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The effect of mobile-assisted online flipped learning process on pre-service teachers' information literacy skills and educational beliefs

Bilal İnan [a], Kerem Kılıçer [b] *

[a] İstanbul Gelişim University, Türkiye;
[b] Tokat Gaziosmanpasa University, Türkiye

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Abstract

In today's world, where the accessibility of information is increasing thanks to the development and transformative effect of technology, the use of technology in the education system is now indispensable. The use of technology in the learning experiences of students, who are defined as digitally native in particular, has facilitated both the design of activities more appropriate for their learning habits and the application of contemporary methods based on the constructivist approach. The pandemic process has increased the application of constructivist methods and the importance of research on these methods in order to increase the quality of distance education. In this context, the effect of the mobile assisted online flipped learning experience on pre-service teachers' information literacy skills and their educational beliefs was examined. A total of 74 pre-service teachers studying in the first year of the Guidance and Psychological Counseling Department of Tokat Gaziosmanpaşa University, Faculty of Education, participated in the study, which was carried out in a four-week period. The research was conducted with the quasi-experimental design with pretest-posttest control group. In the study, the pre-service teachers in the experimental group taught the selected topics within the scope of the Instructional Design course online through the mobile assisted flipped learning model, while the pre-service teachers in the control group taught the same topics online through the leacture-based instruction model. Before and after the process, measurement tools were applied to both groups, and the differences between and within groups were evaluated. In addition, by conducting a focus group interview with the pre-service teachers in the experimental group, their experiences about the process were tried to be understood in depth. As a result of the research, it was determined that the flipped learning model is also an effective method in the distance education process, and the course conducted through the mobile assisted online flipped learning model contributes to the increase of the information literacy level and edicational beliefs by improving the different skills of the pre-service teachers.

1. Introduction

In the century we live in, we are witnessing a rapid change and development in all areas of life. Among these, the most we encounter is undoubtedly technology. These technological developments affect our lives

* Corresponding author. Faculty of Education, Tokat, Türkiye.
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deeply as well as the education system. Most of the students who are currently going on their education were born and raised with technology. Since these students are more closely interested in technology, they are more willing to use technology in education, as they are more willing to do everything with technology. According to Prenksy (2001), these students are called digital natives because they have a command of the digital language like their native language. Especially in today's world, where the accessibility of information has increased thanks to the development and innovation of technology, a generation raised with technology receives education in technology-supported teaching environments, not only supports their learning, but also increases the permanence of the learned information (Sadi et al., 2008). With these developments, traditional approaches in educational environments have been replaced by constructivist approaches (Yıldız et al., 2016). Moreover, upon the use of many methods and models together, it has been crucial to reveal the information by keeping the student in the center and active. In this sense, the idea of attaching more importance to practical student-oriented training and the necessity to allocate a large sum of time in the teaching process is discussed in the literature (Kocabatmaz, 2016; Yıldız et al., 2016). In addition, it is vital to enable the use of technology and to support teachers and students in this regard in order to ensure the quality progress of the education process and to train students more productively for the future (Metin, 2018). Thus, different teaching models have been put forward in parallel with the developing technologies. One of these methods is flipped learning.

After the Covid 19 pandemic that started in China in 2019, online training has become widespread in almost all countries to prevent the pandemic. Also, adopting these practices in Türkiye, the Council of Higher Education has decided to continue the 2020 spring semester entirely through distance education (YÖK, 2020). The pandemic process has tangibly proved how much it is necessary to integrate technology into education. Besides, the pandemic period has made the implementation of constructivist aproaches compulsory as well as improving the quality of distance learning, and increased the significance of researches related to these methods. In this context, the effect of the online flipped learning experience supported by mobile applications on information literacy skills and educational beliefs of pre-service teachers, which are among the most important skills of the information age, has been examined.

2. Literature

2.1. Distance Education

Distance education is a planned, institutional and administrative arrangement where students and teachers are located in different places, requiring the application of private lesson design and teaching methods and the use of various technologies (Moore & Kearsley, 2005). In other words distance education is a series of planned activities in which learning activities take place and these activities are presented to users by special communication methods without time and place limitations (Lee, 2020; Rovai & Downey, 2010). The concept of "Distance Education", which was introduced for the first time in the catalog prepared at the University of Winconsin in 1892, was used for the first time in an article by William Ligtly (Kaya & Önder, 2002; Verduin & Clark, 1994). Later, this term was introduced by de German educator Otto Peters in Germany in the 1960s and 1970s, and was applied as a name to distance education institutions in France (Verduin & Clark, 1994). Although the development of this concept in Türkiye was introduced for the first time in order to contribute to face-to-face education, it has become widespread thanks to the increasing demand for this education. In 1950, education by letter was started by the Ministry of National Education, an increase was seen in educational content through TRT radio in 1964, and in 1968, an increase in educational broadcasts along with television. Open Education Faculty was established in 1982 under Anadolu University. In 1990, many universities kept up with the technology and started distance education activities at associate, undergraduate, graduate and doctorate degrees with radio, television and web-based tools. In 2012, the Digital Education Platform of Turkey (EBA), was established by providing educational content to both primary and secondary school students and teachers on the internet (İşman, 2011). With the

