Ss	t	p
General Safety Culture	Vocational School of Higher Education	169	65,67	11,35	0,51	0,61
	Faculty	112	64,98	10,54		

When Table 9 is examined, the survey expressions with the highest average level of participation can prevent serious accidents in the field, respectively 'Wearing protective clothing and equipment on it' (Avg = 4.44; OR = 5; TD = 5), 'The importance of the workplace to safety plays an important role in the reduction of work accidents', (Avg = 4.34; OR = 5; TD = 5) and 'Each workplace must provide OHS training before starting the work of the worker it receives' (Avg = 4,31; OR = 5; TD = 5). The idea that protective clothing and equipment can prevent serious accidents is due to the fact that the first concept that comes to mind when it comes to occupational safety in our society are helmets and safety belts.

The survey expressions with the lowest participation level averages are 'Knowing the risks in what we do, taking precautions and working safely prevent delays in jobs' (Avg = 2.01; OR = 1; TD = 1), 'I think OHS rules increase business efficiency', (Avg = 2.76; OR = 3; TD = 3) and 'I don't take risks even if I have to take risks in what I do' (Avg = 2.89; OR = 3; TD = 3). It is thought-provoking that the average values of these expressions are low. Because although they know that taking risks is wrong, the way they say they are taking risks is an indication that knowledge does not turn into action.

Table 9. Descriptive Values of the Answers Given to the General Safety Culture Questionnaire Statement

Terms	Average	Ss	OR	TD
Wearing protective clothing and equipment can prevent serious accidents on site	4,44	0,94	5	5
The importance given to safety by the workplace plays an important role in reducing occupational accidents.	4,34	0,97	5	5
Every workplace must provide worker health and safety training before starting to employ the worker it hires.	4,31	0,96	5	5
Getting safety instructions on the first day of joining a new company will help increase employee safety awareness.	4,29	1,07	5	5
Safety training affects workers working more safely	4,27	1,11	5	5
Ensuring Occupational Health and Safety is one of the basic human rights	4,27	0,95	5	5
Ensuring safety in the workplace is not only managerial but also the support of the employees.	4,23	1,02	4	5
Tidy and clean work areas can prevent some accidents.	4,21	0,93	4	5
Regularly planned work plans reduce accident rates	4,10	1,06	4	5
I find it right to teach occupational safety at all levels of education.	4,10	1,03	4	5
Occupational Health and Safety should be at every stage of life, not only in the working environment.	4,02	1,02	4	5
Workers who refuse to wear safety protective gear on the field should be punished in some way.	3,96	1,16	4	5
Lack of communication between employees and managers causes more accidents.	3,82	1,12	4	4
Inexperienced and non-compliant employees have more accidents	3,38	1,33	4	4
Even if I have to take risks in what I do, I don't take risks	2,89	1,17	3	3
I think OHS rules increase work efficiency	2,76	1,32	3	3
Knowing the risks in our work, taking precautions and working safely prevents delays in work.	2,01	1,32	1	1

Ss= Standard Deviation, OR= Mean, TD=Mode

When Table 10 is examined, it is understood that there is a significant difference between the pre-application score averages of the OHS course survey and the means of final application scores [t(280)

= -15.22;  $p < 0.05$ ). It was observed that the score averages obtained from the last application were significantly higher than the score averages obtained from the first application. The results showed that the courses attended by the students positively affected the level of knowledge about OHS.

table 10. Pre and post application scores, standard deviation and t test results of occupational health and safety course questionnaire

Variable	Application	N	Ort	Ss	t	p
Occupational Health and Safety Course Survey Scores	Pre- Application	281	1,89	0,46	-15,22	0,00
	Post- Application	281	2,45	0,50		

#### 4. Discussion and conclusion

It was observed that the perception of safety culture did not change according to gender, age, department of education and school of education.

In a study in Bangladesh, other factors such as the participants' age, academic years, marital status and major disciplines did not show any significant difference in their overall safety culture scores (Hasan & Younos, 2020).

While there is no semantic difference in the perception of safety culture of women and men in our study, in a study conducted by Hasan and Younos (2020) among university students in Bangladesh, it was found that the safety culture score in women was significantly higher than in men.

A similar study conducted in a university in China found that female students had a significantly higher safety culture than male students (Gong, 2019). Similarly, a study conducted with university students found that women were more aware of safety in safe behaviours and beliefs (Blair, Seo, Torabi & Kaldahl, 2004).

It was found that the basic knowledge levels of university students who received OHS training increased (first application mean: 1.89 and, second application mean: 2.45). It can be concluded that the level of knowledge has increased in understanding the dangers and risks in work life, fulfilling the conditions of a healthy workplace environment and creating a safe working environment.

