International Journal of Educational Studies in Mathematics

Analyses of the Document Formation Process of a Lecturer in a Digital Environment

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ABSTRACT

In this research, it is aimed to examine the schemes that emerged during the documentation formation process and the factors affecting the process in the context of a lecturer's "Documentational Approach to Didactics" theoretical framework. For this purpose, a case study, one of the qualitative research methods, was preferred in the study. Linear algebra courses teaching plan, course video recordings, clinical interviews and schematic representation of the resource system were used as data collection tools. The research participant is a lecturer who teaches linear algebra at the Faculty of Education of a state university in the Marmara Region. Content analysis was used to analyze the data. Elements related to the schemes that emerged in the process of creating documents as a result of the study have been determined as the fact that the achievements of the linear algebra curriculum are applied in a different order, the language of the selected resources is simple, the lessons are in the form of definition-theorem-example solution-quiz, the lecturer creates his/her own examples on the subject, the digital media resource is Google Meet, the resources and videos are shared in the classroom. In addition, it was concluded that the factors affecting the documentation creation process of the lecturer were grouped under four themes: student-based, faculty-based, mathematical concepts, and teaching environment.

ARTICLE INFO

Article History:
Received: 16.10.2021
Received in revised form: 21.11.2021
Accepted: 26.11.2021
Available online: 14.12.2021
Article Type: Standard paper

Keywords: lecturer, documentational approach, linear algebra, resource usage, digital environment

1. Introduction

Analysis and linear algebra courses have an important place in the mathematics and science programs of universities. However, the studies on mathematics education at the university level started with the studies on the analysis course. In the last 20 years, linear algebra studies have also increased by consideration (Dorier, 2002, p.875). In addition, linear algebra was integrated into the related programs of universities in the 1970s (Aydin, 2009, p.98). In this context, linear algebra emerges as a critical course for university-level students because it finds application in science and social sciences (Konyalioglu, Ipek and Isik, 2003, p.59).

Since linear algebra contains abstract mathematical concepts within itself, researchers generally tried to give the necessary definitions in line with the intuitive approach (Spence, Insel and Friedberg, 2000; Konyalioglu, Ipek and Isik, 2003). According to Spence, Insel and Friedberg (2000), linear algebra emerges as the field of mathematics that expresses linear transformations of vectors and matrices and these structures on vectors. At the same time, in the definition made by Konyalioglu, Ipek and Isik

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DOI: https://doi.org/10.17278/ijesim.1007636

(2003, p. 59), it is defined as a branch of modern algebra that concerns abstract systems called roots and vector spaces from the solutions of linear equation systems. However, linear algebra is a valuable field seen in many mathematics courses such as analytical geometry, algebra, geometry, analysis, differential equations, fractal geometry, numerical analysis. On the other hand, linear algebra shows itself in different fields besides pure mathematics (Dorier, 1995). When these areas are examined, disciplines such as genetics, anatomy, chemistry, physics, statistics, computer technologies, engineering and economics are striking (Birinci, Delice, and Aydin, 2013, p.57).

Most students who take the linear algebra course at universities have the feeling of landing on a new planet due to the abstract and complex nature of this course, and, inevitably, they cannot find their way into this new world (Dorier, Robert, Robinet and Rogalski, 2000). It can be said that students are introduced to many new concepts that they have not encountered before in the linear algebra course for the first time, that they have difficulty in establishing relationships between these concepts and that they cannot connect the linear algebra course to any subject of mathematics (Harel, 1989; Dorier, 1998; Dorier, 2002). In addition, this difficulty can be associated with students' inexperience in proof, logic and set theory (Vinner, 1997; Dubinsky, 2000). However, the lecturers who teach the linear algebra course should show different perspectives for linear algebra teaching in line with the difficulties that the students have for this course (Dogan, 2018; Harel, 1989). In this context, it can be alleviated by using various tools to overcome students' difficulties with abstractions in the concepts required in linear algebra courses. Such tools stand out in different formats such as textbooks, notes or digital technology (Rensaa, Hogstad and Monaghan, 2019). Therefore, the resources that faculty members use for teaching linear algebra are of great importance for both themselves and students. In addition, it can be said that the usage of resources is shaped according to the environment in which the course is given. This environment can be in the classroom or on the digital platform.