enrichment and importance of the developing information and communication technologies in Turkey, its usage has increased day by day (Zırhlıoğlu, 2006). Today, with the development of internet technologies, many digital platforms are used in the distance education. Distance education is also defined as the arrangement and execution of learning and teaching in different physical environments between the teacher and the learner (Ernas, 2020). One of the practical ways to carry out these tasks is e-learning, which is one of the type of distance education and where technology is the leading actor. E-learning is a process that can be applied in different teaching environments with or without a teacher, using different technological tools at different levels, with various strategic and philosophical approaches, and different teaching methods and techniques. In e-learning, the student must be in front of a technological device such as a computer (Gülbahar, 2021, p.2). In addition, e-learning is a student-centered, low-cost high learning activity regardless of time and place. The process, in e-learning environments, becomes even more effective with the support of technology. With the use of online platforms such as social media, forums, blogs, multimedia applications, and learning management systems (Moodle, Google classroom, etc.) the materials related to the subject of the course and the activities in the classroom are transferred to digital platforms. Thus, educational activities are handled in a wide aspect (Ertaş, 2022). In the e-learning process, the instructors play an important role in realizing e-learning successfully by adapting traditional learning environments to e-learning environments, dealing directly with the e-course contents and students, in practicing the training (Soydal, Alır, & Ünal, 2011). At this point, we come up with the concept of blended education, in which the advantages of both distance education and face-to-face education are used together. Blended education is an education model in which online education, one of the type of distance education, and traditional education are used together (Colis & Moonen, 2001). In order to carry out blended learning, first of all, the activities should be designed by considering the suitability of the parts of the subject to be blended (Usta, 2007). According to Rosset et al. (2003), the effectiveness of blended education depends on planning for the design of the environment and the compatibility of the materials and contents to be used, with online materials. When designing a blended learning environment, classroom environments, online communities, blogs, and performance supports are often benefited from. However, there are also other options for this teaching model. Mobile learning is another important concept in the distance education process. Mobile learning has emerged as a result of the blending of e-learning and mobile informatics learning areas. Iı is a learning environment that allows accessing the desired subject content at any time, benefiting from rich-sourced content, and communicating with other people, regardless of location (Özcan, 2008). In the studies, mobile devices are defined as a handheld or palm computer (Kukulska - Hulme & Traxler, 2005), and a wireless mobile connection is required for the teaching to be called mobile education (Motiwalla, 2007). The mobile devices that are used in the process, provide the chance to realize teaching in any setting and any place, by eliminating the limitation of e-learning. According to related literature, mobile learning has many contributions to the teaching process. For instance, Elçiçek and Bahçeci (2015) examined university students' attitudes towards mobile learning in their study. Considering the results of the research, the students had a positive attitude towards the learning method and had high attitudes. Koparan and Yılmaz (2020) also revelaed the opinions of pre-service mathematics teachers about the learning environment supported by mobile learning. As a result of the study, pre-service teachers' motivation towards the lesson increased, they had a positive attitude toward the lesson and they had positive opinions.

2.2. Flipped Learning

The flipped classroom is a model in which the teaching process is reversed. The term flipped in the model was first introduced by Baker (2000). Aaron Sams and Jonathan Bergmann are chemistry teachers at a college in the USA. And, in 2007, they recorded their lessons for students who could not come to school for various reasons and ensured that the students followed these records. Other students also came to the lesson by watching these videos likewise. As the students came to the lesson more prepared, they spent longer time in the activities during the lesson and as a result. Thus, the academic success of the class increased. With the light of these findings, the flipped classroom model has become more recognizable

(Bergmann & Sams, 2012). In the report named "2014 Higher Education Edition" published by The New Media Consortium in 2014, the flipped classroom model ranked among the six technologies of the future. This case has attracted the attention of many researchers and studies started to be conducted in many countries related to this subject (Çevikbaş, 2018; Johnson, Becker, Estrada, & Freeman, 2014). When international publications are checked up on, it was seen that the concept is expressed in different ways such as flipped classroom, flipped learning, inverted classroom, and reserved instruction (Turan, 2015).

