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Development of Guide Material for the Education of Cultural Immovable Heritage Management for Bachelor Students of Geomatics Engineering

Abstract: Türkiye has a wealth of foundations and their properties, assets managed by the General Directorate of Foundations (GDF) through its geomatics engineers. This article aims to identify the misconceptions of senior undergraduate geomatics engineering students (sample group) about the relationship between foundations and land ownership registered as cultural heritage. It will develop and implement materials to eliminate these misconceptions and evaluate their effectiveness. This study consists of a preliminary, a pilot and the main application. The data collection instruments are an open-ended questionnaire, a semi-structured interview form and conceptual understanding tests. As a result of the analysis of the pre-study and the pilot study, guidance materials on information deficits and misunderstandings in the application of Article 30 of the Law on Foundations were developed. In the analysis of the quantitative data, the Wilcoxon signed-rank test is used, a non-parametric analysis methods. In the light of the data obtained from the study, it is recommended that materials be developed in other areas of land management to investigate their effectiveness.

Keywords: teaching skills, student assessment, senior, engineering education, material development

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1. Introduction

The term waqf/foundation implies "to stop, retain, stand, and rest" [1]. In other words, a foundation is the total and permanent surrender of property, whether movable or immovable, to the benefit of the community [2, 3]. Immovable properties owned by foundations are referred to as foundation immovables. These immovables are utilized to generate revenue for the provision of foundation services. As a result, successful foundation management can be accomplished through excellent fundamental real estate management. This notion is employed in various countries, including Türkiye, which is the descendant of the Ottoman Empire [4, 5].

Foundations came to prominence in the Ottoman land system as both charity and property types. The mîrî (in Turkish) lands (cultivated agricultural lands) and the foundation lands were the most important components of the land classes during this period [5]. The most common definition of foundation ownership is the loss of the right to use it as individual property and the perpetual dedication to the public interest [6]. The paper outlining the provisions of a foundation is referred to as a vakfiye (in Turkish). This document was designated as a "foundation certificate" following the proclamation of the Republic of Türkiye [7].

The phenomenon of the foundation was established throughout a vast region, particularly areas adhering to Islam, and played a significant role in social and economic life [8]. With the creation of the Ottoman State, the concept of the foundation reached its pinnacle. Except for internal and external security services and State management, almost every transaction was conducted through foundations. The income-generating real estate of the foundations, comprising land, estates, houses, and inns, was known as akar (in Turkish) in the Ottoman State [7]. The foundation's income from these immovable properties was used to further its mission. There were also immovable properties such as mosques, cemeteries, and fountains known as charity (hayrat in Turkish) real estate because they did not generate income. These were non-profit properties that provided community services at no cost. The income-generating real estate met all expenses.

Today, foundations in Türkiye are divided into two categories: those founded before and after the Republic. The administration of foundations founded prior to the Republic was separated into three types: mazbut (in Turkish, fused in English), mülhak (in Turkish, annexed in English), and cemaat ve esnaf (in Turkish, community and tradesmen in English). Because annexed foundations and community and tradesmen foundations are governing entities, they control and represent themselves. However, because there are no managers or trustees for fused foundations, the GDF manages and represents them [7]. No new fused foundations can now be established and neither administrators nor trustees can be nominated to merged foundations. Furthermore, the legal status of these foundations as private legal organizations cannot be changed. The property land possessed by these foundations is solely theirs, not the Turkish State or the GDF. All real estate and

charitable properties of fused foundations are now listed in the GDF foundation Immovable Property Registry, which is equivalent to the Land Registry. The GDF handles the tracking of these documents with great care. Foundations must hold mobile or immovable property in order to deliver services that are appropriate for their purposes. They use the income generated by these assets to further their business aims.

Immovable property can be acquired by foundations. Foundations are incorporated into land management practices due to their immovable nature [9]. Geomatics engineering plays an effective role in land management but examining the existing literature reveals that there is little research on foundations and foundational real estate that focuses on geomatics engineers and students from geomatics engineering departments. There are just a few studies on foundations, immovable property, and their relationship to the concept of ownership. It is well known that even geomatics engineers working for the GDF in Türkiye have shortcomings in foundation and property issues.

This study will play an important role in the realization of land management practices such as immovable foundation, the elimination of practitioners' inadequacy in these issues, the development of practitioners dealing with knowledge of foundations, and the raising of awareness of the selected students as a sample group. There has been some prior research on foundations and property but it is crucial to impart information and experience obtained in foundations and property issues to senior undergraduate geomatics engineering students. This educational transfer is supported by a conceptual change text, case studies, and theatre activities. There has been little research on how these methodologies and techniques are used in the undergraduate curriculum of geomatics engineering.

The purpose of this study is to first develop and implement guide materials for senior undergraduate geomatics engineering students and then assess the materials' efficacy in detecting and eliminating misconceptions about foundations and their qualities.