The Covid-19 epidemic, which has left its mark in the 21st century, has deeply affected Turkey as it has in other countries. In this influence process, the education sector has also taken its place by switching to distance education. In this context, education and training in classroom environments from pre-school to university level have been transferred to the digital environment. Educators have tried to reach their target working groups through Google Meet, Google Classroom, Zoom, EBA, WhatsApp and social media groups as digital media. However, the books, notes and leaflets used by the educators for the study groups draw attention. More specifically, it is important to examine the resources prepared by a lecturer who teaches linear algebra in the digital environment. Adler (2000), who covers the concept of resource comprehensively, is anything that can contribute to the development of teachers such as a textbook, software, a student's worksheet, a discussion with a colleague, a conversation with a student. In this case, it can be said that the resources are divided into three as material curriculum resources (textbooks, digital curriculum resources, tablets, etc.), social resources (social media, communication with colleagues, etc.) and cognitive resources (frames used to work with teachers, etc.). (Isik Sarioglu, 2020, p.32). According to the documentational approach to didactics, resources are transformed into documents through a documentation process. In this context, it can be said that the documentational approach to didactics is built on two basic structures: the teacher's structuring the resource and the teacher's shaping the teaching practice. (Gueudet and Trouche, 2009). Teachers can make the resources suitable for their usage by interacting with the resources during the documentation process, or they can shape their usage according to the characteristics of a resource (Gueudet and Trouche, 2012). In addition, it has been determined that there are few studies on how these resources are collected within the framework of the didactic approach and how they are applied in the classroom and digital environments (Sabra, 2016; Tapan-Broutin, 2017; Basturk-Sahin and Tapan-Broutin, 2017; Pepin, Xu, Trouche and Wang, 2017; Besnier and Gueudet, 2016; Kock and Pepin, 2018; Gueudet and Pepin, 2018).

In the study of Tapan-Broutin (2017), mathematics teacher candidates' levels and reasons for using the internet, which is a meta-resource, in the process of preparing a secondary school level mathematics course both in their daily lives and in their professional lives, were examined within the framework of

the documentational approach to didactics. The mixed-method was used in the study. According to the research results, it was determined that teacher candidates frequently use the internet to meet their personal, social and professional needs. On the other hand, it has been concluded that the theoretical context is a fundamental factor in forming internet usage schemes. In their study, Kock and Pepin (2018) examined the resources used by first-year engineering students at a technical university in the Netherlands to learn mathematics and linear algebra. Using a case study, the researchers focused on how students used mathematics and linear algebra resources and how these practices were compared with their high school experience. According to the research results, it was determined that the students built on their secondary school experiences and imitated them in the university courses; in this context, some of them had difficulties later on. Another result of the research is that harmonizing course organization and curriculum materials with learning objectives impacted students' selection and resource usage. On the other hand, Pepin, Xu, Trouche, Wang (2017) used the documentational approach to didactics to explore the resource systems of three Chinese mathematics teachers to develop a deeper understanding of mathematics education expertise. The researchers reached three main conclusions: the importance of resources, the professional identity of expert teachers, and the development of expertise. When we look at the studies on the documentational approach to didactics in the literature, it is seen that the researches are generally conducted with teachers and teacher candidates. In this context, the study aims to reveal the elements of the schemes that emerged in preparing a linear algebra course document in the digital environment and the factors affecting this process of a faculty member teaching linear algebra at the faculty of education.

1.1. Research Problem

What are the elements of the schemes that emerged in preparing a linear algebra course document in the digital environment and the factors affecting this process of a lecturer in the faculty of education who teaches linear algebra?

1.2. Sub-problems

1) What is the schematic representation of the resource systems created by the lecturer for the linear algebra course?

2) How does the lecturer organize his/her resources in the linear algebra course before using them in the digital environment?

3) How does the lecturer use the linear algebra course documents s/he has prepared before in the digital environment?

4) How does the lecturer interpret the differences between the course documents s/he has prepared for the linear algebra course and the applications in the digital environment?

2. Method

In this study, the case study model, one of the qualitative research designs, was used. A case study is defined as an empirical research type that seeks answers to "how and why" questions specific to an actual situation under investigation and allows the researcher to collect rich data in depth (Yin, 2014). In the case studies, each context is handled with an in-depth, detailed and holistic perspective (Saban and Ersoy, 2016, p. 119).

