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Research Paper

Social Network Usage Related to Science Learning Approaches: Instagram

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ABSTRACT

This study aimed to determine the opinions of science teacher candidates about their experiences in the process by examining the effect of using Instagram in online learning environments on the sense of community. The study involved 41 teacher candidates, 21 in the experimental group and 20 in the control group. Convergent parallel design, one of the mixed-method designs that quantitative and qualitative research methods, was used in the study. The "Community Feeling Scale in Online Environments", "Structured interview form" and "Teacher candidates' diaries" were used for the data collection. Descriptive statistics and independent groups t-test methods were used for the analysis of the quantitative data and content analysis technique was used for the qualitative data. The quantitative findings revealed a significant difference in favour of the experimental group in the post-test scores of the teacher candidates between the experimental and control groups. It has been concluded that the use of Instagram in the learning environment has a positive effect on the sense of community in online learning so that teacher candidates can communicate with each other and with the instructor. According to the qualitative findings, the teacher candidates stated that the quality of these posts is guiding, clear, and precise. They stated that the posts enhanced the intelligibility, made the learning easier, and guided the process. In conclusion, it has been revealed with quantitative and qualitative findings that the posts related to various approaches used in science teaching using Instagram support the sense of community in online learning environments of science teacher candidates.

INTRODUCTION

Covid-19 (New Type Coronavirus), which emerged in Wuhan, China in December 2019, spread to the world in a short time. For this reason, it was declared a pandemic by the World Health Organization in March 2020. In order to contain the spread of the epidemic, most governments around the world (143 countries) have had to temporarily close their educational institutions to face-to-face education (United Nations Educational, Scientific and Cultural Organization UNESCO, 2020).

After the first case was confirmed in Turkey on March 10, 2020, with the decision of the Higher Education Council (YÖK, 2020), schools were suspended on March 13, and a week later on March 23, 2020, the distance education process was started. In the face of the crisis caused by the Covid-19 epidemic, universities that normally provide formal education started to work quickly and tried to adapt to distance education urgently (Keskin & Özer, 2020). The concept of emergency distance education became widespread during the Covid-19 pandemic. The concept of "emergency distance education" was used for distance education activities carried out during the epidemic and crisis. This process is kept separate from the traditional distance education process (Smith, 2020).

During the epidemic, the compulsory transition to distance education caused a further decrease in the participation and motivation levels of the students. Various studies have shown that students' motivation, interest, and participation levels are low during this period (Mohan, McCoy, Carroll, Mihut, Lyons and Domhnaill, 2020; Yılmaz, Güner, Mutlu, Doğanay & Yılmaz, 2020). During the epidemic period, students who could not have a working environment stated that they were affected by the noise at home and had difficulty concentrating because they could not interact with the instructors (Türküresin, 2020). It has caused a further decrease in the participation and motivation levels of the students in the compulsory emergency distance education process. In online learning environments, the learner's lack of interaction with other learners and the teacher causes motivation problems in the learner. Students feel isolated when they lack interaction with other students and the teacher (Morgan & Tam, 1999). In addition, it has been determined that teacher candidates who have the skills to use information and communication technologies have higher motivation for online lessons (Cakir, Karademir and Erdogdu, 2018).

As a result of physical distance in the distance education process, the decrease in the student's sense of belonging to the learning environment brings an increase in the feeling of exclusion. When it comes to online learning environments, it has been determined that one of the most common complaints of students is the feeling of isolation from other students (Morgan & Tam, 1999). The motivation levels of the students who feel isolated from the learning environment also decrease. Motivation and performance are positively affected when students feel like part of a learning community rather than interacting with technology (Haar, 2018). Students need online learning communities where they feel in touch with other students and teachers, support each other and create

a sense of community.

The sense of community directly affects the participation performance of students in distance learning activities and students with a low sense of community were observed to have low participation in learning activities (Ilgaz & Aşkar, 2009). Rovai (2002b) mentioned 7 elements to create a sense of community in online lessons which are transactional distance, social presence, social equity, small group activities, group management, teaching style and learning process, and community dimension. It is stated that when these elements are provided, a sense of community can be created in online learning and if it is maintained, permanence and satisfaction in learning can be achieved.

Although physical distance in distance education causes a decrease in the sense of commitment among students, it is possible to create and maintain a sense of community thanks to information and communication technologies. Various tools (such as chat, audio, whiteboard, application sharing, screen marking, and voting) play an important role in interaction, participation and collaboration because the fact that the teacher and the student are in separate physical spaces (Clark & Kwinn, 2007; Kear, Chetwynd, Williams and Donelan, 2012). Because, in order for permanent learning to take place in students, continuous interaction must be ensured between student-teacher, student-student, student-course material, and teacher-parent (Özgür, 2005; Tuovinen, 2000).

When the annual reports of 189 universities regarding the distance education activities carried out during the COVID-19 pandemic are examined, Zoom (17%) was the first among the simultaneous teaching environments used by the universities, Microsoft Teams was the second (16%), followed by Adobe Connect (14%) and Perculus (14%) (Yavuz, Kayalı, Balat & Karaman, 2020). In simultaneous lessons, students and instructors had problems entering the environment at the same time, and could not attend the lessons, and therefore, a productive lesson environment was not achieved. In addition, in archived lessons, there were some problems such as audio and picture motion asynchrony in video recordings, deletion of course recordings due to insufficient storage space, and students who entered the system at the same time during the exam were disconnected from the environment. With the increase in the interaction established in distance education, the sense of community in online environments can be improved. Haar (2018) states that it is necessary to use approaches that would attract students' attention and encourage learning and give feedback.

