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## **Comparison of Occupational Safety Perception of Geomatics Vocational High School, Undergraduate Geomatics Technician and Geomatics Engineering Students**

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**Research Article****Comparison of Occupational Safety Perception of Geomatics Vocational High School, Undergraduate Geomatics Technician and Geomatics Engineering Students****Müge Ensari Özay<sup>1,\*</sup> , Aykan Büyükkaydın<sup>2</sup> , Rüştü Uçan<sup>3</sup> **<sup>1,3</sup>Department of Occupational Health and Safety, Faculty of Health Sciences, Uskudar University, Istanbul, Turkey<sup>2</sup>Department of Occupational Health and Safety, Institute of Health Sciences, Uskudar University, Istanbul, Turkey\* Corresponding author: M. E. Özay  
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Accepted: 22.08.2021**How to cite:** Özay, et al. (2021). Comparison of Occupational Safety Perception of Geomatics Vocational High School, Undergraduate Geomatics Technician and License Geomatics Engineering Students. *International Journal of Environment and Geoinformatics (IJEGEO)*, 8(4):475-481. DOI: 10.30897/ijegeo. 868994**Abstract**

Occupational health and safety concern not only employers or employees but also the general public, and therefore it is very important to achieve a social development on this subject. Occupational health and safety perception are a phenomenon that differs according to sector, education level and other demographic characteristics. In this study, the perception of occupational safety was handled with students of the geomatic department. It was carried out on the basis of the search for whether the perception of occupational safety varies according to different educational levels. A sample of 265 participants, who continue their education at high school and undergraduate levels, an occupational safety perception survey was applied. The perception of occupational safety and demographic characteristics of geomatics students were examined. As a result of the analyzes carried out in the SPSS 18.0 program, a statistically significant difference was found between the occupational safety perceptions of the participants and the feature of willingly choosing and studying at the geomatics department as well as considering to have sufficient the occupational safety knowledge.

**Keywords:** Geomatics Engineering, Geomatics Technician, Occupational Health and Safety, Occupational Safety Perception**Introduction**

Occupational health and safety are one of the factors that directly affect human life and safety, and it is one of the issues that should be emphasized intensely. Turkey is also one of the countries which take considerable steps in the occupational safety field. In parallel with the developments in human rights, legal regulations in the field of occupational safety are developing day by day (Akyüz, 2021; Solmaz et al., 2020; Keleş, 2004). However, it is not possible to mention that it has reached the desired level yet, that thousands of workers die as a result of occupational accidents and occupational diseases each year (ILO, 2015).

The first step to make progress in the occupational health and safety field changes attitudes of the enterprises is legal arrangements. Raising awareness of business administrations directly relating to the matter, even if it is a possible step, introducing deterrent legal regulations is effective in generating faster solutions (Erdem, 2004). In addition, increasing the individual and social awareness regarding occupational safety is one of the first steps to be taken. Educational programs, public service announcements, television, newspaper and magazine publications to be organized in this direction provide significant gains (Huang, et. al., 2016). The perception of occupational safety is as important as the accumulation of occupational health and safety

(Karacan, and Erdoğan, 2011). In a simpler expression, not only increasing the personal and social knowledge about occupational safety, but also creating awareness about the importance of the subject is the determination of the development of the process and the prevention of loss of life and property due to occupational accidents and occupational diseases (Siui, et. al., 2003; Bergheim, et. al., 2014). In order to increase individual and social occupational safety perception, perhaps the first step to be taken is to give the subject a wider coverage in educational curricula (Çetin, 2021; Williamson, et. al., 1997). Occupational health and safety are a phenomenon that covers all business life and all sectors. It will be very useful to include occupational safety education within 12 years of compulsory education in Turkish education system, and then to include it in the curriculum as an elective or compulsory course in vocational high school and undergraduate university programs (The Ministry of Labor and Social Security, 2009).

The geomatics education programs are included in the high school level and within the scope of compulsory education in Turkey, and also in both vocational high school and undergraduate university programs. Geomatics department students receive education at three different levels: high school, vocational high school and undergraduate. The number of available geomatics engineers, according to recent figures released in Turkey has reached 17000, and there are over 2000

quotas in 25 universities (HKMO, 2019; Sarıtürk et al., 2017; Gazioğlu, 2018). There exist 13 high schools in 12 cities with high school level geomatics section (Çepni et al., (2011). In Turkey, not only in the engineering level of the geomatics department, also intended to be given by both high school and vocational high school level that provide a broader reach and development in the cartography field, so as this is the basis of the program development process.