In a similar study conducted between students who took OHS lessons and those who did not, it was found that the knowledge level of students who took OHS course was significantly higher than those who did not, while their attitudes towards OHS practices were found to be significant in less questions (Resitoglu et al., 2018).

In another study, 27.7% of labour economics and industrial relations students who took or did not take OHS lessons stated that they knew the legal regulations about occupational safety, while 35.4% preferred to remain indecisive. It also creates a dilemma that 33.8% of the students who have difficulty in knowing the legal regulations know what to do about job safety for their profession (Topgul & Alan, 2017).

For this reason, after taking the OHS lesson, students have been successful in achieving the goal of changing the level of knowledge about OHS positively, with the average being significantly higher. Providing OHS training in all areas is of great importance in terms of developing the safety culture.

Therefore, it is important that this course is included in the curriculum on the basis of other departments.

Another study carried out in safety training and intervention programs participating in the technical secondary school male students, according to those who participate in training on how to achieve the goal of improving information on OSH were found to be more successful. While more than three-quarters of the study group (85.7%) had good knowledge, 99.3% of the majority of the control group still had insufficient knowledge. There was a statistically significant relationship between the department and the total knowledge score of the study group (Amin, Soliman, Madian, Ali, 2020).

The purpose of OHS trainings is to create safe environments in workplaces, to reduce work accidents and occupational diseases, to ensure that employees are informed about their fundamental rights, and also to ensure that necessary measures are taken regarding the risks that may arise. The most important point is to create OHS awareness through training and make this a safety culture.

It is aimed to increase awareness by including OHS course as a compulsory course in different departments and programs at Istanbul Aydin University.

Both physical and mental health of the employee is an important factor for their efficient work. The safe working environment reduces the likelihood of an occupational accident but will allow the employee to act mentally comfortably and work efficiently as a result.

From here, it is revealed that education for OHS is the most important tool in terms of raising awareness about OHS due to its socio-cultural structure. It is imperative that the existence of the safety culture is first in the workplace and then in the society.

The survey expressions with the lowest participation level average are 'Knowing the risks in what we do, taking precautions and working safely prevent delays in jobs' (Avg = 2.01) 'I think OHS rules increase business efficiency', (Avg = 2.76) and 'I do not take risks even if I have to take risks in what I do' (Avg = 2.89). It is thought-provoking that the average values of these expressions are low. Although students know that taking risks is wrong, expressing that they are taking risks is an indication that knowledge does not turn into action. This may be because students do not receive any education related to OHS until they come to university education. For this reason, OHS training should also be given to children at the age of primary school in line with a healthy and safe life and in this way, safety culture should be increased.

Education is one of the most important factors in providing the working environment and the necessary safety and health conditions for the work to be carried out. The said OHS training is shaped not only during the on-the-job processes but also with the training to be given starting from the education-training periods in the environment where it grows. With the awareness of OHS and training to be given in the early stages, people can develop a relevant safety culture. The importance of working healthily and safely in order to have a quality life should be adopted by the members of the society in every period of life. Understanding this importance is related to the OHS training to be given to individuals.

Again, it is seen that the average of the expressions 'Knowing the risks in our work, taking precautions and working safely prevents delays in the works' and 'I think OHS rules increase work efficiency' are actually low in fact, it is seen that OHS is not fully understood. However, according to the average score obtained in general, it can be said that the TSC perceptions of the participants are high.

It was observed that the perception of safety culture did not change according to gender, age, department of education and school of education.

According to the 2019–2023 OHS working group report published by the Ministry of Development (2018), there are remarkable additions to primary and secondary school books that will create OHS awareness, and OHS awareness-raising activities for primary school students are carried out practically with mobile devices equipped with the Güven Master School project. However, according to the report, the practice of introducing OHS courses as compulsory or elective courses in universities has not yet been developed sufficiently. According to Article 5 of the Higher Education Law, ‘In higher education institutions, Atatürk’s Principles and History of Revolution, Turkish language, foreign language, OHS in faculties that train graduates who can be occupational safety experts according to the Law on OHS dated 20/06/2012 and numbered 6331’. In addition to the phrase ‘Safety is one of the compulsory courses’, it is believed that it will be beneficial to add the OHS course to the curriculum of departments and programs that do not have any obligations according to the law, as implemented by Istanbul Aydin University.

## 5. Recommendations

It is recommended that the OHS course should be included in the curriculum in order to increase the awareness of occupational health and safety in students. Also, conferences should be organised with the participation of professional specialists in order to improve the safety culture during the training.

It plays an important role in spreading occupational health and safety to the education of children and young people, developing and improving safety cultures in the workplace, thus preventing occupational accidents and diseases. Because it will be possible to change the behaviour by putting the information learned through education into practice, thus creating correct behaviour models and awareness regarding OHS.

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