In addition to the interactive tools offered by the learning management systems used in the distance education process, there are Web 2.0 tools in which teachers and learners can easily communicate and share content. Web 2.0 tools improve communication between users and enable easy sharing of content (Thompson, 2007). Web 2.0 tools give students the chance to create, change and control content and socialize with each other during the lessons. Thus, the presence of students and their interaction with each other increase (Altıok, Yükseltürk & Üçgül 2017).

Instagram, one of the most widely used Web 2.0 tools by individuals under the age of 35 today, allows sharing of photos, videos and stories (Hu, Manikonda & Kambhampati, 2014). Phillips (2013) stated that Instagram supports communication between students and teachers in and out of the classroom, provides a learning experience, and develops cooperation between students through the photo or videos sent (Manca, 2020). It has been stated that the use of Instagram increases students' participation in classroom activities and their motivation for learning (Purnama, 2018). Web 2.0 tools support interaction and offer formal and informal learning opportunities to new-generation students (Junco 2014; Siemens & Weller, 2011).

The use of Instagram in educational environments can positively affect teachers' pedagogical knowledge, content knowledge, self-efficacy and learners' learning outcomes. Rovai (2002a) stated that educators should find ways to create and increase the sense of community in distance education environments. In this study, Instagram, one of the most frequently used social networks by young people, was used as a learning environment. Science teacher candidates developed content on various approaches used in teaching science individually and in small groups. Community members, who are teacher candidates, shared the activities they prepared every week on Instagram. Student-content, teacher-student and student-student interaction was ensured in the materials shared on Instagram. Furthermore, the instructor shared the course content, activity preparation instructions and evaluation criteria every week. In this study, the interaction was managed by sharing individual and small group activities related to various approaches used in science teaching, using Instagram, one of the social networking applications. The aim of this study was to determine the effect of using Instagram in online learning environments on the sense of community of science teacher candidates. Furthermore, it was also aimed in this study to determine the opinions of teacher candidates about their experiences in the process. Therefore, the following study questions were identified.

1. Is there a significant difference between the online learning sense of community scores of the teacher candidates who use the online learning environment supported by Instagram posts and the teacher candidates who use the online learning environment without the use of Instagram?
2. What are the opinions of the teacher candidates about the various approaches used in science teaching by preparing examples of activities and sharing them on Instagram?

METHOD

In this study, a convergent parallel design from mixed-method designs was used to examine the effect of learning environments supported by the posts related to various approaches used in science teaching using Instagram on the sense of community in online learning environments of science teacher candidates, and to determine their views on their experiences in the process. Mixed

methods research is a type of research in which the researcher or researchers combine the components of qualitative and quantitative methods to increase the breadth and depth of the study (Creswell & Plano-Clark, 2011). The convergent parallel design is formed by the simultaneous application of qualitative and quantitative phases in one phase of the study process. This pattern gives equal priority to the methods, keeps these stages separate during analysis, and then combines the results for overall interpretation (Creswell & Plano-Clark, 2011). In this study, Instagram was used for teacher candidates to communicate with each other through posts. It was aimed to collect more detailed data by using quantitative and qualitative data collection tools together to determine the motivations, sense of community, and views of teacher candidates in this process. Therefore, although quantitative and qualitative data were collected simultaneously by the nature of the mixed method, they were analysed separately and combined in the interpretation stage. In this study, Instagram was used for teacher candidates to communicate with each other by making posts. To examine the effect of Instagram use on the sense of community in online learning environments, a quasi-experimental design with a post-test control group was used. The primary purpose of experimental designs is to test the cause-effect relationship between the variables (Büyüköztürk, Çakmak, Akgün, Karadeniz, & Demirel, 2008). In studies, it is stated that the post-test control group design can be used in cases where the application of the pre-test is not possible or unnecessary (Karasar, 2016). In this study, pre-testing was not considered necessary since the online learning sense of community would develop during the process.

Participants

The study was carried out with 41 teacher candidates, 21 in the experimental group and 20 in the control group, who were studying in year 3 of Science Teaching at a state university in the 2020-2021 and 2021-2022 academic year and took the Science Teaching Course. The study group was determined by purposive sampling. A purposive sample consists of individuals who are consciously selected and have experience with the main phenomenon or key concept of the study (Creswell & Plano-Clark, 2011). In the determination of the experimental group, in line with the purpose of the study, the "Science Teaching" course was chosen, a course in which teacher candidates can learn the approaches used in science teaching and design practical activities related to these approaches in the classroom. In addition, it is important that teacher candidates have knowledge about the aims of science teaching, the arrangement of learning environments in science teaching, and communication technologies through the various courses they take. An interview form and teacher candidates' diaries were used in this study to determine the opinions of 21 teacher candidates in the experimental group to evaluate the effectiveness of the use of Instagram in the online learning environment.

