The Eurasia Proceedings of
Educational & Social Sciences (EPESS)
ISSN: 2587-1730

The Eurasia Proceedings of Educational & Social Sciences (EPESS), 2023

Volume 31, Pages 1-9

ICRESS 2023: International Conference on Research in Education and Social Sciences

Determination of the Relationship between the Vocational Qualifications and Academic Programs on a Perceived Competencies Basis Approach: A Case for Geographical Information Systems

Dilara Unuvar-Unluoglu
Eskisehir Technical University

Nazire Burcin Hamutoglu
Eskisehir Technical University

Saye Nihan Cabuk
Eskisehir Technical University

Alper Cabuk
Eskisehir Technical University

Abstract: GIS education and training activities become widespread as GIS utilization inevitably increases worldwide. Besides, vocational standards and qualifications are developed to form a quality assurance basis for GIS-related jobs and services and the employment of qualified personnel. From this perspective, this study aims to examine to what level the graduates of GIS associate degree, master, and doctorate programs have gained the necessary knowledge and competencies defined in the GIS Specialist (Level 6) National Qualification throughout their academic education. Within this context, an online survey was developed based on 43 performance criteria derived from the vocational qualification units (A1, A2, A3). The respondents were asked to self-evaluate the achievement of the given criteria during their academic education on a 5-point Likert scale. It was detected that 39.1% of the 174 survey participants have associate degrees, 61.7% have master's degrees (with thesis, without thesis, and distance education), and 6.9% have doctorate degrees. In comparison, 3% of them completed the GIS certificate program. The results showed that the competency achievement perceptions in the A3 section increased following the education level of the graduates. No significant difference was determined for A1, while an insignificant difference was detected for the A2 unit between the graduates of doctorate and distance education master's degree programs. The results are expected to be adopted by the relevant parties to align the GIS education programs with the sectoral needs and vocational qualifications.

Keywords: Vocational qualifications, Geographical information systems, GIS specialist, Learning outcomes

Introduction

Geographical information systems (GIS) is an eminent tool for understanding and supporting the solutions developed for the sustainability of the Earth (Andreev, 2020). GIS provides and enormously facilitates the processes reserved for capturing, manipulating, storing, managing, analyzing, and visualizing the geospatial data that are inevitably necessary for various disciplines and fields (Goodchild, 2000). Therefore, although the very start of the development of the GIS methods, tools, and sectors are primarily related to physical planning and spatial analysis activities and implementations, today, it has become a common tool for a wide range of fields (Maliene et al., 2011). Within this journey, the definition of the competencies required for GIS-related works and the need to raise qualified GIS personnel have become important, especially after the 1980s when GIS

- Selection and peer-review under responsibility of the Organizing Committee of the Conference

education and training programs became widespread in the universities and the GIS sector (Coopock & Rhind, 1991). Kholoshyn et al. (2019) explain that following the initial attempts and academic research at the Laboratory for Computer Graphics and Spatial Analysis, Harvard University, GIS has already been effectively included in the education system worldwide at the beginning of the 21st century, especially after the developments in universities in the USA, Canada, and the UK. Easy and fast access to geospatial data and technologies, advancements in geographical data infrastructures, and the existence of web-GIS resources have made GIS an inevitable tool for even secondary education today (Gonzáles & Torres, 2020).

GIS is multidisciplinary, comprises diverse information, knowledge, and competency areas, and GIS education is often organized under varying curricula (Bowlick et al., 2019; Hodza et al., 2021). The reflections of this rich and complex structure can be observed in the efforts of developing geospatial competencies through the UC Geographical Information Science and Technology Body of Knowledge, DOLETA Geospatial Technology Competency Model, Geospatial Management Competency Model (Alrwais, 2023; Cabuk, 2019), as well as certification implementations of GIS Certification Institute, American Society for Photogrammetry and Remote Sensing, US Geospatial Intelligence Foundation, etc. (Cabuk, 2019). Njiru et al. (2022) address the Slim GIM framework, Urban and Regional Information Systems Association (URISA) GIS CMM, and PSD Geospatial Maturity Index along the GIS-based models defining GIS capabilities within the enterprise level. Even the diversity and the unclarity of the GIS personnel employment calls from different sectors and projects put forward the necessity to align better the framework of GIS-related jobs and the minimum requirements for GIS training and education programs. In the education and training side, many academic programs in many countries currently provide GIS-related degrees. At the same time, there are also certification implementations and/or vocational qualification systems to provide quality assurance for the relevant jobs (Pesaresi, 2019). Wikle and Sinton (2020) note that the GIS certification, which first started in universities in 1990, is the most common academic credential for students who finish a set of courses at hundreds of public and private institutions. However, they widely vary in terms of knowledge and competencies they address.