It is possible to mention that the geomatics technician education given within the Geomatics and Cadastre department at the vocational high school level of Geomatics Technician has spread to a wider field and reached the capacity compared to high school education. "Geomatics and cadastral" department have vocational high school program in many cities such as Istanbul, Ankara, Izmir, Afyon, Antalya, Konya, Bursa, Mersin, Malatya, Trabzon, Isparta and so on.

Geomatics Engineering offers education under the name of "geomatics engineering" at undergraduate level; the geomatics education, it is given in formal education and secondary education in 21 provinces in Turkey. The training is given in 32 programs (Kocaeli University, 2019). Apart from this education, which is spread over 19 cities, there are also postgraduate programs.

When the literature research is done, it is seen that the researches on the subject are limited. In the study conducted by Istanbul Aydın University on the scope of occupational safety in schools, it was concluded that the knowledge of the instructors and students at the secondary and higher education level was not at a sufficient level (Dalbay and Gümüş, 2015). It is concluded that adequate occupational safety is not taken and students are not made aware of this issue, especially due to the fact that there are laboratory and field studies in vocational schools (Dalbay and Gümüş, 2015). When the structure and fields of activity of the geomatics sector are investigated, a limited number of working groups and dispersed workforce organization are observed (Çepni, et al., 2011). Occupational health and safety has been intensely emphasized in our country in recent years, but sufficient development has not been achieved in the field of geomatics (Akçay, 2013).

The aim of this study is to determine the occupational health and safety perceptions of students at different levels in the field of geomatics and to determine whether there is a lack of knowledge in occupational health and safety. Within the scope of the study, a questionnaire study was carried out for the students of the geomatics department given at high school, vocational high school and undergraduate levels in order to investigate the occupational safety perceptions of the participants.

**Materials and Methods**

In the study, it is aimed to determine the occupational safety perceptions of geomatics studying students. Accordingly, it was determined whether the occupational health and safety perceptions differ according to the

demographic characteristics of the participants, especially their education levels. The universe of the research consists of students studying in Turkey in the geomatics department at the high school and the university. A quota for an average of 1700 students is opened every year at the undergraduate level (Council of Higher Education, 2019), a quota for an average of 4000 students is opened at the vocational high school level (Council of Higher Education, 2019) and a quota for an average of 400 students is opened at the high school level (Republic of Turkey Ministry of National Education, 2019). These numbers have been calculated by taking into account the quotas on the official sites of the Higher Education Council and the Ministry of National Education. The sample of the study was formed with the participation of 265 high school, vocational high school and undergraduate university students. 81 of the participants are high school, 97 are vocational high school and 87 are undergraduate students.

In this research, 22 survey questions, including 7 demographic characteristics and 15 occupational safety perception, were prepared. The demographic characteristics are about the gender, age, education level, school, class of the participants and whether they choose to study at the department willingly and whether they consider that their knowledge of occupational safety is sufficient. On the scale of 15-item at occupational safety perception survey, participants were asked to answer according to the 5-Likert scale as "1 = Strongly Disagree, 2 = Disagree, 3 = Undecided, 4 = Agree, 5 = Strongly Agree".

The scale was developed by Eraslan's (2015) study titled "Social Security Perceptions of University Students". Then it was used by Topgül and Alan's (2017) study titled "Evaluation of Students' Job Safety and Job Safety Training Perception" includes 13 statements in total for occupational safety and safety perception. In the questionnaire used in this study, 2 questions (14th and 15<sup>th</sup>) were added in addition to these 13 questions. The final form of the questionnaire was given according to the expert opinions of the academic staff at the occupational health and safety department in Uskudar University and preliminary study results. As part of the preliminary trial of the research, interviews were conducted with 10 high school, 10 vocational high school and 10 undergraduate students in Istanbul. As a result of the preliminary analysis the occupational safety perception questionnaire was finalized.

Within the scope of the study, frequency tables were constituted to examine the demographic characteristics of the participants. Reliability analysis and normality test (Table 1) were completed as a preliminary preparation in statistical analyzes, and Kruskal Wallis and Mann Whitney U tests were applied.