In the flipped learning model, learners come to the classroom after studying the content prepared in various formats outside the classroom. During the lesson, they apply the content they have previously studied outside of the classroom by doing different activities with their peers. With the different activities applied, students have the opportunity to further develop their high-level thinking and collaboration skills. According to Zownorega (2013), this model is a case of displacement of the traditional model, out-of-class and in-class. The flipped classroom model is the one that does not have a certain pattern or class but also does not have a certain duration and stable narration (Bates & Galloway, 2012). Relatively, Francl (2014) stated that the flipped learning environment approach is a practicable system in the technology age. Moreover, he stated that the lessons and activities taught in the traditional teaching environment are left behind and that smartphones and portable tablets should be used in the internet age. Looking at the studies in the literature, the flipped learning environment has many contributions in various aspects compared to the traditional education model. For example, Karaca (2016) aimed to compare flipped learning and traditional education, and revealed that the success and skills of students studying in flipped learning environments increased more. Foldnes (2016) tried to examine the effect of the collaborative flipped classroom practice on the academic success of studends. As a result of the study, it was found that supporting the flipped classroom method with collaborative learning activities increased the accademic success of the students. Munir, Baroutian, Young, and Carter (2018) used the flipped classroom model together with collaborative learning in engineering courses. The finding of the study revealed that the students were satisfied with this method, that taking courses with this method increased the interaction between students, contributed to the development of communication, and supported and developed teamwork. Turan (2015) also displayed that the flipped classroom model increases academic achievement and reduces cognitive load compared to traditional methods. And, students who study in a flipped learning environment are more motivated than the ones in traditional methods. Chen Hsieh, Wu, and Marek (2017) investigated the effect of flipped learning model on motivation in English lessons. Thus, it was found that the motivation of the group to which the model was applied increased more than the model in which lessons were taught with traditional methods. Çukurbaşı and Kıyıcı (2017), on the other hand, revealed that in the activities carried out with the flipped learning model, the abstract subjects could be more easily comprehended by the pre-service teachers and more time could be allocated to the avtivities not being performed due to the limited course time. Similarly, Alsowat (2016) examined the effect of the flipped classroom method in the English lesson, and found that it was a positive effect on the participation of the students who took the course with the flipped teaching method. Clark (2015), on the other hand, applied the flipped classroom method in the mathematics lesson, and concluded that the flipped classroom method increased students' participation in the course. Moreover, Nouri (2016) concluded that the students who took the scientific research course with the flipped classroom method had higher participation in the course than the students who took the course with the traditional methods. There are also various studies in the literature showing that the model is useful and can be used in different courses (Akdeniz, 2019; Aydın, 2020; Demiralay Yiğit, 2014; Keskin, 2020; Özdemir et al., 2020; Şerefli, 2020; Talan, 2018; Turan, 2015). Hence, it was decided to use the flipped learning process, one of the constructivist approaches in online courses, in the research.

2.3. Information Literacy

Information literacy is the acquisition and use of the information required to realize a situation or solve a problem. An information literate is an individual who can sense at the time when one needs information

and finds out the information he or she needs and can use it effectively by evaluating this knowledge. In other words, information literacy is defined as the combination of the ability to access, evaluate and use information flowing from different sources (Doyle, 1992). Behrens (1994) emphasizes that knowledge, skills, and knowledge to be used in problem-solving constitutes the necessity for information literacy in order to use information instruments and primary sources obtained from information instruments. There are many definitions related to information literacy in the literature. It is stated in all definitions that information literacy is related to many skills. Accordingly, the concept of information literacy involves skills such as problem-solving, life-long learning, use of technology, high-level of thinking, working colleboratively, ethical issues, and adapting to changes (Kurbanoğlu, 2010).

Information literate individuals can also be considered as individuals with 21st century skills. While these skills are important for all occupational groups, they are more critical for teachers. Teachers need to be equipped with these qualifications in order to both develop themselves and raise their students as information literate individuals. Teachers must have acquired these skills during university education to fulfill this task. Therefore, pre-service teachers should be a mediator, guides, lifelong learners, able to organize knowledge, and also a teacher between knowledge and the learner, beyond being capable of how to access and use knowledge (Merter & Koç, 2010.)

When analyzing the related literature, there are many studies on information literacy devoted to teachers and pre-service teachers. For example, Erkensiz et al. (2013) determined that students' perceptions of the concept of information literacy are mostly related to the ability to access and use information. Gürbüztürk and Koç (2012) examined the opinions of pre-service teachers on information literacy skills, and they concluded that pre-service teachers generally benefited from information and communication technologies (ICT) to reach information, but they were insufficient in using information in ethical ways. On the other hand, Ünal and Er (2015) found that pre-service teachers do not have sufficient information literacy skills. Kurbanoğlu and Akkoyunlu (2007) stated that teachers who are information illiterate will not be able to teach information literacy skills to students, but teachers who are information literate will be able to pick and use the appropriate and correct resources for their students. Çoklar, Dulkadir Yaman, and Kabakçı Yurdakul (2017) investgated the relationship between pre-service teachers' online information search strategies and information literacy, and revealed that there was a significant relationship between them. Yıldırım and Yemenici (2020) examined the information literacy levels of Turkish pre-service theachers in their study, and at the end of the study, the authors concluded that the information literacy levels of pre-service teachers were in favor of female pre-service teachers in terms of gender. In addition, there was no significant difference in the literacy level of pre-service teachers according to their high school graduation. Dilek Eren, Muşlu Kaygısız, and Parlak (2019) investigated the relationship between pre-service teachers' information literacy skills and evaluation of the reliability of information sources. Thus, it was determined that pre-service teachers have a high skill level in information literacy. The other finding of the study was that there was a low-level and positive relationship between information literacy skill levels and the evaluation of the reliability of different online information sources. Dedebali, Daşdemir, and Şan (2019) examined the relationship between pre-service teachers' media literacy and information literacy in their study. Therefore, a positive and high-level relationship was determined between media literacy and information literacy. Tekkol and Demirel (2018) investgated the relationship between pre-service teachers' inquisitiveness and information literacy levels in their study, and as a result of the study, a positive and high-level relationship was found between pre-service teachers' inquisitiveness levels and information literacy skills. In this sense, information literacy, which is one of the important skills of the information age, has been discussed in the research.