2.1. Research participant

The purposeful sampling technique, one of the nonprobabilistic sampling techniques, was adopted in the study. Purposeful sampling is to select information-rich situations so that the research can be done in-depth, and it provides the opportunity to understand these information-rich situations in depth (Patton, 2014, p. 230). In this context, the participant of the case study is a lecturer who teaches linear algebra at the education faculty of a state university in the Marmara Region. In this research, professional experience, openness to sharing, volunteering and having been teaching linear algebra for at least five years of the teaching staff whose documentation creation process will be examined were

considered. It was considered important that the participant had 34 years of professional experience, had given a linear algebra course for one year in the faculty of science, two years in the faculty of engineering and seven years in the faculty of education, was open to sharing information about his/her resources and documentation creation processes, and volunteered to participate in the research. The reason why the professional experience of the faculty member participating in the study was considered important because the documentation creation process requires a long time. On the other hand, it was thought that the faculty member with more professional experience could have more resources and documents. Therefore, the schemes affecting documentation creation would be determined more clearly. It was considered important to be open to sharing information about the documentation creation process because it was thought that more and more accurate information would be reached in the meetings to be held. Parallel to the openness criterion of sharing, it was important that the participant volunteered to participate in the research, providing correct information during the interviews and expressing himself/herself comfortably. However, an individual examination was made on the lecturer in question, and his/her individual documentation was taken into account.

2.2. Data Collection Tools

Qualitative research brings along the data collection methods specific to the researcher's attitude. The researcher plans the process with the awareness that each situation has its characteristics, and therefore determines and applies the data collection methods from this point of view (Seggie and Bayyurt, 2015, p. 44). In the study, the reflective survey data analysis data collection method, which provides the opportunity to know the large collection created by the lecturer for linear algebra, and brings a reflective perspective, was adopted (Gueudet and Trouche, 2012). More than one data collection tool can increase the diversity of the data in the reflective survey data collection method. Parallel to this, as a data collection tool, linear algebra course teaching plan, course video recordings, clinical interviews and schematic representation of the resource system were collected. The purpose and operation of the study were explained by doing an initial interview with the participant faculty member. Immediately after, s/he was asked to create a schematic representation of the resource system, and a semi-structured interview was conducted. The data collection tools used in this process are described below.

Linear Algebra Lesson Teaching Plan

In the linear algebra course teaching plan, there are the code of the course, the type of the course, the level of the course, the year/semester in which the course is given, the credits of the course, the theoretical course hours, the language of the course, the way the course is given, the course coordinator, the contact information of the course coordinator, the purpose of the course, the contribution of the lesson to the professional development, course learning achievements, course content, course book, references and/or other resources, assessment, ECTS/workload table and the relationship between program qualifications and course learning achievements. However, it is seen that the linear algebra topics in the course content were divided into fourteen weeks. These topics were lesson introduction, matrix concept (week 1), matrix operations, primitive row and column operations (week 2), the rank of a matrix, the inverse of a square matrix (week 3), determinants (week 4 and 5), systems of linear equations (week 6 and 7), general review and midterm (week 8), vector spaces, subspaces (week 9), the space stretched by a cluster (week 10), linear dependence and linear independence (week 11), the base and dimension of a vector space (week 12), row and column spaces of a matrix (week 13) and general review (week 14).

Schematic Representation of the Resource System

It can be said that the schematic representation of the resource system allows the instructor to draw the general framework of the documentation system in his/her professional life. In this context, it was requested to make a schematic representation of the resource system to reveal the resources used by the lecturer while creating his/her documents, the way s/he classifies these resources and the selection criteria. A draft shape was not determined for the schematic representation of the resource system, and the lecturer needed to convey it as s/he created it in his/her mind.

Clinical Interview

A clinical interview was conducted with the participant lecturer to obtain information about the resources s/he used in the linear algebra course and get his/her views on the documentation usage and learn what s/he took into account while creating his/her documents. While preparing the clinical interview questions, experts' opinions in the field of mathematics education were taken.

Reviewing Video Recordings

The researcher examined the video recordings to determine the elements that may arise while applying the documents of the linear algebra course prepared by the participant lecturer in the digital environment. That may affect the documentation process.

2.3. Data Collection Process

In the study, the researcher first interviewed the faculty member, the participant of the study, to obtain information about the study. However, a week later, the researcher examined the resources that the lecturer would use or had used, and the researcher asked the lecturer for "The Schematic Representation of Resource System". In addition, at the same time, the researcher had a preliminary interview with the lecturer about the linear algebra course. On the other hand, video recordings were requested from the lecturer at the end of each lesson by the researcher a week later, and it was determined that this process lasted approximately two months. Immediately after the end of all linear algebra courses, the researcher conducted a clinical interview with the faculty member.