Data Collection Tools

In the study, "Community Feeling Scale in Online Environments" scales were used to collect quantitative data. In the collection of qualitative data, “structured interview form” and “teacher candidate diaries” prepared by the researchers were used. Detailed information about data collection tools is given below**.**

Community Sense Scale in Online Environments

Within the scope of the quantitative dimension of the study, the "Community Feeling Scale in Online Environments" developed by Randolph and Crawford (2013) and adapted into Turkish by Yıldız (2018) was used to determine the level of community feeling of teacher candidates in online environments. The scale has 4 dimensions and is in a 6-point Likert type, consisting of 14 items in total, including 3 items on instructor interaction, 3 items on courtesy and respect, 4 items on learning-teaching styles suitability, and 4 items on student cooperation. The Cronbach Alpha value, examined to determine the reliability of the scale, was 0.84.

Structured Interview Form

Within the scope of the qualitative dimension of the study, a structured interview form consisting of 4 open-ended questions prepared by the researchers was used. During the preparation of the interview form, the literature was examined and interview questions that could be asked within the scope of the study were determined. To ensure the internal validity of the interview questions, expert opinion was taken from the field of Educational Technologies and Science Education. In line with the expert opinions, the appropriateness of the interview questions for the study purpose was examined and necessary arrangements were made. The interview questions in the form are given below:

1. How do you evaluate posts on Instagram in the teaching of the subject "Approaches used in teaching science"? (Social presence, social equality)
2. Evaluate the use of Instagram in teaching the subject of "approaches used in teaching science" in terms of students, teachers, and the learning-teaching process. (Transactional distance, community size, group management)
3. How do you evaluate the posts of the activity examples that you have prepared individually or with a group regarding the approaches used in science teaching on Instagram? Evaluate in terms of contributions it provides/does not provide. (Group activities, group management)
4. Evaluate the examples of activities that you have prepared and examined regarding the approaches used in science teaching? For each activity example you have prepared and examined (Project-Based Learning Approach, Problem-Based Learning Approach, Inquiry-Based Learning Approach, Argumentation-Based Learning Approach and STEM Approach), please state your opinion by considering the following items (Teaching Style and Learning Process)
    - Preparation phase
    - Instagram posts phase
    - Review phase on Instagram

Teacher Candidate Diaries

Within the scope of the qualitative dimension of the study, teacher candidates' diaries were used to examine their experiences in the process. By examining the relevant literature, daily guidelines that are suitable for the study and that can be used effectively and efficiently have been prepared. The teacher candidates' diaries were regularly filled by the teacher candidates after the posting was completed for each approach used in science teaching. Evaluating the process in terms of themselves and their friends, teacher candidates were expected to write their experiences and evaluations about the process in their diaries in line with the instructions given. In addition, diaries were used in the study for data diversity. Below are the daily guidelines:

- Write down what you learned in the process of defining each approach, its features and its use in science teaching.
- Write down what you learned during the preparation of your activity example for each approach.
- Write down your evaluations about the use of social networks in the teaching of each approach.
- Could you prepare your activity example differently? Please explain. (When you examine the activity examples of your other friends after sharing, are there any shortcomings you noticed?)
- Is there a difference between your initial thoughts and your thoughts (after sharing and reviews are done) at the end of the process? Please explain.
- Write down your thoughts about the instructor's posts during the process.
- Did the process make any contributions to you and did you encounter any difficulties during the process? Please explain.
- If you have any suggestions regarding the process, write them.

Implementation and Data Collection Process

The implementation process of the study was carried out with the teacher candidates of the Science Education Department who took the Science Education Courses in the 2020-2021 and 2021-2022 academic years. Instagram was used in the 2020-2021 academic year to ensure interaction in the learning environment in the experimental group, while Instagram was not used in the 2021-2022 academic year. Due to the limited number of students taking the Science Teaching course and to keep the experimental conditions fixed, the application process of the experimental and control groups in the study was carried out in the academic year following each other. Lessons in both groups were conducted online. The same topics were determined for the groups within the scope of the same lesson and a weekly program was created.

Due to the COVID-19 pandemic that affected the whole world, face-to-face education in learning institutions was substituted with distance education. University students attending higher education institutions continued their online education at home simultaneously and asynchronously through the learning management system. Instagram, one of the most preferred social networks of young people, was used in this study in order to enable teacher candidates in the experimental group to interact with each other and with the instructor during the pandemic. The reason for using Instagram, where teacher candidates could develop social content, is that it can meet the seven elements specified by Rovai (2002b) to create a sense of community in online lessons.
The implementation process of the experimental group of the study lasted for a total of 12 weeks. In the first week, teacher candidates were informed about the study. Teacher candidates were informed about the basic concepts to be examined within the scope of the study. Application examples regarding the use of Instagram in learning environments were presented. Visual design principles to be considered regarding educational posts on Instagram were given.

Within the scope of the study, the applications of "Project-Based Learning", "Problem-Based Learning", "Inquiry-Based Learning", "Argumentation-Based Learning" and "STEM" approaches used in science education were carried out in 2 weeks (between the 2nd and 11th weeks). In line with this, the definition of each approach, its importance in terms of science education, its applicability in science education, its advantages-limitations, and examples that can be used in science lessons related to this approach were shared by the instructor for each approach through the Learning Management System. When each approach was completed, the teacher candidates designed activities that could be applied in the classroom by the attainments they chose at the 5th, 6th, 7th, and 8th grades from the Science Curriculum (2018) regarding this approach, and by the student level. To design the activities, they considered the course content, activity preparation instructions, and evaluation criteria shared by the instructor. Teacher candidates shared the activities they designed in line with the approaches determined weekly in the course content on Instagram. Teacher candidates prepared their activities individually or in small groups within the framework of the determined program. Teacher candidates and instructors presented their opinions and suggestions about the shared activities on Instagram. A discussion environment was created with the interaction provided through the learning environment on Instagram. After the posts and discussions about each approach were completed, the teacher candidates were asked to fill in their diaries in order to reflect on their feelings about the process. During the implementation process, the posts by the instructors and teacher candidates were done on Instagram. After the practices were completed, the "Community Feeling Scale in Online Environments" and a structured interview form were applied to teacher candidates in the 12th week. Both measurement tools were applied simultaneously at the end of the study. Taking into account the distance education process in the application of the measurement tools, the forms prepared for the teacher candidates were sent to the Instagram groups and the data were collected. After the forms were shared, teacher candidates were given one day to fill out the forms.