Table 1. Normality Test Results

Scale	Kolmogorov-Smirnov		Shapiro-Wilk			
	Sta	df	Sig.	Sta	df	Sig.
Occupational Safety	,104	264	,000	,964	265	,000

$H_0$ : The scale has a normal distribution at 95% confidence level.

$H_A$ : The scale does not have a normal distribution at 95% confidence level.

Normality test results are given in Table 4. As a result of the normality test, since the sig. value is less than 0,05, it is concluded that the scale does not have normal distribution at 95% confidence level. Accordingly, nonparametric tests will be used in the difference tests.

In the reliability analysis related to the survey, Cronbach's alpha value was obtained as 0,913, as seen in Table 2, which leads to the conclusion that the scale is highly reliable.

Table 2. Reliability Analysis Results

Cronbach's Alpha	No of Observations
0,913	15

Kaiser-Meyer-Olkin (KMO) Test is a measure of how suited your data is for Factor Analysis. Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) was calculated as 0,905 for the questionnaire. KMO value is acceptable when it is greater than 0,06. Barlett's Test of Sphericity value was calculated as 0,00 (acceptable when <0,05) and this value is significant. Therefore, the data set is suitable for factor analysis.

Principal component analysis revealed that there exist three components with eigenvalues above 1. These components explain 45,4%, 16,6%, 7,1% of the variance, respectively. The slope plot reveals a clear break after the second component. Therefore, it was decided to keep the two components for further analysis using the Catell slope test.

Table 3. Descriptive Statistics on the Occupational Safety Scale

No	Items	Min	Max	Average	Standard Deviation
1	I know the legal regulation about occupational safety.	1	5	2,72	1,079
2	I know what I need to do regarding occupational safety related to the cartography department.	1	5	3,06	1,206
3	Providing occupational safety in work areas is one of the fundamental human rights.	1	5	3,85	1,472
4	I think in Turkey, the enterprises give great importance to occupational safety.	1	5	2,22	1,075
5	I think in all working areas in Turkey, has an occupational safety culture.	1	5	2,38	1,112
6	I think that employees receive effective training about the risks that they are exposed and about the dealing with them.	1	5	2,25	1,097
7	I think in Turkey, the training of occupational safety is qualitative.	1	5	2,42	1,146
8	I think that occupational safety measures are adequately implemented in all work areas in Turkey.	1	5	2,19	1,001
9	The quality of occupational safety specialist training provided should be discussed by various institutions.	1	5	3,25	1,230
10	Occupational safety training should be provided by private sector and government cooperation.	1	5	3,49	1,462
11	I think the treatment of occupational safety specialist is effective.	1	5	3,12	1,348
12	I think it is right to give occupational safety as a lesson at every education level.	1	5	3,57	1,445
13	I think sanctions for occupational safety violations are effective in Turkey.	1	5	2,69	1,251
14	I think occupational safety measures in the cartography field are at a lower level compared to other fields.	1	5	2,75	1,190
15	Occupational safety training in the cartography field is sufficient.	1	5	2,69	1,129

The two-component solution explained 62% of the variance in total. The first component contribution to this explained variance is 45,4%, and the second component contribution is 16,6%. Oblimine rotation has been implemented to aid in the interpretation of the two components. A simple structure is demonstrated in the rotated solution in which both components show several strong loads and all variables significantly load only one component. There is a medium positive relationship between the two factors obtained ( $r = 0,417$ ). In terms of the results of this analysis, it could be recommended to evaluate the analysis in two dimensions. However, since the Cronbach's alpha value (0,913) is too high, the statistical analysis is evaluated as one the dimension.

**Research Questions:**

The main purpose of the research is to determine the differences between the occupational safety perceptions of students of the geomatics department and their perceptions. Accordingly, 5 research questions have been identified.

**Question 1:** Is there a statistically significant difference in the occupational safety perceptions according to the gender of the participants?

**Question 2:** Is there a statistically significant difference in the occupational safety perceptions according to the age of the participants?

**Question 3:** Is there a statistically significant difference in the occupational safety perceptions according to the education level of the participants?

**Question 4:** Is there a statistically significant difference in the occupational safety perceptions according to the participants' willingness to choose the department that they study?

**Question 5:** Is there a statistically significant difference in the occupational safety perceptions as the participants find their knowledge of occupational safety sufficient?