In Table 1 below, information is given about the application steps of the data collection tools in the reflective analysis.

Table 1. Data Collection Process

Meeting with the lecturer
Examining the resources of the lecturer and requesting the SRRS diagram from the lecturer (1 week later)
Preliminary interview about linear algebra course (within the same day)
Requesting video recordings from the lecturer at the end of each lesson (1 week later)
Conducting a clinical interview after all subjects of the course are finished (2 months later)

3. Data Analysis

In this study, which was conducted with a lecturer who taught linear algebra, the documentation creation processes of the lecturer were emphasized. The data were transcribed verbatim before being analyzed. Content analysis, one of the qualitative data analysis methods, was used to analyze the data collected afterward. Content analysis requires an in-depth analysis of the collected data and allows the revealing of previously unclear themes and dimensions (Yildirim and Simsek, 2011, p. 223). The data analyzed by the content analysis method were coded and categorized as suggested by Yildirim and Simsek (2011). The "Documentational Approach to Didactics" was used as a theoretical framework in examining the documentation creation process of the lecturer. In this context, the documentation creation process of the lecturer was examined within the framework of individual documentation creation. The points that the participant lecturer paid attention to during the documentation creation process and the factors affecting their documentation creation, the correlations noticed as a result of the interviews were determined and interpreted.

Credibility, Transferability, Consistency and Ethics

To increase the study's credibility, diversification was made in the data collection, and expert opinion was sought for the clinical interview questions made to the faculty member. However, the confirmation

of the lecturer was obtained after the data obtained from the interviews and the course video recordings were coded. Detailed descriptions were made to increase the transferability, and the data were presented without adding comments according to the themes revealed. To ensure consistency in the research, attention was paid to the fact that the lecturer was treated similarly (sincerely) in each interview. On the other hand, in terms of ethics, attention was paid to the fact that the identity of the lecturer was not stated in the study in any way.

4. Findings and Discussion

In this part of the research, the findings and interpretations of each sub-problem are explained in detail.

Schematic Representation of the Resource System

In the research, the findings and interpretations of the first sub-problem, "What is the schematic representation of the resource system created by the lecturer for the linear algebra course? ", for the lecturer are explained below.

To determine the resource systems for the linear algebra course of the lecturer, firstly, the schematic representation of the resource system (SRRS) was requested from him/her. In Figure 2, the schematic representation of the faculty member's resource system is given.

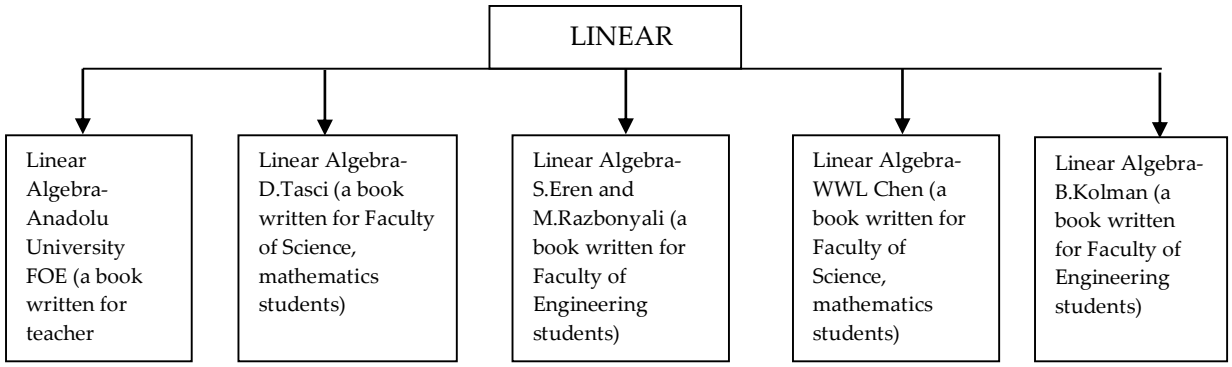

Figure 2. SRRS diagram of the lecturer

The lecturer indicated the resources that s/he usually used in the linear algebra course in his/her drawing. It is seen that there are five resources, one of which is a book written for teacher candidates, two for science faculty mathematics students, and the other two for engineering faculty. It is seen that Anadolu University's book is the Linear Algebra book (a book written for teacher candidates) that the lecturer referred to as the main resource. On the other hand, it was determined that the frequency of using the resources by the lecturer was as stated in the schematic representation. The lecturer stated that the same schematic representation of the resource system was valid in the face-to-face education process.