1.1. An International Approach to Geomatics Education and the Profession of Surveyors

Looking at the studies in the field of surveying education in recent years, technological developments and differentiation of needs in the world market have affected graduates. Graduates must possess skills to adapt to a rapidly changing labour market [10]. As a result of this change, traditional cadastre has been replaced by planning and land management. For this reason, graduates must utilize their skills to deal with the unknown problems of the future and the educational base must be flexible. As a result of these factors, skills for learning to learn have become increasingly essential. Professional skills can be developed at a later stage during one's career, but skills for theoretical problem solving and skills for learning to learn can only be achieved through academic training at universities [11].

The major key international trends in surveying education in the following years are as follows [12]:

- management skills versus specialist skills,
- project organized education versus subject-based education,
- virtual academy versus classroom lecture courses,
- lifelong learning versus vocational training.

At the current moment, it seems that surveying/geomatics education has focused on learning to learn, the need for flexible curricula to deal with constant change, action to promote the virtual academy, the demand to create a quality culture and lifelong learning perspective. It has been noted that facing these challenges requires an innovative and adaptable approach to both curriculum design and lecture delivery within the framework of a general culture of quality [13].

In an innovative study in the Netherlands, appropriate education, research, and capacity development studies were initiated in the field of land management. Within the scope of the study, a series of workshops and surveys were carried out and the mission, vision and objectives of the department were determined to guide the new curriculum [14]. In this study, university education was emphasized in order to find solutions to changing needs as technology advances. It was stated that the theoretical problem solving and learning to learn skills of graduates can be strengthened with academic education. The adoption of novel methodologies in academic training at universities, as well as the development of teaching materials, was emphasized in our study in order to raise the knowledge level of geomatics engineering students regarding foundations and foundation properties. One of the most remarkable studies was carried out in Africa. Given the need to expand knowledge and capacity for efficient use and management of land and natural resources in Africa, it explores a new academic networking method that can increase land education in Africa [15].

Looking at the international agenda, in line with the new trends in the world, studies such as creating a new curriculum and redefining the mission and vision of surveying/geomatics education [16] can be discerned. In addition to this, it is mentioned that there are needs such as learning to learn, the need for flexible curricula to deal with constant change, action to promote the virtual academy, the demand to create a culture of quality and a lifelong learning perspective.

1.2. Problem Definition

Geomatics engineering is one of the most effective professional disciplines in the management of immovable foundations. In the literature, there are various studies on foundations in many areas such as economics, law, history, the harmonization process of the European Union, and management styles. There are a limited number of studies conducted with geomatics engineering students on “foundation” and “immovable foundations”. However, no studies based on the success of these

materials regarding the lack of information and the elimination of misconceptions by addressing the issue of foundation and property together and establishing a relationship between them have been encountered. The absence of such studies poses a problem for undergraduate students of geomatics engineering departments.

1.3. Aim of the Study

The goal of this study is to identify the misconceptions that geomatics engineering students have about the connection between a foundation and a fundamental property, to develop and implement instructional materials to dispel these misconceptions, and to assess how well the materials work. The following sub-goals were selected to attain this goal:

- to determine the current level of knowledge and misconceptions of the sample group on the concept of "foundation",
- to increase the current level of knowledge of the types of foundations, foundation properties and land management practices with the courses,
- to enable the sample group to gain experience by making applications for the solution of land management problems that they may encounter in their professional lives,
- to ensure that the sample group is aware of the foundations and other immovable foundations in their surroundings, which are registered as cultural assets,
- to raise awareness for the sample group about the protection and development of the cultural assets of immovable foundations.

In the study, a questionnaire form and a semi-structured interview form were developed as data collection tools and then sent them to the sample groups who were geomatics engineers and working for the General Directorate of Foundations. By analysing the data collection tools, some lack of information and weaknesses were seen in sample group members who were geomatics engineers. Weaknesses in education on this issue also seem to be part of this gap. It would be better to have these deficiencies described in the introduction to clearly state the research problem. To eliminate those kinds of weaknesses there is only one solution, which is education. Thanks to educational materials, greater awareness can be fostered amongst people and this was precisely the objective of this study.

2. Method

A simple experimental research method was employed in this study, using one group and no control group. Figure 1 depicts the path taken within the scope of the study.