2.4. Educational Belief

Raising individuals who have intended qualities and learning products is the most fundamental task in education. Education can only fulfill this task by setting on the elements and operations in the teaching-learning processes through the teacher. Therefore, to manage this process in the best way depends on the teacher's qualifications. It is so curicual because the teachers to be employed in the education system to be well trained both pre-service and in-service and to accomplish their duties in a qualified manner (Şişman, 2001; as cited in Yeler, 2022). The teacher's perspective on education is an important factor that determines the quality of education. In the educational process, each teacher tries to reach the planned educational goal. However, the teaching-learning environment designed, the methods and techniques used, and the teaching process planned while trying to reach these goals, constitute the knowledge, skills, views, and beliefs of the teacher. The view and belief of the teacher directly affect the teaching process carried out in the classroom (Doğanay & Sarı, 2003). Thus, as in this context, teachers' indirect assumptions about the classroom, teaching, students, and the subject to be taught pre-service and in-service are defined as educational beliefs (Abu-Jaber, Al-Shawareb, & Gheith, 2010; Kagan, 1992; Palenzuela, 2004). Teachers' educational beliefs are based on their individual orientations, personal and professional experiences, or educational needs evolving personally. Moreover, teachers' educational belief is an important factor that guides their in-class and out-of-class practices. Skills related to the teaching profession, such as being able to influence student performance, self-perception, and self-confidence in fulfilling their duties, are within the scope of education belief (Pajares, 1992).

The beliefs based on the philosophy of education for realism and idealism are traditional (Yılmaz, Altınkurt, & Çokluk, 2011). On the other hand, pragmatism and existentialism are described as contemporary educational beliefs (Demirel, 2010; Ornstein & Hunkins, 2014). Teachers with different educational beliefs may exhibit different teaching approaches. For instance, teachers who believe in progressivism strike a pragmatist approach. Teachers with a belief in reconstruction put the student in the center and provide rich learning environments for them (Sönmez, 2005). Existentialist teachers are individuals who do not regard education as a profession and contribute to their students in the matter of taking their own existential responsibilities (Cevizci, 2005). Perennialism, besides keeping idealism and realism at its core, defines humans as intelligent beings. Hence, teachers who have the perennialism belief, uphold the fact that education has universal, unchangeable, and absolute truths, and these truths can only be changed through the mind (Çüçen, 2005; Sönmez, 2005). According to essentialist teachers, the core of education is clear and it can be transferred to the student only through the teacher. In addition to the teacher being at the center, the student has to obey, repeat and memorize what the teacher says (Çüçen, 2005). It is claimed that, with the inclusion of contemporary approaches in education, the task of the teacher has become more passive than in the past. However, since the new approaches are learner-centered, the teacher rather takes the role of a guide. Therefore, teachers should be able to use ICT tools effectively and keep informed of new tools (Kıldan, 2012). Since teachers' educational beliefs mostly depend on their professional development and personal experiences, this study focused on the reflection of pre-service teachers' professional experiences not only on their information literacy skills but also on their educational beliefs.

2.5. Research Objective

The objective of this research is to examine the effect of the mobile assisted online flipped learning process on pre-service teachers' information literacy skills and their educational beliefs. Within this framework, answers to the following questions were sought in the study;

1. Does the mobile assisted online flipped learning process lead to a significant difference in the information literacy skills of pre-service teachers?
2. Does the mobile assisted online flipped learning process lead to a significant difference in the educational beliefs of pre-service teachers?

3. What are the opinions of pre-service teachers about the mobile assisted online flipped learning process?

3. Method

3.1. Research Model

In this study, a mixed method was used in which both quantitative and qualitative data were collected. The mixed method helps to explain different aspects of the examined situation by revealing a more holistic understanding with the combination of quantitative and qualitative methods (Davies, 2000). In the research, convengent design, which is one of the mixed methods, was used. The reason for using this design is both to examine the quantitative contribution of the mobile assisted flipped learning process and to evaluate the experiences of the users about the process as a whole (Creswell et al., 2003). In the research, "Quasi-Experimental Design with Pretest-Posttest Control Group" was used to examine the effect of mobile assisted online flipped learning model on education beliefs and information literacy (Campbell & Stanley, 1966). In this context, "Information Literacy Scale" and "Education Beliefs Scale" were applied to the experimental and control groups as a pretest before the experimental process, and at the end of the experimental process, the same scales were applied again to the experimental and control groups as a posttest. Within the scope of the qualitative research, on the basis of the case study design, a focus group interview was held with the pre-service teachers who underwent the most and least change in the experimental group at the end of the application, regarding the flipped teaching process.