Instagram was not used in the control group of the study. The application process of the study for the control group took a total of 12 weeks. In the first week, the control group was given information about the lesson, and the course content was shared with them.

In the first week, the presentation of the course and the sharing of the course content were carried out. Each of the "Project-Based Learning", "Problem-Based Learning", "Inquiry-Based Learning", "Argumentation-Based Learning" and "STEM" approaches used in science education were carried out for 2 weeks between the 2nd and 11th weeks. In line with this, the definition of each approach, its importance in terms of science education, its applicability in science education, its advantages-limitations, and examples that can be used in science lessons related to this approach were shared by the instructor for each approach through the Learning Management System. Teacher candidates uploaded the activity examples they prepared for these approaches individually through the Learning Management System. The instructor also conveyed his/her views and suggestions regarding the uploaded activities to the relevant student via the Learning Management System in the form of an individual message. After the practices were completed, the "Community Feeling Scale in Online Environments" was applied to the teacher candidates in the 12th week.

Analysis of Data

In the quantitative aspect of the study, the different statistics between independent group means were used to examine the effect of the practices on the teacher candidates' sense of community in online environments. The "Community Feeling Scale in Online Environments" was applied to the groups as a post-test in collecting the study data. Büyüköztürk (2009) recommends using the "Kolmogorov-Smirnov" test when the participant number is 50 and above, and the "Shapiro-Wilk" test if it is below 50, in examining the normality of the distribution.

Table 1. Normality test results

	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	sd	p	Statistic	sd	p
Experimental Group	0,12	21	0,20	0,96	21	0,57
Control Group	0,14	20	0,20	0,95	20	0,33

The fact that the significance level in Table 1 is greater than 0.05, which is considered statistical significance in the study, indicates that the data in the sample are statistically normally distributed. Furthermore, the skewness coefficient was found to be between -1, and +1 and the mean, median and mode values were close to each other. Normality assumptions indicate that the data obtained in the study can be evaluated with parametric tests. Therefore, the "independent group t-test" was used to determine whether there was a significant difference between the groups.

In the qualitative aspect of the study, the content analysis technique was used for the structured interview forms and teacher candidate diaries. It aimed to reach concepts and relationships that could explain the data collected in content analysis. The collected data should be conceptualized first, and then the emerging concepts should be organized logically. In this direction, similar data were brought together within the framework of certain concepts and themes and interpreted in a way that the reader could understand (Yıldırım and Şimşek, 2018). The qualitative data obtained within the scope of content analysis were organized and interpreted according to the themes determined by taking expert opinions and supported by direct quotations. The consistency of the codes used by the researchers independently from each other was determined as "Agreement" or "Disagreement". The cases where the same code was used regarding the statements of the teacher candidates were evaluated as consensus, and the cases where different codes were used were considered as disagreements. Codings in which the researchers disagreed were included in the reliability calculation. Accordingly, coder reliability was found to be 88% using the formula [Consensus / (Agreement + Disagreement) x 100] (Miles & Huberman, 1994; Baltacı, 2017). The result obtained was accepted as reliable for the study. In addition, to increase the reliability of the study, structured interview forms and teacher-candidate diaries were used by making use of data diversity.

To ensure equivalence in the groups, the study was controlled in terms of variables that would not be evaluated (age, gender, academic average per term, number of students). It was determined whether the groups were equivalent in terms of these variables. Accordingly, the ages of the teacher candidates in both groups were found to be mostly between 20-22 and the numbers of female and male teacher candidates were close to each other. There was also no difference between the university entrance scoring types of teacher candidates in both groups. When the general academic mean scores for the term of the teacher candidates in the groups were examined, no significant difference was found in terms of the term general academic mean scores of the experimental and control group students before the application as per the independent group t-test results [t(39)=-0,99 p>,05].

FINDINGS

In this section, in line with the purposes of the study, first of all, the effect of using Instagram in online learning environments on the sense of community was determined, and then, examples of activities related to various approaches used in science teaching were prepared and the views of teacher candidates on posts on Instagram were presented. Qualitative and quantitative findings were tabulated and interpreted.

Quantitative Findings

Findings Regarding the Feeling of Community in Online Learning Environments

The descriptive statistics of science teacher candidates' sense of community in online learning environments and the independent group t-test results are given in Table 2.

Table 2. Independent group's t-test results regarding the post-test scores of the online community feeling scale of teacher candidates in the experimental and control groups

Variable	Groups	n	$\bar{X}$	ss	t	Sd	p
Community Feeling in Online Environment	Experimental	21	71,33	5,63	-2,18	39	0,03
	Control	20	66,55	8,21			

As per Table 2, a significant difference was found in favor of the experimental group between the independent group t-test results and the mean scores of science teacher candidates in the experimental and control groups regarding the sense of community in online environments [t(39)=-2.18 p<, 05].