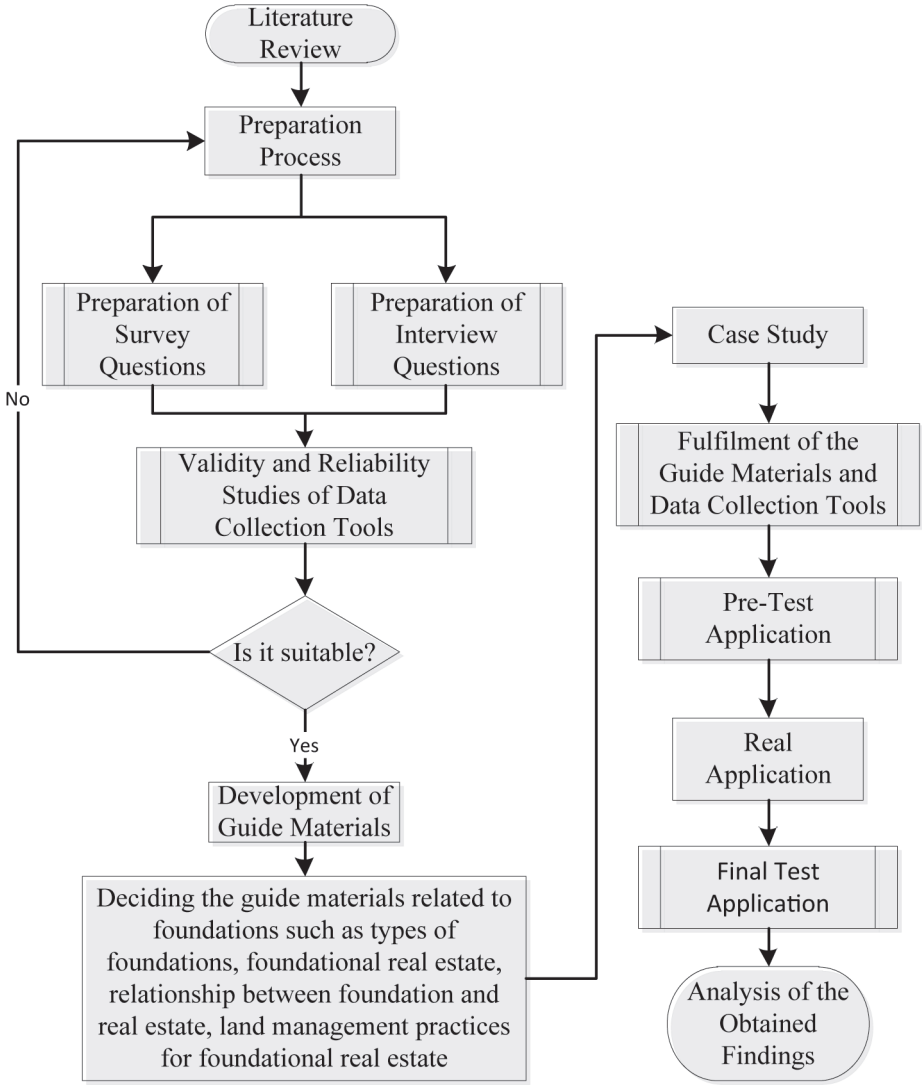


Fig. 1. Application stages of the study

2.1. Test Method

The study began with a "Literature Review". Thanks to the data obtained from similar studies, the "Preparation Process" which is composed of the "Preparation of Survey Questions" and "Preparation of Interview Questions" was completed. After the preparation of all the problems related to the study subject, the "Validity and Reliability Studies of Data Collection Tools" phase was started. At this stage, questions that failed the suitability test were removed from the tests. New questions

were added, and some questions revised. After ensuring the suitability of all questions, the "Development of Guide Materials" section followed. Under this title, "Deciding the guide materials related to foundations such as types of foundations, foundational real estate, the relationship between foundation and real estate, land management practices for foundational real estate" were provided. After the development of the questionnaire-interview questions and the completion of the materials, the "Case Study" section, where all these data will be applied for the first time, started. Then, the final form of data collection tools was given with the "Fulfilment of the Guide Materials and Data Collection Tools" section. Immediately afterwards, the "Pre-Test Application" was made, thus the first application phase of data collection tools and materials was completed. At this stage, data triangulation, which means the application and combination of several research methods in the study of the same phenomenon has been made [17]. Then the materials developed in the "Real Application" section were applied and the questionnaires and interviews were re-conducted with the "Final Test Application" section to test the validity and reliability of the materials. In this way, changes to the sample group were obtained. All of the data were evaluated and interpreted together in the "Analysis of the Obtained Findings" section, and the study was completed.

2.2. Sample Group

The study's sample group is made up of 40 senior undergraduate geomatics engineering students. The sample was chosen using a simple random sample selection. The probability and chance of each sample composing the sample group (universe) in a simple random sample are equal to the group sample [18].

2.3. Developing the Guide Materials

Within the scope of the study, as a result of survey and interview data analysis before application, the following information deficiencies and misconceptions were found in students (geomatics engineering students outside the sample group). According to the results, to include the following information in the guide materials was decided:

- the concept and definition of foundations,
- foundation types,
- foundations before the Republic,
- foundations after the Republic,
- foundation management and representation,
- ownership in foundations,
- the relationship between foundations and property,
- the relationship between foundations and land registry,
- implementation of Article 30 of the Law on Foundations, which is a new means of acquiring real estate.

Therefore, it was agreed to prepare the following materials on the implementation of Article 30 of the Law on Foundations within the scope of the study:

– conceptual change texts,
– case studies,
– drama materials.

Conceptual change texts help students identify their misunderstandings and provide reasons and instances for why they are incorrect. Scientifically recognized notions or ideas are presented in texts called conceptual change texts [19, 20]. Recently, many researchers have used conceptual change texts to eliminate students' misconceptions [21–24].