3.2. Study Group

The study group of the research consists of 74 pre-service teachers studying in the Guidance and Psychological Counseling Department of Tokat Gaziosmanpaşa University, Faculty of Education in the fall semester of the 2021-2022 academic year. Since the pre-service teachers participating in the study consisted of two groups (A and B section), the groups were randomly determined as the experimental and control groups. One of the two sections consisting of forty-person classes was chosen as the experimental group and the other as the control group. At first, there were 80 participants. However, four pre-service teachers from the experimental group and two from the control group could not complete the experimental process due to the absence of pre-service teachers. Also, they did not participate in two of the pretest and posttest. Thus, the study was completed with 36 pre-service teachers in the experimental group and 38 pre-service teachers in the control group. To estimate the required sample size power analysis computed in G*Power (Faul, Erdfelder, Lang, & Buchner, 2007). As a result of the power analysis (α=.05; power=.80; effect size =.34) the sample size estimated for ANCOVA was a total of 70 pre-service teachers (35 pre-service teachers per group). 56 (75.6%) of the pre-service teachers participating in the research are female, whreas 18 (24.4%) are male. And all of them are in the first grade. Most of the pre-service teachers participating in the study are female. The participants of the qualitative part of the study, on the other hand, were determined in respect to the extreme or deviant case sampling method, with the least difference in terms of pretest and posttest at the end of the experimental process. Accordingly, six pre-service teachers participated in the focus group discussion. The pre-service teachers participating in the focus group discussion are five females and one male.

3.3. Data Collection Tools

Three different data collection tools were used in the study. These are; information literacy scale developed by Adıgüzel (2011), the education beliefs scale developed by Yılmaz et al. (2011), and the semi-structured focus group discussion form developed by researchers. Permissions were obtained by the authors before using the scales.

3.3.1. Information Literacy Scale

The information literacy scale developed by Adıgüzel (2011) aims to evaluate the approaches to acquiring and structuring knowledge. Being formed of 29 items in a 5-point Likert type, the scale consists of four factors. These factors are "Access to information" consisting of 11 items, "Ethics and legal settings in use of information" consisting of 5 items, "Use of information" consisting of 5 items, and "Defining information needs" consisting of 8 items. The explained variance of the scale is 53.43%. The item-total correlation coefficienty for the scale ranged between .457 and .735. Also, the internal consistency (Cronbach Alpha) reliability coefficient for the whole scale was determined as .93. In this study, Cronbach's Alpha coefficenty was calculated as .94 for the whole scale and as .73 and .89 for its factors. Accordingly, it can be said that the reliability of the scale is above the value accepted in the literature (Field, 2005).

3.3.2. Educational Belief Scale

Another scale used in the study is the education belief scale developed by Yılmaz et al. (2011). Exploratory and confirmatory factor analysis was applied to determine the construct validity of the 5-point Likert-type scale, which consists of 40 items. As a result of the exploratory factor analysis, it has been determined that the scale has five factors including "Reconstructionalism", "Essentialism", "Perennialism", "Existentionalism" and "Progressivism" educational philosophies, and the item factor loadings of the items are between 0.42 and 0.74. In addition, the corrected item-total correlations are between 0.22 and 0.90, and the explained variance of the scale is 49.57%. Moreover, the five-factor structure of this scale has been confirmed by confirmatory factor analysis. As a result of confirmatory factor analysis, $\chi^2/df = 2.23$, GFI= 0.85 and AGFI= 0.83 has been found and accepted to be sufficient. The values have been detected as following RMSEA=0.046, RMR=0.065, SRMR=0.065, CFI=0.97, NFI=0.95, NNFI=0.97 and PGFI= 0.75. As a result of the study, the scale is a reliable and valid tool that can be used in determining the education beliefs of teachers and pre-service teachers. It was observed that the internal consistency (Cronbach Alpha) reliability coefficient of the scale ranged between 0.70 and 0.91. Cronbach's Alpha coefficienty was observed to vary between .73 and .96 in terms of the whole scale and factors. Accordingly, the reliability of the scale is above the value accepted in the literature (Field, 2005).

3.3.3. Semi-Structured Focus Group Discussion Form

A semi-structured focus group discussion form was used as a data collection tool in the qualitative dimension of this research. The focus group discussion was selected because it provides convenience with the flexibility of the practitioner. The semi-structured focus group discussion form was prepared by the researchers. In the process of developing the focus grup discussion form, first of all, purpose-oriented draft questions were created. While creating the draft form, other studies in the literature were examined. The draft questions were presented to the opinions of three experts in the field of a Computer Education and Instructional Technologies, one expert in the field of a Measurement and Evaluation Education, and one expert in the field of a Curriculum and Instruction, and arrangements were made in line with the feedback received. The focus group discussion form prepared by the researcher consists of six main questions in total and fifteen sub-questions linked to these questions. Through these questions, information was obtained about the pre-service teachers' thoughts on the mobile-assisted online flipped learning environment, the problems they experienced in the process, the methods they used to solve the problems they experienced in the process, the parts they liked most, and the parts they disliked the most.