The lecturer compared the content of the linear algebra course given in other faculties. It was determined that s/he found the linear algebra course taught in the faculty of science and literature close to the faculty of education.

"They were trying to give theorem-proof, in linear algebra in 4+4 format, four hours in the first semester and four hours in the second semester in the faculty of science and literature. So let me tell you, when I was there, it's too hard for me. Was it necessary? It is discussed. When we talk about the engineering faculty, when we look at the event, if we give the logic in the subject that we give to the teacher candidates there, it will remain inconvenient there. We were trying to give where and how to use it. Apart from that, linear algebra is the same main topic in the faculties of administrative sciences, but our solution examples are very different as it must be. As far as I have studied, I cannot give this to teacher candidates. I can't give engineering examples either. Again, it may be the closest science faculty examples, but there is a lot of theoretical parts in the sense that it remains in theory."

When the statements of the lecturer are examined, it can be said that the linear algebra course taught in the faculties of engineering, the faculties of administrative sciences and the faculties of science and literature has a more complex structure than the linear algebra course taught in the faculties of education. For this reason, it can be said that the sample solutions for the linear algebra course in these faculties are almost not suitable for the faculty of education. Therefore, these faculties can be expressed as more theoretically based than education faculties.

Organization of Linear Algebra Course

In the research, the findings and interpretations of the second sub-problem, "How does the lecturer organize his/her resources in the linear algebra course before using them in the digital environment?", for the lecturer are explained below.

When Figure 2 is examined, the framework of the resources used by the lecturer in the linear algebra course can be seen. In this context, the researcher determined that the main resource and supplementary resources were used together. Instead of directly reflecting these resources as pdf in the digital environment, the lecturer prepared his/her PowerPoint presentation and transferred it to his/her students. In addition, while transferring the resources used by the lecturer in his/her linear course during the face-to-face education process, it is seen that s/he transferred these resources to the digital environment during the pandemic period, and s/he explained how s/he arranged these resources before using them in the digital environment:

"I didn't have any order other than the order I had done in the previous years. Moving to the digital environment instead of just the blackboard was also to digitize the documents I wrote on the blackboard in the classroom environment from a few resources, not a previously written resource. When we look at what is different from what I did on the board, I also paid attention to the fact that each environment and each data were shown one by one in the digital environment since there are transitions between books in terms of definition or application, and how each step would be and from what these steps might have resulted. I tried to convey to my students that they could produce solutions in the digital environment as if writing one by one on the board. So in this sense, I don't think there is a serious change in terms of the resources offered by a different digital environment. Just so, I wonder if people we haven't seen asked me questions, what would I answer, what could be the contribution, maybe more additional parts may have appeared while moving to the digital environment. But, as I said, since it is a lesson I have been teaching for years, I tried to transfer the questions that may arise from my past experiences to digital media according to that type of flow diagram by re-planning the questions that may arise from my past experiences, they can understand what they did not understand more easily if I expressed them."

The lecturer always used the blackboard in his/her thirty-four years of professional experience and faced teaching in the digital environment for the first time during the pandemic period. In this situation, it is seen that the lecturer had some difficulties in arranging the resources to be used in the digital environment for the linear algebra course. It can be said that one of the difficulties in question was to transfer the examples related to the course to PowerPoint.

"Of course, PowerPoint and equations take a long time; the most important things of linear algebra are abstract concepts, matrices. At least if I show this to the children as a picture, I can't do the flows very well. As a general structure, after the first week, I set up equations myself and tried to do it by writing and making them appear one by one; it took quite a long time. In other words, I prepared the lecture notes for an only two-hour lesson, for almost three or four days, compared to the fact that I was tired when I normally gave hourly lectures on the board. So I spent three or four days for a lesson."

The main factor in selecting resources for the lecturer's linear algebra course was the fact that it had a simple language. On the contrary, the fact that the resource had a complex and difficult language was considered from the lecturer's perspective, so the possibility of students breaking away from the course and developing a phobia about the course was also considered. However, it can be said that the lecturer preferred the Anadolu University Faculty of Open Education book, which s/he recommended to his/her

students and stated as the main resource, due to the ease of access and the limited time of the course. The lecturer stated this situation in the following words:

"It is a linear algebra book written only for teacher candidates, and there is no problem accessing open education resources since it was completed and finished a year before. In other words, it does not need to be accessed by an illegal method; it is a resource that they can see directly when searched in Google. I know that they can but other books, but I chose this main resource because it is more suitable for a two or three-hour linear algebra course for teacher candidates, not just a four-hour linear algebra course. Well, I used this resource as the main resource because other resources were a bit more theory-heavy, namely, contents that I thought would be a little difficult for our teacher candidates. I chose the others as supplementary resources."