The case study in social sciences and life sciences is a research method that involves the close, in-depth and detailed examination of a particular case. Case study research can mean single and multiple case studies, include quantitative evidence, rely on multiple sources of evidence, and draw on previous developments of theoretical propositions. Case studies can include both qualitative and quantitative research methods [25]. Single subject researches provide a statistical framework for inferences from quantitative case study data [26]. Another suggestion is that the case study should be defined as a "research strategy", which is an empirical study that examines a phenomenon in a real-life context. The case study does not need to be $N = 1$ as there can be many observations in a case study (many people and entities over many time periods) [27, 28].

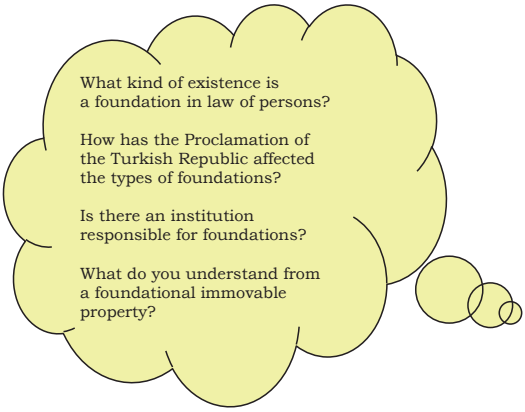
The resulting "case study research" has long held an important place in many disciplines and professions, from psychology, anthropology, sociology and political science to education, clinical sciences, social work and administrative sciences [26, 28–30]. Case studies have also played an important role in business and management research [31, 32]. Recently, many researchers have used case studies for the meaningful learning of students [22, 23, 33]. The conceptual change texts shown in Figure 2 were created to address the students' information gaps and misconceptions.

The case study is an approach that exposes pupils to real-world challenges. This strategy bridges the theoretical and practical divide. Students may be unable to bridge the gap between abstract concepts and real-world situations. This connection can be established using the case study method. This strategy has the potential to engage students [34]. In this study, two: case studies were created.

The first case study in Figure 3 focuses on the immovable property's present ownership status as well as the topic/conceptions of the immovable property signifying the cultural property in the land registry. The second case study focuses on the relationship between the immovable and the foundations, as well as how this relationship is reported in the foundation archives.

The drama method, which begins with the experiences of a group and its members, can be described as animating a subject by using methods like role play and improvisation [35]. The goal of the drama technique is to inspire student creativity and show them different methods to obtain information. Drama is a useful learning tool because it can make abstract ideas concrete, appeal to a variety of senses, and

make events and situations intelligible [36]. The goal of the drama event was to treat immovable properties belonging to different legal organizations in a comparative manner. Students were asked to develop inferences within the context of this purpose by discussing which categories of immovable can be subject to Article 30. It was critical for pupils to be creative during this procedure.



The students think the following:

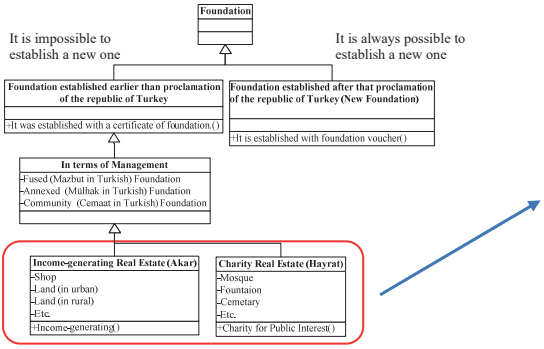
A foundation is a public legal person / private / person / company, etc.

Foundations established before and after the proclamation of the republic are of the same nature.

The Ministry of Culture and Tourism / Treasury / Land Registry and Cadastre General Directorate etc. are responsible institutions for foundations.

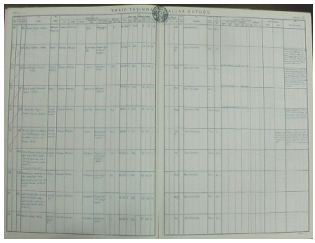
Today, an immovable foundations property can be registered on behalf of a private / legal person other than the related foundation.

The above student thoughts are wrong.

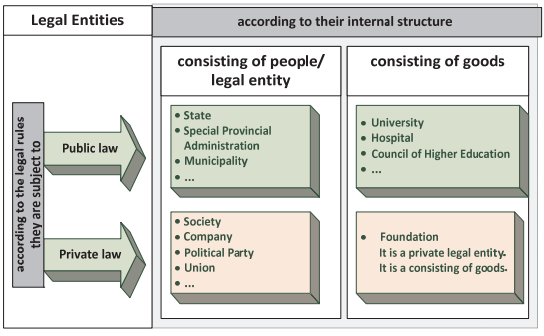


Types of Foundations in Türkiye

.It is a registry in which foundational real estate can only be managed and presented by the General Directorate of Foundations.