In Turkiye, since the beginning of the 2000s, there have been intensive national efforts to develop standards for GIS, spatial data infrastructures, legislation, policies, and human resources under the framework of the Turkish National Geographical Information Systems – TUCBS project (Atac et al., 2020; Saralıoglu et al., 2019). As qualified human resources and their training/education are of great importance for the successful implementation and sustainability of TUCBS, the number of GIS education/training programs and courses and efforts to develop GIS-related vocational standards have increased. Tastan (2021) emphasizes the GIS lessons launched under the geography program of Istanbul University in the 1990s. On the other hand, GIS lessons and software were already taught under the landscape architecture program of Ankara University in the mid-1990s. Today, besides certificate programs provided by private and public initiatives, associate degree and graduate programs are delivered by various Turkish universities. Currently, 11 higher education institutions have 12 GIS associate degree programs. Diversity of geography, planning, landscape architecture, engineering, and surveying undergraduate programs also serve GIS courses. More than 15 higher educations in the country have active GIS-related master and doctorate programs.

While individuals with varying GIS knowledge and competency levels have been raised, Turkish National Vocational Qualifications Agency (MYK) has published 3 GIS-related vocational standards and national qualifications in the meanwhile, which were also shared by the higher education institutions, the private sector, and the relevant authorities as a guide to align their related educational/training programs. GIS-related national qualifications have also been critical basepoints to meet the human resources in the field as defined in the National GIS Strategy and Action Plan and the Türkiye Integrated Geographical Information Framework developed under the coordination of the Ministry of Environment, Urbanization, and Climate Change (CBS Genel Mudurlugu, 2020). Regarding the Geographic Data License Directive (Cografi Veri Lisans Yonetmeligi 2021), license applicants are required to employ GIS Specialists and/or GIS Operators (relevant national qualification certificate holders) recognized by the authorized national personnel certification authorities. This employment and certification process is primarily based on national qualifications. However, the recent revision made in March 2023 in the Directive allows the employment of graduates of GIS programs under some license application categories.

From this perspective, the relation between the outcomes of GIS education/training programs and GIS vocational standards/qualifications becomes even more significant as they are also the descriptors of the minimum requirements of knowledge, skills, and competencies for the target jobs and the assets for employment. This study aims to reflect and evaluate the perceptions of the graduates of GIS programs regarding the competencies gained throughout their education and the qualifications defined in the GIS Specialist (Level 6) National Qualification. A survey based on the learning outputs in the national qualifications was prepared, and the participants were asked to evaluate to what degree they gained these outputs on a 5-point Likert scale. The results are expected to be used by the parties involved in both the national policymakers and the education sector.