Qualitative Findings

The use of Instagram in the teaching of approaches used in teaching science, in line with the written opinions and diaries of the teacher candidates, was evaluated in terms of the posts of teacher candidates and instructors. In addition, the views of the teacher candidates were supported by examples.

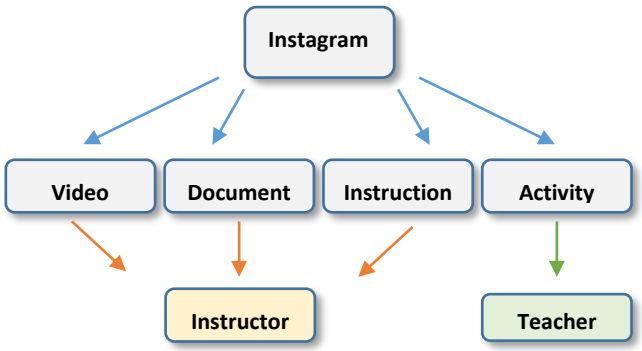

Figure 1. Theme and codes for Instagram posts

In this process, while the instructor shared videos, documents and instructions, teacher candidates shared activity examples related to approaches used in science teaching.

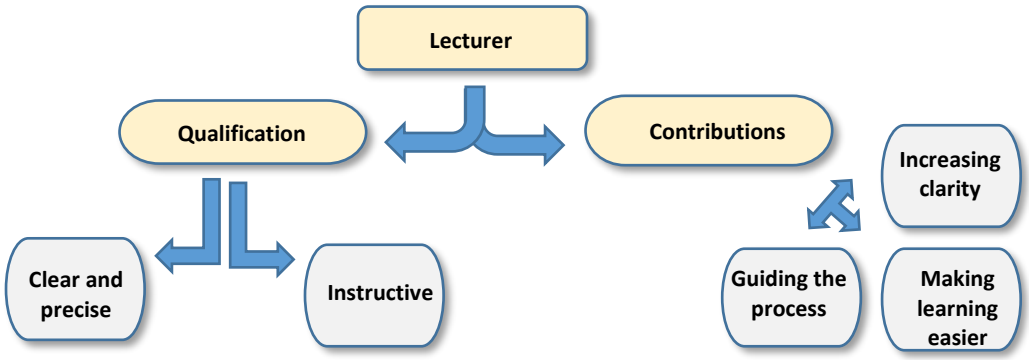

Figure 2. Theme and codes for instructor posts

The teacher candidates stated that the instructor's posts were instructive, clear, and precise regarding the quality of the posts. They also stated that the posts increased clarity, make learning easier, and guided the process. Examples of opinions of teacher candidates are given below.

The instructor is in the position of a good guide to the students, as she can reach everyone while giving instructions and can easily give feedback on the questions and opinions of the students (T14). (Written Opinion)

With the documents uploaded to the system by our instructor, the process became much easier. In this process, she was very open to us (T11). (Written Opinion)

At the beginning of the process, the process that I had to do and follow became clearer with the information and guidance which were given by our instructor. With the example scenario activities, the instructor gave me how can I do it myself. In what ways can

I script the subject I choose? It was an answer to questions such as (T2). (Diary)

The documents uploaded to the system by the instructor helped me to have an idea about the project and while preparing the project, I benefited from the project preparation steps in the document. In this regard, these documents helped me a lot. She guided me (T4). (Diary)

Since the explanations were given what was requested, we did it knowing what to do without any difficulty while doing what was requested. This situation helped us learn more (T7). (Diary)

Clear and precise. I had no difficulty in preparing homework because it was understandable (T13). (Diary)