Registry of Foundational Real Estate
(in Turkish Vakıf Taşınmaz Mallar Kütüğü)

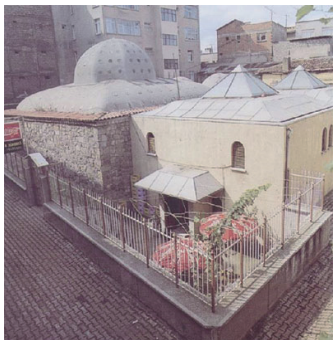


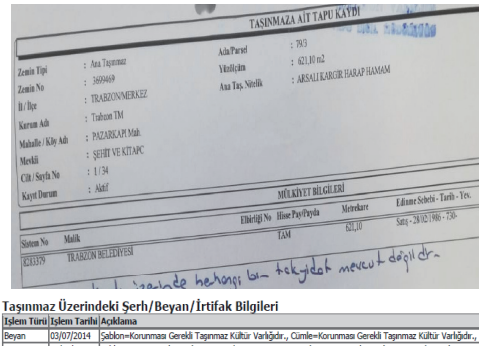
Some definitions

Foundation:
Types of foundations:
Foundational Certificate:
General Directorate of Foundations:
Fused Foundation:

Fig. 2. Article 30 of the Law on Foundations – conceptual change text

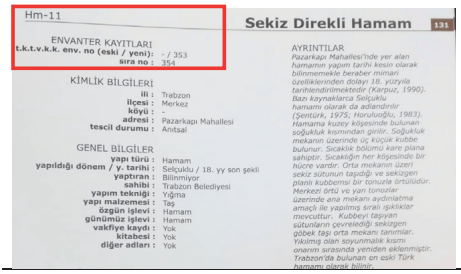
Trabzon Municipality was the owner of the block number 79, parcel number 3 real estate known as Turkish bath with 8 columns in Turkish "8 Direkli Hamam", in the city of Trabzon, Pazarkapı Neighbourhood. This immovable has been registered as a "cultural asset". This registration decision was taken by the Trabzon Cultural Heritage Conservation Regional Board.





A photograph and land registry of "8 Direkli Hamam"

According to this registration decision, the statement of the land registry is "immovable cultural asset" in the declarations section. The official decision that "8 Direkli Hamam" is an immovable cultural asset is provided with land registry.



The registration decision of "8 Direkli Hamam" as a cultural heritage and its cadastral layout

Discussion:

• If the block-parcel number of "8 Direkli Hamam" had not been determined, how would the process have proceeded? Why? Please explain.

• If "8 Direkli Hamam" had not been registered as a cultural property, how would the process have proceeded? Why? Please explain.

Fig. 3. Article 30 of the Law on Foundations – case study part

Material enhanced with a conceptual change text, case studies, and drama exercises were used in the process by Article 30 of the Law on Foundations. However, because the theatre activities were merely written papers, they were excluded from this portion.

2.4. Data Collection Tools

A conceptual understanding exam with open-ended questions and a semi-structured interview form (SSIF) were used to collect data. The data collection method was used to test students' conceptual understanding. The questions were created with the workflow in the Law of Foundations in mind. Table 1 shows the conceptual understanding test questions.

Table 1. The questions of the conceptual understanding

Which institution do you think is responsible for foundations in our country? Why? Please explain.
How is foundation explained in the law of persons? Please explain.
What is a immovable foundations? Please explain.
Which institution do you think is authorized to do the works of a fused foundation established before the Proclamation of the Turkish Republic? Please explain.
Do you think there is a registry where the immovable foundations can be registered except for the land registry? Please explain.
Do you think there is an opportunity to establish a foundation for every purpose? Please explain.
Nowadays, is it possible to legally establish a fused foundation? Please explain.
Who can the owners of the immovable property owned by a foundation in the land registry be? Please explain.
According to you, can a real estate which is a cultural asset and registered in the name of a particular public legal entity be registered in the name of a fused foundation? Please explain.

The questions of the semi-structured interview form can be seen in Table 2.

Table 2. The questions of the semi-structured interview form

Do you think that there is an institution responsible for the foundations in our country? Which institution, if any? Please explain.
Can you give an example for a private legal entity which is both a legal entity and consists of goods?
What does the concept of foundation real estate mean to you? Can you explain?
How and by which institution do you think the works related to the immovable belonging to a foundation established before the proclamation of the Turkish Republic and known as a fused foundation can be carried out? (private legal entity and consisting of goods)? Can you explain?
Can a immovable foundations be recorded in any registry? What do you think about this? Can you explain?
Can you give an example for the purposes of foundations established for different purposes?
Can a foundation be established today? What do you think about its installability?
Who can be an owner of a immovable foundations property in land registry? Can you explain?
In your opinion, can an immovable property that is also a cultural heritage on land registry in the name of a public legal entity be registered free of charge on behalf of a foundation? What do you think about this?

The pilot study of the research is presented in Table 3. The research was carried out with 20 students. After the pilot implementation, the materials and data collection tools were finalized.

Table 3. Pilot implementation process

Pilot implementation	Period [month]	The number of students
Pre-application of data collection tools	2	20
Pilot study	2	20
Completion of post study for data collection tools	2	20
Preparation of materials and data collection tools after the pilot application	1	–

Based on the results of the pilot study, data gathering techniques and materials were organized. Aside from the pilot study, the contents were reviewed by two academicians and two GDF experts. As a result, professional evaluations of the materials were acquired. The study's pilot phase was completed in three months. After the pilot implementation, the final arrangements for the materials and data gathering instruments were finished in one month.