It is seen below that the lecturer used matrices, which is a sub-topic of the linear algebra course, from the Anadolu University FOE resource book.

Figure 3. Lesson 1, PowerPoint presentation, p.7

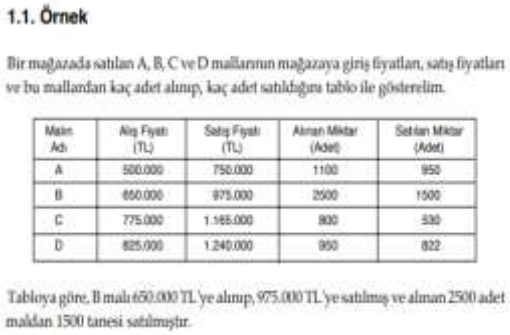

Figure 4. Anadolu University FOE, p.3

On the other hand, it is seen that the lecturer also referred to supplementary resources other than the main resource. S/he expressed this in the following words:

"The examples of open education were sometimes not satisfying for me, so I used the supplementary resources for solving examples rather than the lecture."

The lecturer stated that s/he had used the resources indicated in the schematic representation of the resource system since 2018. This was because the linear algebra curriculum changed three years ago. Curriculum change was not meant in the context of acquisition and content, but it is seen that it is related to the number of hours of the course. In other words, it is determined that the three-hour linear algebra course has been reduced to two hours. Thus, it is thought that the decrease in the number, of course, hours of the linear algebra course may affect the choice of the resource system of the lecturer.

Using of Linear Algebra Course Documents

In the research, the findings and interpretations of the third sub-problem, "How does the lecturer use the linear algebra course documents s/he has prepared before in the digital environment?", for the lecturer are explained below.

S/he stated that the examples used by him/her in the linear algebra course were written directly from the resources mentioned above and the examples s/he had created by himself. It can be said that the lecturer created a document based on his/her experiences.

"In other words, I indeed said it would be better if I gave this example instead of giving that example as a resource of my experience, and I made similar examples. As I said, there were examples that I have taken from other resources, as well as examples that I had produced."

It is seen that the lecturer listed the resources that s/he stated in the resource system in order of importance from left to right. However, the lecturer stated that s/he used the mentioned resources in all

subjects of the linear algebra course and the reason for preferring the supplementary resources other than the main resource with the following words:

"As I said as the main theme, the resource written by the faculty of open education consisted of a simple but understandable definition and theorem. I tried to bring the definitions and theorems from there and examples from various resources because the examples of the open education system were sometimes not satisfactory for me, so I used the supplementary resources more for solving examples than for the explanation of the subject."

It is understood that the importance given by the faculty member to choosing the mentioned resources for the linear algebra course was that the students encountered many examples of solutions and that it was an open education resource on a rich basis in line with the content and achievements of the course, while other resources played the role of reinforcement.

"As I said, it is important that the student can solve more examples because we are both in distance education period and I think that it is necessary to make examples frequently to determine how much the subject is understood or not. The resources were linear algebra books, one of which was for teacher candidates, two of which were taught in the faculty of science, both abroad and domestically, and two of which were taught in the faculty of engineering. In other words, there were many other books written for linear algebra teacher candidates. Still, they were very limited, in terms of content, the most satisfying sub-base was the open education resource, and of course, they were complementary factors for me in terms of examples in other books."

In the distant education process, it is thought that the digital environment impacts the teaching staff to create their documents. It can be said that while creating the documents by the lecturer, it can be said that s/he prepared his/her documents by considering what kind of questions the students asked about linear algebra subjects and which parts of the subjects they could not comprehend. This situation is stated below:

It was not easy. I knew "What kind of questions were asked in the class?", "What did the children not understand?" and, "Could I have asked them again in the digital environment as feedback?" since I had been teaching this course for years. When I prepared for them as if I was going to be asked, I saw that I was filling the gaps."

In the linear algebra course videos watched by the researcher, it was determined that the lecturer had quizzes at the end of each course. It can be said that the quizzes made at the end of the courses were an important document for the lecturer. In addition, it is seen that the existence of quizzes met the quality of homework.