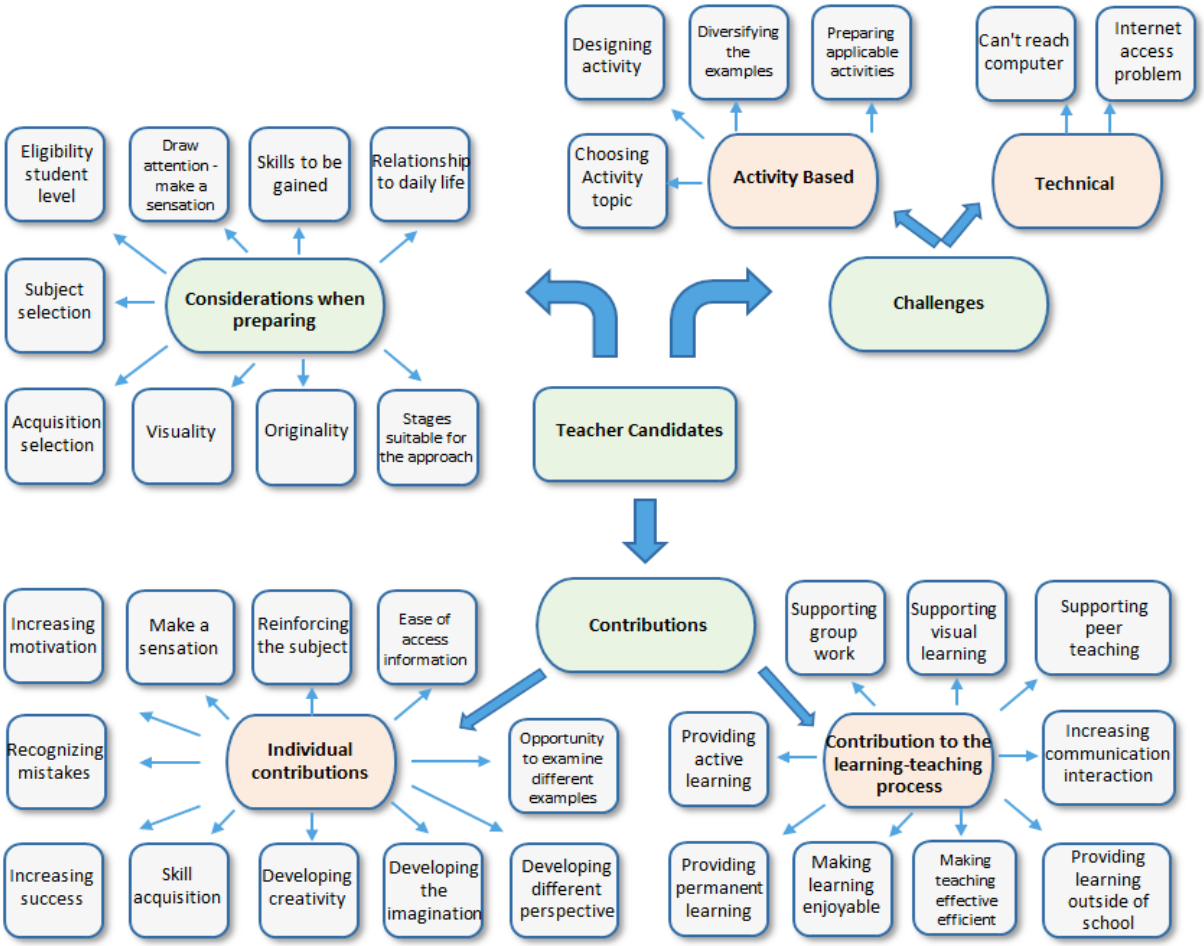

Figure 3. Theme and codes for teacher candidates' Instagram posts

In this process, teacher candidates prepared examples of activities related to the approaches used in science teaching and shared them via Instagram. They expressed their views on the contributions of the process and the difficulties they experienced while preparing the activity sample. Teacher candidates stated that while they were preparing their activities, they took into account features such as the level of the student, achievement, subject, appropriateness to the stages of the approach, being related to daily life, noteworthy, visuality and originality. Examples of opinions of teacher candidates are given below.

While preparing for my activity, I did my research, determined my subject content, and chose my images correctly (S2). (Written opinion)

For each learning approach that we prepared as an activity example, I first identified an interesting problem situation that attracted the attention of the students (S7). (Written opinion)

During the preparation phase, I first determined attainment. After choosing my attainment, I thought about how I could design a project (S11). (Written opinion)

While preparing the example of the activity, I did a lot of research and thought about how they could understand the information I am going to convey, which is appropriate for the age group I am interested in. I learned to design a project accordingly. (S7). (Diary)

While designing the activity, I first determined the subject of the activity, then after researching the subject, I found sample course

contents and created my own draft with their help (S10). (Diary)
While designing the activity, I examined the activities prepared related to the subject to eliminate the questions in my mind and followed the road map where I could originally design my event. I got help from sample activities while preparing my event (S9). (Diary)

Teacher candidates evaluated the contributions of the process individually and in terms of the learning-teaching process. Teacher candidates stated that the process has made contributions to individuals such as increasing motivation, arousing interest-curiosity in the lesson, reinforcing the subject, increasing success, ease of access to information and contributing to skill acquisition, providing the opportunity to examine different examples, developing creativity, imagination and different perspectives, recognizing mistakes, and fixing the shortcomings. Examples of opinions of teacher candidates regarding the individual contributions the process has made are given below.

Since we have the opportunity to see the posts prepared by our other friends, this process is progressing very efficiently. Sometimes, when we do not know how to prepare, we get an idea by looking at the posts prepared by our other friends and we prepare our post. In other words, I think it is nice and useful to use Instagram in terms of interaction and seeing various activities related to the subject (S5). (Written Opinion)

Overall, it was a class that I enjoyed. It was important for the lesson to see both our own mistakes and the rights and wrongs of our friends with the photos we uploaded to the application (S11). (Written Opinion)

After examining various examples, we also see different perspectives, so it allows us to look from multiple perspectives. In addition, if we have shortcomings, we have the opportunity to see and correct them (S14). (Written Opinion)

I think it increases the interaction and success of the course (S15). (Written Opinion)

I think the subject was taught very clearly and the subject was reinforced with the posts made on Instagram (S21). (Written Opinion)

In general, after we prepared our activity, we shared this activity and projects with our other friends using the Instagram application. In this way, it provides different perspectives by looking at the projects of our other friends, seeing their rights and wrongs, and how we can improve them or adapt them to our own project (S4). (Diary)

I think it is very useful to share our work on social media. Seeing different works and different thoughts not only causes us to think more creatively but also allows us to see if we have any shortcomings. We see works that we can share with our students in the future (S9). (Diary)

It's helpful to see other people's posts. Actually, I think it develops the imagination. Because when I look at the event shared by a friend of mine, I say that she could do something like this, it would be better if it was like this, and I think about those events somehow (S10). (Diary)

I find Instagram posts very useful and it motivates us to do homework in different places (S12). (Diary)

Thanks to social networks, we can access information more easily. We can take an example from what other friends do (S13). (Diary)

The use of social networking helped my friends and instructor to see my posts. I got different ideas by seeing other posts (S19). (Diary)

Teacher candidates in the learning-teaching process stated that they contributed to increasing communication interaction, making teaching efficient, providing learning outside of school, making learning enjoyable, providing permanent learning and active learning, and supporting visual learning, peer teaching, and group work. Examples of opinions of prospective teachers on the contribution of the process to the learning-teaching process are given below.