3.4. Data Analysis

In the process of data analysis, firstly, the convenience of the collected data was evaluated. The data collected from pre-service teachers who participated only in the pretest or posttest were considered invalid. SPSS 26.0 program was used in the analysis of the quantitative data obtained in the study. In order to decide on the analyzes to be used in the research, the normality of the pretest and posttest scores of the experimental and control groups' information literacy scale were examined. Therefore, firstly, the kurtosis and skewness

values of the pretest and posttest scores of the experimental and control groups were examined. It has been defined that the skewness value of the pretest and posttest scores of the experimental group is between -0.983 and0.099, and the kurtosis value of the pretest and posttest scores of the control group is between -0.463 and1.646. In addition, the normality of the pretest and posttest scores of the experimental and control groups was also examined by the Shapiro-Wilk test. Analysis results are shown in Table 1.

Table 1.
Shapiro-Wilk test results and skewness-kurtosis values of pretest and posttest scores of information literacy scale of experimental and control groups

			Shapiro-Wilk				
	Test	Group	Statistic	df	p	Skewness	Kurtosis
Information Literacy Scale	Pretest	Experimental	.985	36	.893*	.099	-.446
		Control	.933	38	.026	-.983	1.646
	Posttest	Experimental	.951	36	.112*	-.572	-.463
		Control	.973	38	.469*	-.179	-.427

*p>.05

As can be seen in Table 1, according to the Shapiro-Wilk test results obtained from the information literacy scale, the parametric test was used to compare the posttest scores of experimental and control groups. In the analysis of the qualitative data, the content analysis method was used. While creating the themes in the content analysis, the questions in the focus group discussion form were taken into consideration. Direct quotations about the opinions of the pre-service teachers interviewed in the research were included. In order to ensure the confidentiality of the participants, the real names of the participants were not used and a number (S1, S2, etc.) was given to each participant. Frequency was given to determine the number of views on each theme. The interview took 30 minutes in total. As a result of the analysis, the experiences of the pre-service teachers about the process and the contribution of the process were tried to be determined.

According to the Mann-Whitney U test that was conducted regarding the equivalence of the experimental and control groups, it was revealed that there was not a significant difference between the information literacy skills pretest scores (U=508.00, p>.05). Accordingly, it was concluded that the pre-service teachers in the experimental and control groups were similar in terms of information literacy. In addition, the raw data obtained from the focus group discussion were also analyzed by a researcher doing a master's degree in a different field. Miles and Huberman's (1994) “agreement / (agreement + disagreement)” formula was used to calculate inter-coder consistency, and as a result, the inter-coder consistency was calculated as .91.

3.5. Experimental Process

Before the research, permissions were obtained for the scales to be used in the study. Then, research permission was obtained from the relevant ethics committee of the university where the experimental process would be made. The experimental process was carried out within the scope of the two-hour "Instructional Technologies" course in the related program. Within the scope of the online course, the teaching content of the current literacy and the design of teaching materials in the course content determined by Council of Higher Education were followed. After determining the pre-service teachers who would be in the experimental and control groups, first of all, "Information literacy scale" and "Education belief scale" were applied as a pretest. After applying the pretests, the five-week teaching process was conducted online. In the first week, pre-service teachers were informed about the mobile application and how the courses would be taught. In this way, it was hindered that the pre-service teachers get unfamiliar with the model to be applied. In the next four weeks, the mobile-assisted online flipped teaching process shown in the Figure 1 was followed.

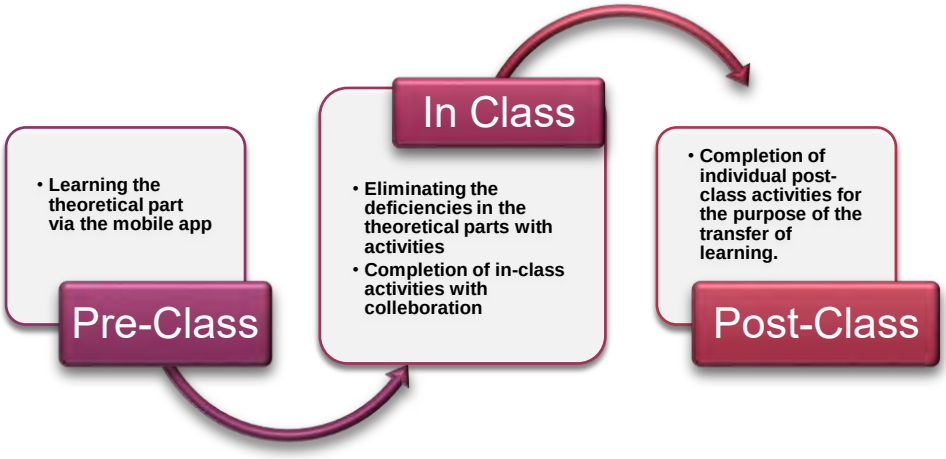

Figure 1. The mobile-assisted online flipped teaching process

As seen in the Figure 1, the four-week process of the study was carried out in three separate parts. These are pre-class, in-class and post-class activities. The operation of the four-week experimental process is as follows;