**Results**

In order to determine the occupational safety perceptions of the participants, the descriptive statistics results were examined, and then the difference tests were conducted by examining whether the levels of occupational safety perceptions differed according to their demographic characteristics.

Descriptive statistics regarding the occupational safety scale directed to the participants are given in Table 3. According to this, when the dispersion is examined, the item that the participants respond most positively is “Providing occupational safety in the work areas is one of the fundamental human rights” views. Also, the item that the participants responded most negatively is “I think in Turkey, the enterprises give great importance to occupational safety.” With respect to the dispersion of the Occupational Health and Safety (OHS) knowledge to be considered sufficient, approximately one third of the participants (32,5% n = 86) find their occupational safety knowledge sufficient. When the dispersion of willingly selecting the department that they study is examined, it is seen that most of the participants (78,1% n = 207) chose the part they study willingly in geomatics department.

Table 4. Demographic characteristics of the participants

Demographic Characteristics	N	%
<b>Gender</b>		
Male	172	64,9
Female	93	35,1
<b>Age</b>		
16 – 17 years	52	19,6
18 – 19 years	74	27,9
20 – 21 years	85	32,1
22 – 23 years	54	20,4
<b>Education level</b>		
High School	81	30,6
Associate Degree	97	36,6
Undergraduate	87	32,8
<b>Dispersion of selecting willingly the department that they study</b>		
Yes	207	78,1
No	58	21,9
<b>Dispersion of considering to have sufficient OHS knowledge</b>		
Yes	86	32,5
Partially	117	44,2
No	62	23,4

The hypotheses of the research questions were examined statistically in detail.

Table 5. Occupational Safety Perception According to Gender (Mann Whitney U Test)

Scale	Gender	N	Average	p
<b>Occupational Safety</b>	Female	93	2,92	,600
	Male	172	2,79	

H<sub>0</sub>: There is no statistically significant difference in the occupational safety perceptions of the participants according to gender.

H<sub>A</sub>: There is a statistically significant difference in the occupational safety perceptions of the participants according to gender.

In Table 5, occupational safety perceptions of the participants were measured according to gender. In accordance with the normality test results, the non-parametric test, Mann Whitney U Test, was used. As the p value is greater than 0,05, it is concluded that there is no statistically significant difference in the occupational safety perceptions of the participants according to gender. Ho hypothesis was accepted.

Table 6. Occupational Safety Perception by Age (Kruskal Wallis Test)

Scale	Age	N	Average	p
<b>Occupational Safety</b>	16 - 17 years	52	2,63	,188
	18 - 19 years	74	2,95	
	20 - 21 years	85	2,80	
	22 - 23 years	54	2,94	

H<sub>0</sub>: There is no statistically significant difference in the occupational safety perceptions of the participants by age.

H<sub>A</sub>: There is a statistically significant difference in the occupational safety perceptions of the participants by age.

In Table 6, occupational safety perception levels of the participants and the age of participants are examined. In the test conducted using the Kruskal Wallis Test, since p value is greater than 0,05 there is no statistically significant difference in the occupational safety perceptions of the participants by age.

Table 7. Occupational Safety Perception According to Education Level (Kruskal Wallis Test)

Scale	Education Level	N	Average	p
<b>Occupational Safety</b>	High School	81	2,73	,552
	Associate Degree	97	2,87	
	Undergraduate	87	2,90	

H<sub>0</sub>: There is no statistically significant difference in the occupational safety perceptions of the participants according to the education level.

H<sub>A</sub>: There is a statistically significant difference in the occupational safety perceptions of the participants according to the education level.

The Kruskal Wallis Test results of the occupational safety perception levels of the participants according to the education level are given in Table 7. In the test, since the p value is greater than 0,05 for work safety, it is concluded that there is no statistically significant difference in the occupational safety perceptions of the participants according to the education level.

Table 8. Occupational Safety Perception According to Willingly Selecting the Department (Mann Whitney U Test)

Scale	Willingly Selecting the Department	N	Average	p
<b>Occupational Safety</b>	Yes	207	2,90	,006
	No	58	2,62	

$H_0$ : There is no statistically significant difference in participants' perceptions of occupational safety according to willingly selecting of the department.

$H_A$ : There is a statistically significant difference in participants' perceptions of occupational safety according to willingly selecting the department.