Table 1. Centre the caption above the table

A1 - Workplace Health and Safety, Environmental Protection Measures, Quality Management Systems, and Work Organization
1. I can explain the risk factors related to workplace health and safety.
2. I can explain the requirements for reducing the risk factors related to workplace health and safety.
3. I can define workplace health and safety measures in the work area.
4. I can define emergency procedures in case of danger.
5. I can describe the environmental impacts of the work and the working environment.
6. I can identify potential hazards related to the work and the working environment.
7. I can define environmental protection measures related to environmental impacts and hazards that may occur during the implementation of working processes.
8. I can explain the basic requirements for the efficient use of resources such as energy, consumables, and time related to the work.
9. I can explain the quality requirements of the work.
10. I can explain the technical procedures for ensuring the quality of work.
11. I can explain the measures aimed at preventing/correcting the errors and malfunctions detected in the processes.
12. I can explain the requirements to prepare a work program according to the demands.
13. I can define the necessary procedures for work planning related to the work.
14. I can explain the requirements for personnel planning related to the work.
15. I can explain the procedures necessary to determine the characteristics of the work area.
16. I can explain the issues related to the arrangement of the work area.
17. I can define situations and requirements for communication with other professionals for duties outside my responsibility.
A2 - Information Security
1. I can list the main items related to information security standards.
2. I can define the confidentiality process within the scope of information security standards.
3. I can define the integrity process within the scope of information security standards.
4. I can define the accessibility process within the scope of information security standards.
5. I can list the main issues to be included in the security policy.
6. I can list the necessary actions to approve and enforce the security policy.
7. I can explain how the security policy will ensure its functionality.
A3 - Technical Organization
1. I can interpret the requirements for preparing the hardware and network configuration required for the GIS project.
2. I can interpret the requirements for preparing the software configuration required for the GIS project.
3. I can interpret the processes necessary to ensure data provision.
4. I can explain the requirements to ensure data organization.
5. I can interpret the processes necessary to identify methods to transform data into useful information.
6. I can list the processes required to query and analyze data.
7. I can explain national and international standards and legislation related to GIS.
8. I can explain the technical requirements and process for reporting.
9. I can describe the technical requirements and process for presenting data and information.
10. I can implement the requirements for preparing the software configuration required for the GIS project.
11. I can apply the requirements for preparing the hardware and network configuration required for the GIS project.
12. I can provide data.
13. I can arrange data.
14. I can identify methods that transform data into useful information.
15. I can query data.
16. I can analyze data.
17. I can prepare web services.
18. I can conduct reporting process.
19. I can conduct data and information presentation processes.

Materials and Methods

Material

The main material of this study is an online survey developed from the learning outcomes and the success criteria defined in the three qualification units of GIS Specialist (Level 6) National Qualification (16UY0255-6). The survey was prepared under four main sections, including the personal and demographic information of the participants and GIS competency levels for different qualification units. GIS Specialist (Level 6) National Qualification is structured under three qualifications units, namely,

- A1-Workplace Health and Safety, Environmental Protection Measures, Quality Management Systems and Work Organization,
- A2-Information Security, and
- A3-Technical Organization.

Within the national qualification system framework, all national qualifications, actively 648 in force varying between levels 2 to 6, include the A1 unit addressing workplace health and safety, environmental protection, and quality management requirements related to the vocation. Table 1 gives the survey questions addressing the qualification unit-based gains.

Method

Development and Implementation of Survey

The learning outputs defined under A1, A2, and A3 qualification units of GIS Specialist (Level 6) National Qualification were examined and reorganized to develop survey questions addressing only one gain at a time, so 38 criteria under the units were expanded to 43 questions and designed to provide evaluations on a 5-point Likert scale basis, where 5 refers to the highest level of gain and 1 the least. The online survey (Google Survey Form) was shared with the graduates of the GIS-related certificate program, associate degree, master's degree (with thesis, without thesis, without thesis-distance education), and doctorate degree programs run by Anadolu University and Eskisehir Technical University. The respondents were asked to make a self-evaluation to reflect their perceptions on to what degree they have gained the given criteria throughout their academic study.

The primary motivation for selecting the respondents from Anadolu University and Eskisehir Technical University is the shared history of both institutions in the field of GIS education. Before the establishment of Eskisehir Technical University by the legal detachment of the related faculties from Anadolu University in 2018, all the GIS-related programs were under Anadolu University. As of May 2018, GIS graduate programs were transferred to Eskisehir Technical University. Therefore, the graduates of these universities were more accessible than other programs conducted under different higher education institutions in the country.

Evaluation of Survey Results

The research was designed as a quantitative research method to compare the differences between the perceptions of the graduates of GIS certificate, associate degree, master, and doctorate programs regarding the level of achievement of the outcomes described in the GIS Specialist (Level 6) qualification units, throughout their academic education. Accordingly, the survey model was used to show whether there are any differences between the GIS-based programs and GIS Specialist (Level 6) National Qualification with the basis of ANOVA via survey modeling.

The survey model is the most widely used descriptive method in educational research, where researchers summarize characteristics (skills, preferences, attitudes, etc.) of individuals, groups, or the physical environment (such as schools) (Fraenkel et al., 20212). Normality assumptions regarding the usability of parametric tests were met in the data set created from different universities (Anadolu University and Eskisehir Technical University) ($p>.05$). In the analysis phase, one-way analysis of variance (ANOVA) was used from descriptive statistics and from parametric tests to determine the differences between the independent variable of GIS National Qualification and program profiles.