"I was giving homework when I was teaching in class. But in the digital environment, I did a quiz every week. These were homework quizzes. In other words, I completed all the examples or evaluation questions about the subject that I explained in that lesson before, with quizzes at the end of the last lesson. There are quizzes that I do almost every week at the end of the lesson, sometimes in the middle of the lesson. Among those quizzes, its name remained quiz, but in fact, it was a short exam, but it tested whether the topic of the day was understood or not. That's why I didn't feel the need to give homework."

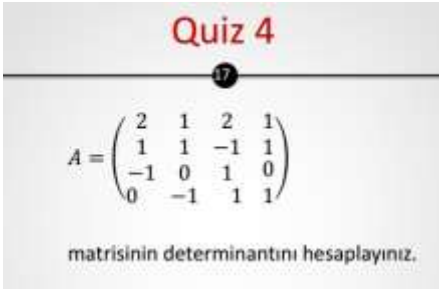

Figure 5. Lesson 5, PowerPoint presentation, p.17

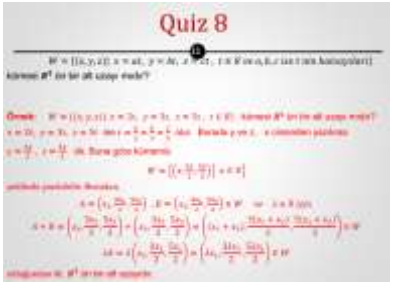

Figure 6. Lesson 9, PowerPoint presentation, p.11

Figure 5 and Figure 6 are the quizzes applied by the lecturer to his/her students. Although there is no clue in Quiz-4 in Figure 4, an example solution that students can benefit from has been identified in Quiz-8. This can be shown as a sign that the lecturer receives feedback through quizzes whether his/her students understand the subject of the day. In this context, it is thought that the lecturer is faced with the opportunity to edit his/her documents.

It is determined that there is a partial difference between the resources in the schematic representation of resource system by the lecturer in Figure 2 and the resources in the lesson teaching plan. This difference is because while there were five books (Linear Algebra-Anadolu University FOE. (book written for teacher candidates), Linear Algebra-D. Tasci (Faculty of Science, book written for mathematics students), Linear Algebra-S.Eren and M. Razbonyali (Faculty of Engineering book for students), Linear Algebra-WWL Chen (Faculty of Science book written for mathematics students), Linear Algebra B.Kolman (Faculty of Engineering book for students) in the schematic representation of resource system of the lecturer, there were three books (Linear Algebra-Anadolu University FOE-Mathematics Teaching, Linear Algebra-I- Hilmi Hacisalihoglu, Elementary Linear Algebra- Bernard Kolman) in the Linear Algebra curriculum. In addition, the resources that were common in both the schematic representation of resource system and the Linear Algebra course curriculum were Linear Algebra-Anadolu University FOE (A book written for teacher candidates) and Linear Algebra (B.Kolman). This difference is shown in Figure 7.

23	Coursebook, References and Other resources	Editor, Orhan OZER(1998), Matematik Öğretmenliği Lineer Cebir, Anadolu Üniversitesi Açık Öğretim Fakültesi Yayınları No:589 H.Hilmi Hacisalihoglu(2000) Lineer Cebir I. Hacisalihoglu Yayincilik Bernard Kolman(2004) Elementary Linear Algebra; Fifth Edition

Figure 7. Linear Algebra Curriculum, Textbook, References and/or Other Resources

The important point to note here is that the main resource was included in both the schematic representation and the lesson teaching plan. Still, when the supplementary resources are examined, it is seen that this situation differs. In the question asked by the researcher about this situation in the clinical interview, the lecturer explained this difference with the following statements.

"Unfortunately, we are preparing them a little fast; they want it urgently, there may be shortcomings."

It was determined that the lecturer transmitted sourcebooks and videos to his/her students through Classroom. On the other hand, the instructor asked the students to upload the answers to the quizzes made at the end of the course to the Classroom. In other words, it can be said that Classroom was the part where the resource system was collected for the lecturer.

Differences between Linear Algebra Course and the Applications in the Digital Environment

In the research, the findings and interpretations of the fourth sub-problem, "How does the lecturer interpret the differences between the course documents s/he has prepared for the linear algebra course and the applications in the digital environment?", for the lecturer are explained below.