The main study was carried out with 40 undergraduate students. Table 4 summarizes the actual implementation process.

Table 4. Real implementation process

Real implementation	Period [month]	The number of students
Pre-application of data collection tools	2	40
Performing the real implementation	2	40
Making the post study of data collection tools	2	40

2.5. Data Analysis

The categorization method [36] was used in the analysis of the conceptual understanding test consisting of open-ended questions and semi-structured interview form:

- Full Understanding (FU) (3 points),
- Partial Understanding (PU) (2 points),
- Partial Understanding with Specific Misunderstanding (PU/SM) (1 point),
- Specific Misunderstanding (SM) and Not Understanding (NU) (0 points).

Non-parametric tests were used to analyse the conceptual understanding test data. The statistics were presented to the reader in the form of line graphs to demonstrate each student's individual development. Furthermore, the sample responses are shown to the reader as examples for the categories. Students were coded in accordance with the applicable research ethics. The students were allocated codes ranging from 1 to 40 in coding.

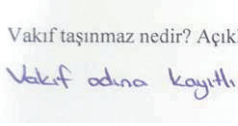
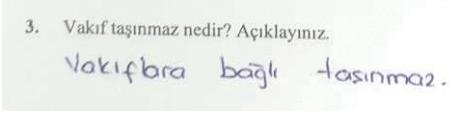
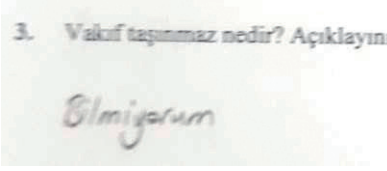
3. Results

3.1. Findings from the Questionnaire Form

Nine questions were asked to the students in the test. One of them, asked as the third in this study, is given in detail.

The third question is, "What is a immovable foundations? Please explain". The students' possible accurate solution to the linked question is, "Immovable property belonging to any foundation is called immovable foundations". The connected foundation owns the real properties". Table 5 contains examples of student responses to the pre-test question.

Table 5. Sample students' responses to question 3 of the CUT in the pre-test

Categories	Sample explanations (the images in this table are images of students' responses to the CUT; under each image, the description in the image is translated in English)	SC
FU	 A foundational real estate is one that is owned by a foundation	7
PU	 A foundational real estate is one that is owned by a foundation	25
NU	 I have no idea	17

In the pre-test, students were categorised again based on their responses, as shown in Table 6.

Table 6. Students are classified based on the 3rd question of the CUT in the pre-test

Categories	Student codes
FU	2, 7, 10, 12, 13, 14, 21, 22, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 38, 39, 40
PU	25
NU	1, 3, 4, 5, 6, 8, 9, 11, 15, 16, 17, 18, 19, 20, 23, 24, 37

Examples of the answers given by the students to the question in the post-test are presented in Table 7.

Table 7. Sample students' responses for category 3 of the CUT in the post-test

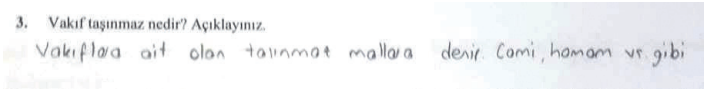
Categories	Sample explanations (the images in this table are images of students' responses to the CUT; under each image, the description in the image is translated in English)	SC
FU	 A Foundations possess immovable foundations property. Mosques, Turkish baths, and etc.	12
PU	 A piece of property that is tied to a "foundation voucher" or "foundation certificate-charter" and is committed to the public good	17
NU	 It is a grouping of items with a common purpose and continuity. It can be administered by either private or legal entities	9

Table 8 displays the data about the classification of students based on their post-test responses.

Table 8. Classification of students according to the 3rd question of the CUT in the post-test

Categories	Student codes
FU	2, 3, 4, 7, 10, 11, 12, 13, 14, 15, 16, 18, 19, 20, 21, 22, 23, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40
PU	17
NU	1, 5, 6, 8, 9, 24

The students' improvement was assessed by comparing their answers to the relevant test question before and after the materials. Figure 4 depicts this review.

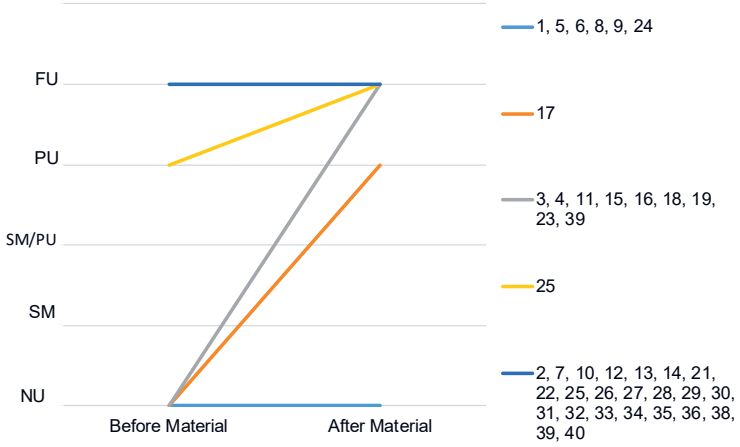


Fig. 4. The distribution of students' answers to the 3rd question of the test

Together with the materials, 15% of the students are in the category of not comprehending before and after the content. Before the material, the student with code 17 was in the not understanding category, and after the material, he was in the partial understanding category. While 22.5% of students were in the not understanding category before the materials were applied, they were included in the full understanding category after the materials were applied. Before the material, the 25 coded student was in the partial understanding category; after the material, he was transferred to the full understanding group. Before and after the material, 57.5% of the pupils had full understanding.