Results and Discussion

Survey Participation and Descriptive Statistics

This section analyzes the graduates' assessments of their own GIS skill sets after completing their respective degree programs. Accordingly, the descriptive statistics obtained within the scope of the participants' perceptions of GIS Specialist (Level 6) National Qualification Units (A1, A2, A3) are shown in Table 2. The data from the survey are almost symmetrical according to the skewness and kurtosis values.

Table 2. Descriptive statistics

	n	Minimum	Maximum	M	sd	Skewness	Kurtosis
A1	174	44,00	85,00	69,67	9,89	-0,159	-0,391
A2	174	13,00	35,00	25,82	5,59	-0,310	-0,199
A3	174	43,00	95,00	78,94	11,59	-0,375	-0,282
ALL	174	5,00	25,00	18,01	4,85	-0,380	-0,359

Although the online survey was shared with over 800 graduates of GIS certificate, associate degree, master's degree (with thesis, without thesis, without thesis-distance education) programs and doctorate programs of Anadolu University and Eskisehir Technical University, only 174 people completed it thoroughly. When broken down by degree level, the results showed that 39.1% (f=68) of the respondents obtained an associate degree, 3.3% (f=4) a certificate, 23% (f=40) a master's degree with thesis, 4% (f=7) a master's degree without thesis, 34.7% (f=43) a master's degree without thesis (distance learning) and 6.9% (f=12) a doctorate.

According to Table 2, in all GIS program groups, the average declared competency level is 4.09 in A1, 3.69 in A2, and 4.15 in A3, on a 5-point Likert scale. The overall average, including 3 of the qualification units, in other words, the GIS Specialist (Level 6) National Qualification, is found to be 3.60. Figure 1 illustrates the distribution of the average results per qualification unit on GIS program basis.

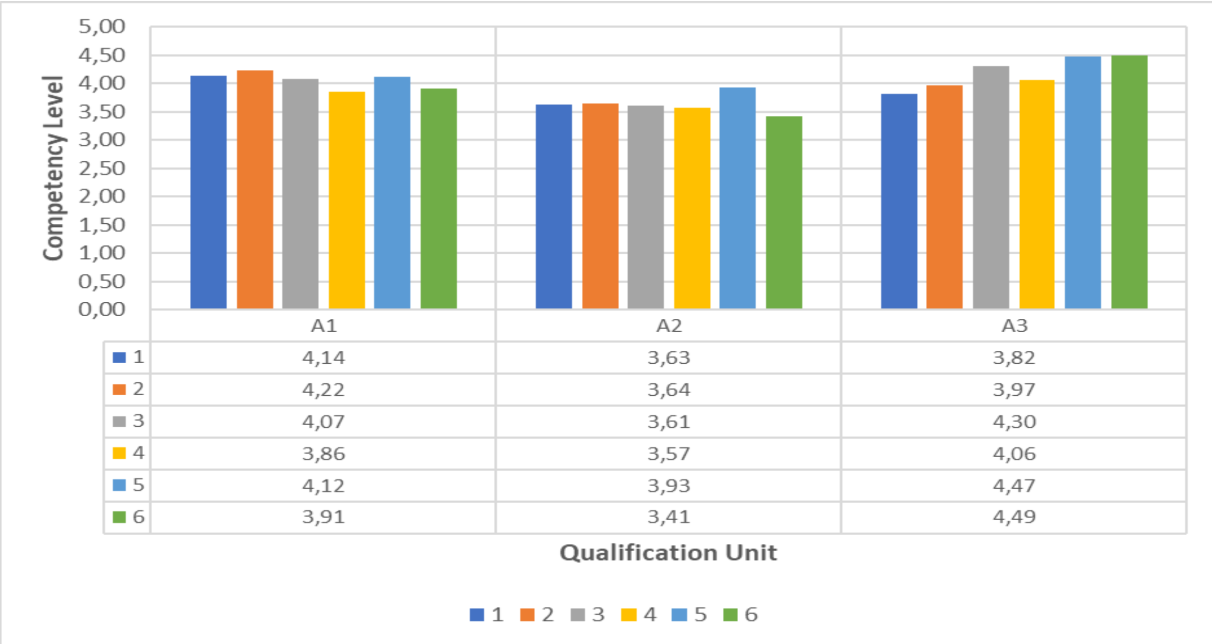

Figure 1. Survey result averages per qualification units

1: Associate degree, 2: Certificate program, 3: Master's degree (with thesis), 4: Master's degree (without thesis), 5: Master's degree (without thesis-distance education), 6: Doctorate degree