It provided opportunities such as improving the communication skills of teacher-student and students with each other, and the support of the teacher in this process (S7). (Written Opinion)

I can say that it creates an opportunity for education to continue outside the school, which is based on cooperation and makes the student active (S8). (Written Opinion)

One of the best methods for us to learn these approaches in distance education permanently was Instagram. Learning only theoretical knowledge and not applying it does not provide permanence in knowledge (S9). (Written Opinion)

Sharing the activities with our friends developed a positive attitude towards the course. In addition, thanks to this method, learning becomes easier and more permanent (S12). (Diary)

I was able to review many examples. I was able to communicate with the teacher and friends (S14). (Written Opinion)
After listening to the course, I also perform peer learning through Instagram. Instagram greatly contributes to my understanding of the course (S15). (Written Opinion)

Thanks to the social network, other people can see and learn about the activity. I have prepared. Likewise, I see what they have prepared and benefit from it. We contribute positively to each other through mutual interactions (S2). (Diary)

Thanks to the social network, we can communicate actively with both our teachers and our friends. I think it provides comfort in sharing our homework (S8). (Diary)

The use of social networks enables students to improve their communication skills between teachers and students. It provides opportunities such as the teacher's support to the process, which can ensure the realization of cooperative learning with our friends (S16). (Diary)

Teacher candidates stated that they encountered some technical difficulties while preparing the activities in the process. While preparing their activities, teacher candidates stated that they had difficulties in choosing a topic, designing the activity, diversifying the examples used, and preparing applicable activities. Teacher candidates also stated that they encountered difficulties such as not being able to access the computer and internet access problems. Examples of opinions of teacher candidates regarding the difficulties they encountered in the process are given below.

I think it was very nice and useful. We see each other's posts with our friends and get to know our shortcomings. Since I don't have a computer, I prepare the posts over the phone. That's why it takes so long to prepare the posts (S5). (Written Opinion)

Instagram is an easy platform for those who access the internet (S7). (Written Opinion)

The difficulty I faced during the process was writing the part of the activity. I was a little tired of designing an event related to the scenario (S4). (Written Opinion)

I had some difficulty in preparing the appropriate scenario and determining the appropriate activity on the subject that could be easily applied in the classroom environment (S5). (Written Opinion)

If I talk about the difficulties, since I don't have a computer, I needed to prepare such posts from the phone. It took me a long time to prepare a post as there were not many features on smartphones (S15). (Diary)

DISCUSSIONS and CONCLUSION

This study aimed to determine the effect of learning environments supported by sharing activities related to various approaches used in science teaching using Instagram, one of the social networks, on the teacher candidates' sense of community in online environments, and to determine their views on their experiences in the process. First of all, it has been concluded that the use of Instagram in the learning environment has a positive effect on the sense of community in online learning so that teacher candidates can communicate with each other and with the instructor. The sense of community in education enables learners to feel comfortable in their environment and to feel that they belong to that environment. Considering that learning takes place in virtual environments in distance education, it can be said that the sense of community of the learners is important (Enfiyeci & Büyükalan Filiz, 2019). Dawson (2006) stated that there is a relationship between students' frequency of communication and their sense of community. Furthermore, it was stated that the more interaction individuals have with their peers and teachers in online learning communities, the better their sense of community would be. In this study, the interaction of teacher candidates with each other and with the instructor through the posts on Instagram in the distance education process can be said to support the sense of community. In their study, Erdoğmuş, Çakır, and Korkmaz (2022) concluded the presence of a moderate positive relationship between the sense of community in online learning environments and students regarding knowledge sharing. Ergün and Kurnaz (2017), on the other hand, stated in their study that students had a high sense of classroom community and reported that there was a moderate positive relationship between classroom community and student engagement in online learning environments.

Due to the rapid transition to distance education during the COVID-19 pandemic, users experienced some problems due to the lack of infrastructure in online synchronous courses in the early days of higher education. In synchronous courses, students and instructors had problems entering the environment at the same time, could not attend the course, and therefore, a productive course environment was not achieved. Therefore, online asynchronous courses are preferred. In addition, in archived courses, there were some problems such as audio and motion picture asynchrony in video recordings, and deletion of lecture recordings due to insufficient storage space. Motivation and performance are affected when students feel like part of a learning community rather than interacting with technology (Haar, 2018). For a successful and productive online learning environment to be created, it is important for students to feel like a part of the group (Valentine, 2002). Ilgaz (2009) also investigated the effect of the use of communication tools on the sense of community. As per the results of that particular study, the use of communication tools was observed to make a significant difference in the sense of community. During the pandemic, it was determined that students communicated with each other through social media and with instructors via the learning system or e-mail (Yıldız, 2020).