The Wilcoxon signed-ranks test was used to analyse the sample group's pre-test and post-test results. The findings of the analysis are shown in the table. Table 9 shows the Wilcoxon signed-ranks test findings for the sample group's pre-test and post-test scores.

Table 9. Wilcoxon signed-ranks test results of the pre-test and post-test scores of the sample group

Post-test – pre-test	*N*	Average	Total	*z*	*p*
Negative sequence	0	0.00	0.00		
Positive	40	20.50	820.00	−5.519*	0.000**
Equal	0				

*Based on negative ranks, ** $p < 0.05$.

The analysis results demonstrate that there is a significant difference between the students in the sample group's pre-test and post-test scores ($z = -5.519$, $p < 0.05$). Considering the order totals of difference points, this difference appears to be in favour of negative sequences, implying that the post-test is more effective. In other words, the conceptual change texts, case studies, and drama activities used with the sample group are highly effective in insuring the students' conceptual changes.

3.2. Findings from the Semi-structured Interview Form

Nine questions were asked to the students in the interview form. One of them, asked as the third in this study, is given in detail just as an analysis of the interview form.

The third question in the interview was "What does the concept of foundation real estate mean to you? Can you explain?". The possible correct answer expected from the students for the relevant question is, "Immovable foundations is called immovable belonging to a foundation. The legal entity of a foundation is the only owner of the real estate of the relevant foundation". The most suitable examples, selected among the answers given by the students to the relevant question, are presented in Table 10 before the materials.

Table 10. Sample students' answers for categories for the 3rd question of the SSIF in the pre-test

Categories	Sample explanations	SC
FU	Real estate whose owners are foundations. Real estate which were registered in the name of foundations. Foundations can use them for their own benefit via their own purposes	33
PU	Real estate is linked to foundations	25
SM	Real estate which the Turkish State controls	18
NU	I think there is a necessity that their incomes must be given as charity and their usage defined beforehand	8

Before the materials were applied, the students were classified according to their answers as in Table 11.

Table 11. The 3rd pre-test question of the SSIF according to the classification of students

Categories	Student codes
FU	1, 2, 4, 7, 10, 12, 13, 14, 21, 22, 26, 27, 28, 29, 30, 33, 34, 35, 36, 38, 40
PU	25
SM	18, 24
NU	3, 5, 6, 8, 9, 11, 15, 16, 17, 19, 20, 23, 31, 32, 37, 39

Examples of the answers given to the relevant question in the interviews with the students after the material was applied are presented in Table 12.

Table 12. Sample students' answers for categories for the 3rd question of the SSIF in the post-test

Categories	Sample explanations	SC
FU	In the land registry records, they are immovables registered in the name of the foundation	1
SM	Documents created with foundation certificates or foundation charters related to buildings built in the past are called immovable foundationss. These are generally obliged to be registered as a cultural asset in land registry	24
NU	The immovables that are established for a specific purpose and have sustainability	9

After the materials, students were classified according to their answers in Table 13.

Table 13. The 3rd question of the post-test of the SSIF according to the classification of students

Categories	Student codes
FU	1, 2, 3, 4, 6, 7, 8, 10, 11, 12, 13, 14, 15, 16, 18, 19, 20, 21, 22, 23, 25, 26, 27, 28, 29, 30, 31, 33, 34, 35, 36, 37, 38, 39, 40
SM	5, 24
NU	9, 17, 32

The answers given to the relevant interview question were evaluated separately before and after the materials. The improvement of the students on the basis of the question was examined. These examinations are shown in Figure 5.

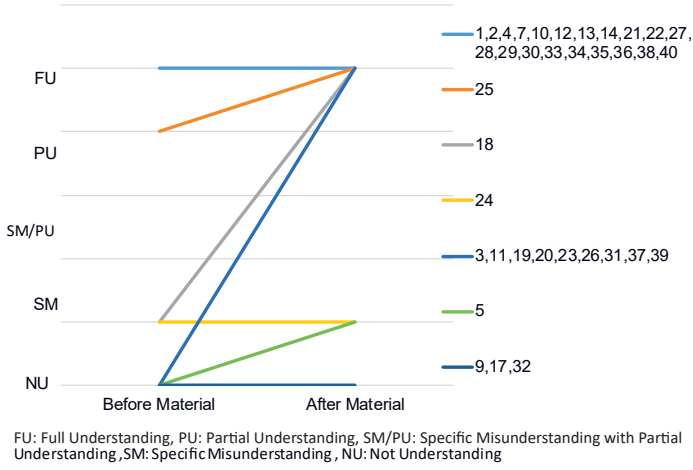


Fig. 5. The distribution of student answers to the 3rd question of the SSIF in categories