In this section, the results regarding the qualification unit-based perceived competency gains under 6 different GIS programs are presented, and the differences between the programs are compared to reveal whether there are significant differences based on the type of the completed program. Table 3-Table 5 summarizes the ANOVA results for each qualification unit according to GIS program types, while Table 6 presents results for all qualification units.

Table 3. ANOVA results for A1 qualification unit according to GIS program types

Prg. Type*	N	M	sd		Sum of Squares	df	Mean Square	F	Sig	Post hoc
1	68	70,43	9,95	*Between Groups*	295,037	5	59,007	0,596	0,70	-
2	4	71,75	6,95	*Within Groups*	16639,290	168	99,043			
3	40	69,30	9,97	*Total*	16934,328	173				
4	7	65,71	8,84							
5	43	70,14	9,97							
6	12	66,58	11,06							
Total	174	69,67	9,89							

**1: Associate degree, 2: Certificate program, 3: Master's degree (with thesis), 4: Master's degree (without thesis), 5: Master's degree (without thesis-distance education), 6: Doctorate degree*

Table 4. ANOVA results for A2 qualification unit according to GIS program types

Prg. Type*	N	M	sd		Sum of Squares	df	Mean Square	F	Sig	Post hoc
1	68	25,44	5,66	*Between Groups*	198,054	5	39,611	1,277	0,276	-
2	4	25,50	3,00	*Within Groups*	5210,061	168	31,012			
3	40	25,32	6,01	*Total*	5408,115	173				
4	7	25,00	5,45							
5	43	27,56	4,75							
6	12	23,92	6,73							
Total	174	25,82	5,59							

**1: Associate degree, 2: Certificate program, 3: Master's degree (with thesis), 4: Master's degree (without thesis), 5: Master's degree (without thesis-distance education), 6: Doctorate degree*

Table 5. ANOVA results for A3 qualification unit according to GIS program types

Prg. Type*	N	M	sd		Sum of Squares	df	Mean Square	F	Sig	Post hoc
1	68	72,71	11,38	*Between Groups*	5104,582	5	1020,916	9,456	0,000***	1-3 1-5 1-6
2	4	75,50	7,77	*Within Groups*	18138,843	168	107,969			
3	40	81,77	10,40	*Total*	23243,425	173				
4	7	77,14	11,54							
5	43	84,98	9,15							
6	12	85,42	8,21							
Total	174	78,94	11,59							

**1: Associate degree, 2: Certificate program, 3: Master's degree (with thesis), 4: Master's degree (without thesis), 5: Master's degree (without thesis-distance education), 6: Doctorate degree*

Table 6. ANOVA results for all qualification units according to GIS program types

Prg. Type*	N	M	sd		Sum of Squares	df	Mean Square	F	Sig	Post hoc
1	68	15,25	4,59	*Between Groups*	976,720	5	195,344	10,596	0,000***	1-3 1-5 1-6
2	4	17,25	2,06	*Within Groups*	3097,257	168	18,436			
3	40	19,10	3,74	*Total*	4073,977	173				
4	7	18,00	4,97							
5	43	20,95	4,29							
6	12	19,75	4,31							
Total	174	18,01	4,85							

**1: Associate degree, 2: Certificate program, 3: Master's degree (with thesis), 4: Master's degree (without thesis), 5: Master's degree (without thesis-distance education), 6: Doctorate degree*

The results summarized in Tables 3-6 demonstrate a significant difference between perceived qualification unit-based gains and graduated program types regarding A3 and GIS_TOP dimensions ($p<0.001$). LSD test was applied to address the program type significantly affecting the difference in A3 and GIS_TOP dimensions. LSD test results showed a significant difference between associate degree, master's degree with thesis, master's degree without thesis (distance education), and doctorate programs against associate degree. Although LSD test results show that there is a difference between doctorate degree and master's degree without thesis (distance education) programs at the A2 level, it is not significant.