The lecturer stated that there were no differences between the course documents prepared by the lecturer in advance and the applications in the digital environment and that the lecturer continued as planned. In addition, it was stated by the lecturer that there was a change in the order of topics in the resource, but no changes were made during the lectures of the course documents s/he had prepared. On the other hand, the lecturer stated that even if there were any operational errors in answering the questions in the resources, if the question was tried to be solved with the right method, s/he could continue with the mentioned resources. In this situation, it was determined that the lecturer paid attention to solving the question of the resource in determining the resource, even if s/he noticed the operation errors in the solved examples of the resource.

5. Conclusion and Discussion

This research analyzes the elements of the schemes that emerged in preparing a linear algebra course documentation in the digital environment and the factors affecting this process of a lecturer who teaches linear algebra in the faculty of education. When the documentation creation process of the lecturer was examined, in addition to the elements related to the schemes that emerged during the documentation creation process of the lecturer, the factors affecting the documentation creation process were also determined. Elements related to the schemes that emerged in the documentation creation process as a result of the study are determined as the fact that the achievements of the linear algebra curriculum are applied in a different order, the language of the selected resources is simple, the lessons are in the form of definition-theorem-example solution-quiz, the lecturer creates his/her own examples on the subject, the digital media resource is Google Meet, the resources and videos are shared in the classroom. It is concluded that other factors besides the elements related to the lecturer's schemes affect the documentation creation process. Factors that affect the faculty member on the documentation creation process are

- student-based,
- lecturer-based,
- mathematical concepts-based and
- teaching environment-based factors.

The lecturer paid attention to a simple language in the selection of resources for the linear algebra course. Due to the abstract nature of this course, it is observed that the faculty members do not want the students to experience additional difficulties in terms of the intelligibility of the course. In this context, it can be concluded that the personal resources and attitudes of the lecturer affect the documentation systems. In this case, it is determined that similar results were obtained in the study of Gueduet (2016).

It is seen that the lecturer drew attention to the concepts of mathematics while teaching, made students see different examples, and gave place to quizzes related to the subject being taught. In addition, the documents prepared by the lecturer for the digital environment were planned by considering the basic questions s/he encountered in the classroom, depending on his/her experiences in the past years. Isik-Sarioglu (2020) concludes that teachers are influenced by their experiences with students while preparing a learning environment. This result of Işik-Sarıoglu (2020) supports the research result.

As another result of the study, it can be said that the lecturer preferred to teach the linear algebra course with the course resources on the internet compared to the concrete material textbooks. It was determined that the lecturer used the course resource on the internet for the main resource. In this context, Tapan-Broutin (2017) emphasized the importance of using resources on the internet in his study. In addition, it was concluded that the lecturer used resource books. This situation is similar to the study of Kocaoğlu-Er, Yıldız, and Tapan-Broutin (2019).

Another important result of the research is the lack of cooperation between the faculty members who teach linear algebra in other universities and the curriculum and resource sharing. Similarly, in the study of Gueduet (2017), the fact that university lecturers do not share their own uniquely designed resources with other colleagues is parallel to the study at hand. However, it is thought that if the faculty members share their resources, their colleagues can create fluctuations in the documentation process.

As another result of the study, it is concluded that the lecturer faced some difficulties in presenting the linear algebra course in the digital environment. In this case, it can be said that the personal background and experiences of the lecturer, his/her knowledge and beliefs about linear algebra, his/her teaching practices and tendency towards digital competence were effective. S/he gave the linear algebra course over Google Meet, the digital environment determined by the faculty member institution. This result is in line with the conclusion in the study of Trouche, Gitirana, Miyakawa, Pepin, and Wang (2019) that

teachers' documentation systems are within the framework of the facilities and rules of the institution they work for.

The elements of the schemes that emerged during the documentation creation process were compared with the previous studies. It can be said that concretization in concepts within the scope of the course is parallel to the findings obtained in the studies of Basturk (2015) and Balkan (2018). Isbilir, Tapan-Broutin and Ilkorucu (2019) found that the teacher in their study did not depend on a single resource but also benefited from the supplementary resources. Similarly, in this study, it is determined that the faculty member did not work with a single main resource and benefitted from the supplementary resources.

6. Recommendations

In this study, the documentation process of a lecturer who teaches linear algebra at a state university was examined. The documentation creation process can be examined based on a different course. Also, the differences and similarities in the documentation process of two faculty members teaching the same course at different state universities can be examined. Based on the documentational studies of the lecturers about the resource books, it is recommended to research the factors affecting the selection of a resource book and how the lecturers use this resource book.

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