4. Discussion

FIG, the largest and best-known international nongovernmental organization of Surveyors and Geomatics Engineers [36] attaches great importance to engineering education. Various researchers, in the surveyors' sector, land administration and geomatics on these issues, carry out studies on engineering education [10–12] quality assurance [9] e-learning facilities [37, 38], mutual recognition [37, 39, 40], definition of mission/vision for the programme [14], material development and so on. Thanks to these efforts, the needs of the sector can be associated with the current curriculum. Of course, the curricula provide services to all colleagues who want to improve themselves, especially students. Thus, curricula can support an overall organizational development process.

Within the scope of the study, as a result of survey and interview data analysis prior to application, students of geomatics engineering as a sample group have the following deficiencies and misconceptions such as the concept and definition of foundations, types of foundations, foundations before the Republic, foundations after the Republic, management and representation of foundations, ownership in foundations, the relationship between the foundation and property, the relationship between the foundation and the property, the relationship between the foundation and the property, the relationship between the foundation and the property, It was decided to provide resources for the application of Article 30 of the Law on Foundations, in which pupils lacked understanding and had misconceptions. A conceptual change text, case studies, and drama activities were included in the resources. The conceptual change texts provided students with the opportunity to replace their misconceptions with scientific truths. In the post-test, conceptual change texts were found to be successful in removing students' misunderstandings. There is some research in the literature that demonstrates this [21, 22, 41–43]. Students explored the application of Article 30 through a real-world application example thanks to the case studies in this course. O'Connor and Hayden [44] discovered that using case studies and animations to present daily life issues to students improved their interest in the lecture. Case studies are used in research that contributes to student achievement, attitudes about the course, and relationships with subjects in daily life [21, 43–46]. The dramatic exercises utilized in the study helped students reinforce and learn about the events in an enjoyable way [47]. Various researchers have discovered that the learning environment in which drama enhances student accomplishment is enjoyable [48, 49, 50, 51].

5. Conclusion

Like the aforementioned articles, this article puts forward similar benefits with regard to the development, application, and evaluation of the guide materials for geomatics engineering senior undergraduate students who continue their education

according to the geomatics engineering curriculum. This article has achieved its goals thanks to the themes below:

- to determine the knowledge levels and misconceptions of the sample group about the concept of "Foundation",
- to organize lessons, excursions and courses to be given to the sample group,
- to increase the current level of knowledge with the types of foundations, foundation properties and land management practices together with the activities,
- to enable the sample group to gain experience by making applications for the solution of land management problems that they may encounter in their professional lives,
- to create awareness for the protection and development of a immovable foundations by ensuring that the sample group is aware of the immovable foundations and other immovable foundations that are registered as cultural assets.

The materials prepared for the application of Article 30 of the Law on Foundations were shown to have a significant effect on students' conceptual understanding ($z = 5.519$, $p < 0.05$). It has been determined that conceptual change texts, case studies, and drama activities contribute to students' long-term and effective learning. The materials generated employing conceptual change texts, case studies, and theatre activities were found to be highly effective in providing students with conceptual changes.

Geomatics engineering students did not have sufficient knowledge about foundations before the study. Moreover, the materials used before the project did not allow students to obtain sufficient information about foundations. Together with the materials developed within the scope of the study, the students were able to obtain sufficient information about foundations.

The conceptual change text helped students grasp the relationship between their personal law and the legal entity of the foundation. The conceptual change text explains the notion of foundation and the different sorts of foundations. Students comprehended the variations in foundation management and representation before and after the Republic. Furthermore, the students understood that foundations can only be created for specified and permanent legal purposes. They studied foundation certificate-charter, fused foundation, and immovable cultural assets in the final section of the conceptual change text. As a result, students have a greater knowledge of how Article 30 of the Law on Foundations is applied.

Students were asked to act out a fabricated situation in the drama event. At the conclusion of the drama activity, an immovable property constructed by the fused foundation at the start was discussed. The students reinforced the issue when the scenario was completed with the registration of this real estate on behalf of the fused foundation.

All of the materials created were effective in removing students' information gaps and misconceptions. As a consequence of the gains made within the scope of the study, it can be stated that comparable studies for various land management applications in which students have certain misconceptions can be arranged.

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Author contributions

Yakup Emre Çoruhlu: conceptualization, methodology, writing – review & editing, visualization.

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Okan Yıldız: methodology, validation, editing.

Sibel Er Nas: conceptualization and preparing/developing/implementing the educational materials.

Fatih Şahin: responsible for cultural assets and their historical events, conceptualization.

Fatih Terzi: implementing the educational materials with students, visualization.

Mehmet Özgür Çelik: preparing the statistical tests according to the results, review & editing.

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