Discussions

As previously explained in the relevant section, the survey results indicate a significant difference between the academic programs in the A3 unit. The A3 qualification unit includes foundational GIS knowledge and skills that form the basis of the education and training curriculum in academic programs and are focused on the acquisition of the primary program outcomes. Among these, as can be seen in Table 1, there are competencies such as collecting, processing, querying, analyzing, interpreting, and reporting spatial data, as well as skills related to the integration of relevant hardware and software infrastructure, understanding, and using the GIS standards, legislation, and web services. Besides, most knowledge and skills given in the A3 unit of GIS Specialist (Level 6) National Qualification are already adopted as major program outcomes in all the ongoing GIS academic programs and the certificate program included in this survey.

Based on the findings of the ANOVA test, it can be concluded that the competency level in the A3 unit increases in parallel to the level of education, as seen in the significant difference between the groups (associate degree program and master's and doctoral programs/ 1-3, 1-5, and 1-6). However, there is little distinction between master's and doctoral degrees in terms of perceived competency gain. The results obtained in A1 and A2 units show no program-related increase or decrease in the assessment of the gains. The A2 unit was found to have included the skills and knowledge that were rated as the least acquired among the 3 qualification units. The average rating of all groups in A2 is approximately 3.69, 4.05 in A1, and 4.15 in A3. According to the measurement/evaluation methods and criteria given in the GIS Specialist (Level 6) National Qualification, the success criteria of the exams are 60 in A1, 60 in A2, and 70 and 80 in the A3 unit, which is carried out in two stages, respectively. Based on a simple calculation, it can be concluded that all the survey participants consider themselves competent in meeting the basic requirements to obtain the GIS Specialist (Level 6) qualification certificate.

Conclusion and Recommendations

This study aimed at the determination of the competency gain levels of graduates of different GIS education/training programs in relation to the knowledge and skills put forward by Gıs Specialist (Level 6) National Qualification. 174 participants from certificate, associate degree, master’s degree, and doctorate degree programs of Anadolu University and Eskisehir Technical University completed the online survey and reflected their self-assessment on a 5-scale Likert Scale.

This survey is based on self-assessment. In other words, each participant rated the questions from their point of view and thus declared their competency level for the addressed knowledge/skill. The results indicate that regardless of the GIS program they completed, the respondents find their competency level achieved throughout their academic education compatible with the minimum requirements explained in the GIS Specialist (Level 6). The most surprising aspect of these results is that the knowledge and skills in A1 and A2 units, which the participants consider themselves to be highly competent, are not actually included in the program outcomes of the GIS programs included in this survey.

From these perspectives, first, the motivation and the factors encouraging the participants to believe that they have a high level of knowledge and skills that they have not learned within the scope of the program they graduated from should be investigated. Secondly, the reasons for the insignificant difference between the master's and doctorate graduates in the A3 unit should be analyzed. Finally, it should be examined whether there is a significant relationship between the actual competency achievement level of the candidates participating in the GIS Specialist (Level 6) certification exam and their GIS education background so that the consistency between the perceptions and the actual values should be revealed.

The results should be further studied as the degrees gained from relevant GIS programs are considered equivalent to the GIS Specialist (Level 6) Certificate under Geographic Data License Directive, which is a significant basis for GIs personnel employment.

Scientific Ethics Declaration

The authors declare that the scientific ethical and legal responsibility of this article published in EPESS journal belongs to the authors.

Acknowledgements or Notes

* This article was presented as an oral presentation at the International Conference on Research in Education and Social Sciences (www.icress.net) held in Budapest/Hungary on July 06-09, 2023

* This study was supported by Eskisehir Technical University Scientific Research Projects Commission under grant no: 22ADP337.

References

Alrwais, O. (2023). Assessing GIS education and GIS workforce in Saudi Arabia. *Arab Gulf Journal of Scientific Research*.

Andreev, D. V. (2020). The use of GIS technology in modern conditions. *IOP Conference Series: Earth and Environmental Science, 421*(4)

Atac, B. A., Cenan, D. K., Cetinkaya, A., Sahin, N. D., Sanlı, K., Koc, Z., & Kısa, A. (2020). Methodology of the Turkey's national geographic information System Integration Project. *International Journal of Geotechnical and Geological Engineering*, *14*(8), 196-204.