Some of the criticisms of distance education before the pandemic can be listed as follows: It is difficult to motivate students and presence of very limited teaching methods (Doğan and Paydar, 2019), distance education is boring, inactive and emotionless (Kaleli Yılmaz & Güven, 2015) and students with low motivation levels leaving before completing the program or feeling isolated from the environment due to the lack of interaction (Moore ve Kearsley, 1996; Muilenburg & Berge, 2005). Avşar Erumit et al. (2021) evaluated the views of teacher candidates on online science teaching in terms of expectations, opportunities, threats, motivations and beliefs during the COVID-19. Accordingly, it was concluded that the teacher candidates expressed their views on low motivation at the beginning of the process as being in the home environment, lack of external motivation and sitting in front of the computer for long hours. It can be interpreted that the interaction provided through Instagram in the distance education process and the positive effect of the sense of community among teacher candidates in this study can also affect their motivation.

When the quantitative data of the study is evaluated in general, it can also be stated that the interaction provided with Instagram posts positively affects the sense of community of teacher candidates. The qualitative data of the study also support this result. When the written opinions and diaries of the science teacher candidates were examined, the videos, documents and instructions shared by the instructor were determined to be instructive, clear and precise enough for the teacher candidates. In addition, it was stated that the posts of the instructor increased the clarity of the course, made learning easier and guided the process. The fact that the opinions about the instructors' posts are positive can be interpreted as the process increasing the sense of community and motivation of the science teacher candidates. Conducting lessons with smaller groups to increase the quality of interaction instead of crowded classes to strengthen the sense of community in online learning environments, giving students responsibilities for their learning in the form of individual and group work, making them realize that they are doing something for themselves and each other, and giving students tasks that they can cooperate (Rovai, 2002b) can increase the instructor-student interaction (Shea, 2006). Yıldız (2020) stated that the situations in which the attitudes and behaviors of the instructors are positive are important in providing interaction, contributing, listening to the course, and participating in the course. Haar (2018) stated that it is necessary to use approaches that would attract students' attention and encourage learning and give feedback.

Teacher candidates stated that while preparing the activities they shared on Instagram, they took into account features such as its suitability to the student level, acquisition and subject, stages of the approach, relationship to daily life, drawing attention, skills to be gained, visuality and originality. Teacher candidates stated that while the process has made contributions to individuals such as increasing motivation, arousing interest-curiosity in the lesson, reinforcing the subject, increasing success, ease of access to information and contributing to skill acquisition, providing the opportunity to examine different examples, developing creativity, imagination and different perspectives, recognizing mistakes, and fixing the shortcomings, it contributed to the learning-teaching process such as increasing communication-interaction, making teaching efficient, providing learning outside of school, making learning enjoyable, providing permanent learning and active learning, supporting visual learning, peer teaching, and group work. Accordingly, the posts and evaluations carried out through Instagram during the distance education process in the study can be stated as making a wide variety of contributions to teacher candidates such as increasing their motivation, interest in the lesson, and communication interactions between them. In line with the opinions of the teacher candidates, it can be said that the interaction between the teacher candidates through Instagram increased their motivation. One of the important factors that will positively affect student satisfaction by increasing the bond that decreases as a result of physical separation in distance education and creating a sense of reality is the presence of classroom community feeling (Ilgaz & Aşkar, 2009). It is emphasized that the presence of a sense of community in online distance education classes would create permanence in learning and affect student satisfaction (Rovai, 2002a). Yıldız (2016) stated that there is a positive and significant relationship between students' sense of community and academic success in the online learning environment. Academic success has been reported to be affected by the attitudes and behaviors of the instructor, participation, different learning activities, interaction, and cooperation. Ilgaz (2008) stated that students who can develop a sense of community are more satisfied with distance education and that the use of online media is effective in creating a sense of community.

While the science teacher candidates were preparing their activities, they stated that they had challenges in choosing the subject, designing the activity, diversifying the examples used, and preparing applicable activities and technical challenges such as not being able to access the computer and internet access problems. Particularly technical challenges faced by teacher candidates were also expressed in similar studies. Erzen and Ceylan (2020) stated that in their study, which aimed to determine the views on distance education during the COVID-19 pandemic, some of the students expressed their concerns about the possibility that some of their friends did not have a computer or smartphone, and an internet connection, or that it might be slow. While Özdoğan and Berkant (2020) reported the disadvantages of distance education as lack of measurement and evaluation, loss of motivation, lack of internet and computers, inequality of opportunity, lack of interaction, technical problems, lack of socialization and being unprepared for the process, Yolcu (2020) stated that the technical equipment (computer, internet) of the teacher candidates in the distance education process was not sufficient to a large extent.

In this study, the interaction between science teacher candidates was managed by sharing activity examples related to various approaches used in science teaching using Instagram from social networks. This research is limited to the activity examples shared teacher candidates. In addition, the shares were made on Instagram during the distance education process. It was revealed that the sense of community of teacher candidates in online environments was positively affected in this process, and their opinions about their experiences in the process also supported this outcome. Accordingly, it can be said that it is important for teacher candidates to interact with each other, especially in the distance education process. Based on the results of this study, the following suggestions can be made for the studies to be carried out with teacher candidates:

- In online environments, studies can be planned by using Instagram's different variables such as satisfaction, self-efficacy,

and success apart from community feeling in research.

- Studies in which learning environments are designed to increase the sense of community of teacher candidates can be included in online environments.
- Studies in which learning environments are structured by using different communication tools that will support interaction in online environments can be included.
- Solution suggestions can be developed for the challenges faced by teacher candidates in online environments, and sample applications can be made in this direction.

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