Pre-Class: In the research, the pre-service teachers in the experimental group learned the theoretical part of the related subjects through the mobile application with rich materials supported by audio (podcast), visual, text and video formats and came to the class. The Android version of mobile application was developed by researchers with Mobiroller which is an online self service mobile application platform that enable anyone to create applications. As well, pre-service teachers could be able to remove missing information about the content in line with the feedback they received by solving the mini-tests about the content in the mobile application. In addition, before the activities, a reminder message was sent to the pre-service teachers through the mobile application to prepare for the lessons. The activities in the mobile application are short, comprehendible, and designed to increase the motivation of the student. The pre-service teachers in the control group, on the other hand, did not make any preparations for the course.

In Class: The pre-service teachers in the experimental group came together for the course through the learning management system (LMS) of the university. In the introduction part of the course, firstly, the subjects that were not clear enough about the theoretical part were repeated. In order for the research to be impartial, the lessons in the experimental and control groups were taught by the same instructor. Afterwards, the activities related to the topics designed for the experimental group were carried out online. Socialization of pre-service teachers in the online setting was supported by attaching group activities as well as individual activities. In the control group, leacture-based instruction was used. First the subjects were taught in the online environment by the instructor, and then, in the remaining time, the activities applied at the experimental group were also completed in the control group. The main activities carried out in the course in the experimental group were implemented as post-class activities in the control group.

Post-Class: After the in-class activities were completed, the after-class activities prepared for the relevant subjects were defined in the LMS. The pre-service teachers in the experimental group completed the after-class activities until the next week and posted them on their personal websites. The control of after-class activities being provided by the instructor and the feedback was given to the pre-service teachers. The pre-service teachers obtained the materials of all the activities and content in the process through the LMS and mobile application. The pre-service teachers in the control group completed the main activities as post-class activities.

After the activities were completed, a posttest was applied to both groups. At the end of the experimental process, focus group discussion was held with six pre-service teachers who participated in the experimental

process. Opinions about the process were collected from pre-service teachers through focus group discussion. The pre-service teachers participated voluntary to the focus group discussion.

4. Findings

Findings obtained through analyzes based on research problems are presented under three sub-headings. First, the findings obtained from the information literacy scale are presented. Then, the findings obtained from the educational belief scale are presented. Finally, the opinions of the pre-service teachers about the mobile-assisted online flipped learning process are presented.

4.1 The effect of mobile-assisted online flipped learning process on information literacy skills

The results of the ANCOVA analysis conducted to determine the effect of mobile-assisted online flipped learning process on pre-service teachers' information literacy skills are shown in Table 2 and Table 3.

Table 2
Descriptive statistics of information literacy scale in compliance with posttest scores

Group	N	Mean	Modified Mean
Experimental	36	4.0670	4.094
Control	38	3.8249	3.799

As seen in Table 2, there are posttest mean scores modified in respect to the pretest among the group mean scores. Accordingly, the modified mean score obtained from the information literacy scale of the experimental group is higher than that of the control group.

Table 3.
Summary of Analysis of Covariance (ANCOVA) result of posttest performance of the experimental and control groups in information literacy scores

Source	Type III Sum of Squares	df	Mean Square	F	Sig. (p)	Partial Eta Squared (η^2)
Corrected Model	2.723	2	1.361	5.205	.008*	.128
Intercept	21.178	1	21.178	80.964	.000*	.533
Pretest	1.639	1	1.639	6.264	.015*	.081
Group	1.557	1	1.557	5.951	.017*	.077
Error	18.571	71	0.262			
Total	1171.606	74				
Corrected Total	21.294	73				

*p<.05

According to the ANCOVA results seen in Table 3, it was found that there was a significant difference between the posttest mean scores of the pre-service teachers studying in the mobile-assisted online flipped learning and the pre-service teachers studying in the leacture-based online learning ($F(1, 71) = 5.951$, $p<.05$, $\eta^2= 0.07$). In other words, the information literacy skills of pre-service teachers studying in a mobile-assisted online flipped learning environment have increased more than those of pre-service teachers studying in a leacture-based online instruction environment.

When the changes in the experimental and control groups during the experimental process are examined, the posttest scores of the experimental group in respect to information literacy were higher than the pretest scores. Moreover, there was a statistically difference between pretest and posttest scores ($\bar{X}_{pretest} = 3.647$; $\bar{X}_{posttest} = 4.067$). Accordingly, the teaching carried out through the mobile-assisted online flipped learning model applied in the experimental group improved the information literacy skills of the pre-service teachers. The posttest scores of the control group with regard to information literacy skills were lower than

the pretest scores. Besides, there was no statistically difference between pretest and posttest scores (Z=-.189, p>.05). According to this result, there was no increase in the information literacy skills of the pre-service teachers at the end of the leacture-based online instruction model applied in the control group.