Bowlick, F. J., Bednarz, S. W., & Goldberg, D. W. (2020). Course syllabi in GIS programming: Trends and patterns in the integration of computer science and programming. *The Canadian Geographer/Le Géographe Canadien*, *64*(4), 495-511.

Coppock, J.T., & Rhind, D.W. (1991). The history of GIS. In D. Magiure, M.F. Goodchild, & Ehind, D.W. Ehind (Eds.). *Geographical information systems* (pp.21-43). London: Longman

CBS genel mudurlugu .(2020). Turkiye entegre cografi bilgi çerçevesi. Retrieved from https://webdosya.csb.gov.tr/db/cbs/icerikler/turk-ye-entegre-cograf--b-lg--cerceves 20210423124410.pdf

Resmi Gazete (2021, February 10). Cografi veri lisans yonetmeligi. Retrieved from. https://www.resmigazete.gov.tr/eskiler/2021/02/20210210-5.htm

Cabuk, S. N. (2019). Introduction of Turkish vocational qualifications for geographical information systems related jobs. *International Journal of Geography and Geography Education (IGGE)*, *40*,393-405

De Miguel González, R., & De Lázaro Torres, M. L. (2020). WebGIS implementation and effectiveness in secondary education using the digital atlas for schools. *Journal of Geography*, *119*(2), 74-85.

Fraenkel, J. R., Wallen, N. E., & Hyun, H. H. (2012). *How to design and evaluate research in education* (8th ed.). New York: Mc Graw Hill.

Goodchild, M. F. (2000). The current status of GIS and spatial analysis. *Journal of Geographical Systems*, *2*(1), 5-10.

Hodza, P., Berendsen, M. E., & Hamerlinck, J. D. (2021). Towards a holistic framework for delivering quality GIS education within and across disciplines. *Transactions in GIS*, *25*(4), 2146-2167.

Kholoshyn, I., Bondarenko, O., Hanchuk, O., & Shmeltser, E. (2019). Cloud ArcGIS online as an innovative tool for developing geoinformation competence with future geography teachers.

Maliene, V., Grigonis, V., Palevičius, V., & Griffiths, S. (2011). Geographic information system: Old principles with new capabilities. *Urban Design International*, *16*, 1-6.

Njiru, F. M., Siriba, D. N., & Karanja, F. N. (2022). Developing a conceptual framework for GIS Audit in an Enterprise Setting. *Journal of Geoscience and Environment Protection*, *10*(7), 15-30.

Pesaresi, C. (2019). from education to job opportunities. Defining professional profiles for geographers with high competences in GIS environment. *The Philosophy of GIS*, 253-264.

Saralioğgu, M. O., Demir, O., Coruhlu, Y. E., & Saralioglu, E. (2019). Data model design for qualified natural-protected area in Turkey. *Survey review*, *51*(365), 154-165.

Tastan, B. (2021). Cografi bilgi sistemleri (CBS)'de egitim ve sertifikasyon. *Uluslararası Sosyal Bilimler ve Egitim Dergisi, 3*(4), 69-86.

Wikle, T., & Sinton, D. (2020). The administration of academic GIS certificates: a survey of program coordinators. *Transactions in GIS*, *24(*6), 1681-1694.

Author Information

Dilara Unuvar-Unluoglu
Eskisehir Technical University
Eskisehir,Turkey

Nazire Burcin Hamutoglu
Eskisehir Technical University
Eskisehir,Turkey

Saye Nihan Cabuk
Eskisehir Technical University
Eskisehir,Turkey
Contact e-mail: *sncabuk@eskisehir.edu.tr*

Alper Cabuk
Eskisehir Technical University
Eskisehir,Turkey

To cite this article:

Unuvar-Unluoglu, D., Hamutoglu, N.B., Cabuk, S.N., & Cabuk, A. (2023). Determination of the relationship between the vocational qualifications and academic programs on a perceived competencies basis approach: A case for geographical information systems. *The Eurasia Proceedings of Educational & Social Sciences (EPESS), 31*, 1-9.