In Table 8, according to willingly selecting the department, occupational safety perception levels of the participants were examined by using Mann Whitney U Test. In the test, it is concluded that there is a statistically significant difference in the occupational safety perceptions of the participants according to the voluntary selection, since the p value is less than 0,05.  $H_A$  hypothesis was accepted.

Table 9. Occupational Safety Perception According to Finding Occupational Safety Knowledge Sufficient (Anova Test)

Scale	Finding Occupational Safety Knowledge Sufficient	N	Average	p
<b>Occupational Safety</b>	Yes	86	2,89	,004
	Partially	117	2,94	
	No	62	2,56	

$H_0$ : There is no statistically significant difference in participants' perceptions of occupational safety according to finding occupational safety knowledge sufficient.

$H_A$ : There is a statistically significant difference in participants' perceptions of occupational safety according to finding occupational safety knowledge sufficient.

In Table 9, according to finding occupational safety knowledge sufficient, the occupational safety perceptions of participants were determined using the Kruskal Wallis Test. It is found that there is a statistically significant difference in the occupational safety perceptions of the participants and finding occupational safety knowledge sufficient. Accordingly,

the occupational safety perceptions of the participants, who find their knowledge sufficient, is more positive than the other participants.

**Discussion and Conclusion**

Occupational health and safety in Turkey, as well as worldwide, has become a subject that is accentuated quickly. This has led to a rapid increase in the number of academic studies on the subject. On the other hand, studies on occupational safety in the "geomatics department" are quite limited. Along with this study, it is aimed to eliminate a deficiency in the literature and to provide resources to relevant people and other researchers.

Çepni and coworkers (2011) emphasized the occupational accidents that occurred in the sector of geomatics engineering and found the accidents in this area were mainly experienced by operators and technicians. While falling / slipping, vehicle and construction machine accidents are the main causes of accidents, about 15% of accidents result in death.

In another study conducted by Alkan and Gürsoy (2020), deficiencies of occupational safety were observed in the sector. Occupational safety awareness should be gained to students starting from school years. For this, occupational safety courses and seminars should be given starting from secondary education. Geomatics engineers working as chief and employer positions should be aware of their legal responsibilities regarding occupational safety and occupational accidents. Most importantly, it has been found that it is necessary to increase the safety in the geomatics engineering and to create a regular archive about occupational accidents.

In another study, Gül (2019) examined whether occupational safety knowledge level differs among vocational high school and undergraduate students and found a statistically significant difference in the occupational safety knowledge levels and the education level. The knowledge level of undergraduate students is higher than the vocational high school students. However no significant difference was found in the occupational safety perceptions of students according to the level of education (p=0,552) in this research. It can be seen that the findings differ from the findings of the study applied by Gül (2019).

Finally, in the study performed by Yılmaz and Büyükakıncı (2019), the occupational safety perceptions of the women employees who provide restaurant and beverage services are more positive than men's. The perception levels of the young participants are higher. They found no difference in the perceptions of the employees according to the position and working time in the enterprise. Similarly, in this study, it is seen that there is no significant difference in the occupational safety perception according to the level of education (p=0,552).

There exist sectoral differences according to the perception of occupational health and safety. Within the scope of this study, occupational safety perceptions of

geomatics' students at different educational levels were examined. In this regard, a sample of 36,6% of vocational high school, 32,8% of undergraduate and 30,6% of high school students was studied.

As a result of the study, no significant relation was found between the gender, age and education levels of the students having geomatics education and their occupational safety perceptions. In addition, a significant relationship was found between perceptions of occupational safety in terms of willingly selecting the department and finding the occupational safety knowledge sufficient.

As a result, the main suggestions that can be made to improve the perception of occupational safety are as follows:

- Occupational safety trainings should be provided at all levels of education, and a certain standard should be provided in the curriculum.
- Occupational health and safety education programs should be limited not only to vocational high schools but should take place in all high schools.
- The number of researches on occupational health and safety training should be increased.
- Special programs for occupational health and safety education should be encouraged.
- Legal regulations regarding occupational health and safety should be increased and preventive measures should be taken.
- Audits regarding occupational health and safety should be increased.

Consequently, this research describes the safety perception of geomatics' students. This safety perception survey not only identifies the demographic and organizational factors, but also quantifies organizational and human factors. When those, who plan the curriculum in schools, know and understand these factors, they can plan to achieve safety excellence. We hope this study will be a preliminary study for similar researches.

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