When the sub-dimensions of the information literacy scale were examined, "ethics and legal settings in use of information" stand out as the most increased sub-dimension in the experimental group ($\bar{X}_{pretest}$ =3.944; $\bar{X}_{posttest}$ =4.398). When the sub-dimensions of the scale were investgated in terms of posttest, it was seen that the highest sub-dimension was the "ethics and legal settings in use of information" ($\bar{X}_{posttest}$ =4.398). In the control group, on the other hand, there was no positive change in information literacy skills in general. When the sub-dimensions of the scale were examined in terms of posttest, the highest sub-dimension was "ethics and legal settings in use of information" ($\bar{X}_{posttest}$ =4.042).

4.2. The effect of the mobile-assisted online flipped learning process on education beliefs

In the research, the change in the educational beliefs of the pre-service teachers in the mobile assisted online flipped learning process was examined ands the results were given in Table 4.

Table 4.
Descriptive statistics of educational blief scale

Educational Philosophies	Test	Mean		Standart Deviation	
		Experimental	Control	Experimental	Control
Reconstructionalism	Pretest	3.77	3.65	0.640	0.832
	Posttest	4.13	3.49	0.491	0.718
Essentialism	Pretest	2.36	2.35	0.729	0.816
	Posttest	2.91	2.30	0.866	0.733
Perennialism	Pretest	3.71	3.59	0.644	0.784
	Posttest	4.17	3.57	0.351	0.973
Existentionalism	Pretest	4.66	4.38	0.498	0.959
	Posttest	4.68	4.13	0.342	0.970
Progressivism	Pretest	4.32	4.15	0.499	0.918
	Posttest	4.47	4.07	0.399	0.876

When Table 4 is examined, it was determined that the highest educational philosophy in the experimental and control group was "Existentionalism", and the lowest educational philosophy was "Essentialism". As a result, the pre-service teachers in the both experimental and control groups mostly adopted the existentionalism philosoply of education. The posttest scores of the pre-service teachers in the experimental group were higher than the pretest scores in terms of their all sub-dimension of educational beliefs scale. Accordingly, the flipped learning model applied in the experimental group was increased the pre-service teachers' edicational beliefs. In contrast to this, the posttest scores of the control group in terms of all sub-dimension of educational beliefs scale were lower than the pretest scores. When the sub-dimensions of the educational beliefs scale were examined, it was clear that the "Essentialism" sub-dimension was the most increased dimension in the experimental group ($\bar{X}_{pretest}$ =2.36; $\bar{X}_{posttest}$=2.91). When the sub-dimensions of the scale were examined in terms of posttest, the highest sub-dimension was the "Existentionalism" ($\bar{X}_{posttest}$ =4.685). In the control group, on the other hand, there was no change in the level of educational beliefs in general. When the sub-dimensions of the scale were examined in terms of posttest, the highest sub-dimension is "Existentionalism" ($\bar{X}_{posttest}$= 4.138).

4.3. Opinions of pre-service teachers on the mobile-assisted online flipped learning process

In the research, data were collected through semi-structured focus group discussion to determine the opinions of pre-service teachers about the online flipped learning process supported by mobile applications. In the focus group discussion with the pre-service teachers chosen from the experimental group, their views

on the process, their views on the mobile application, and their views on in-class and post-class activities were examined.

4.3.1. Opinions of pre-service teachers about the mobile-assisted online flipped learning process

In the focus group discussion, pre-service teachers were asked for their views related to the process, and these views were presented in four sub-categories positive, negative, solutions to negativities, and skills gained, as seen in Table 5.

Table 5
Opinions of pre-service teachers on the mobile-assisted online flipped learning process

Theme	Category	Codes
Pre-service teachers' opinions about the process toward the developed setting	Positive	Content being intelligible,clear, and short
		Access to content irrespective of time and space
		Giving feedback in the application
		Coming to class prepared
		Easy access to content
	Negative	Limited time
		Having difficulty in classroom activities
		Having difficulty in Web 2.0 tools.
		Group Work
		Insufficiency of infrastructure
	Solutions to negativities	Getting support from peers
		Getting help from the instructor
		Using the mobile app
		Getting support from web platforms
		Lab use
	Skills gained	Computer use
		Content creation
		Content search
		Working collaboratively
Pre-service teachers' opinions about the application of the developed environment in other courses		Can be applied in a different course
		Cannot be applied in a different course
		Can be applied in some courses

Table 5 displayed that the pre-service teachers appreciated the parts of the process such as being intelligible, clear, and short. Also, they described the parts as being able to access to it irrespective of time and place, giving automatic feedback through the application, and coming to the lesson prepared. The pre-service teachers stated that the limited time in the activities and the intense in-class activities were the most difficult parts that they had. Pre-service teachers shared that they mostly received support from their friends, benefited from the mobile application, or received support from the instructor in order to overcome the parts they had difficulty with in the process. Considering the results of the focus group discussion, the pre-service teachers argued that the process was entertaining and instructive. Besides, pre-service teachers reported that they use the mobile application quite effectively and short content in the application contributed powerfully to their learning.

The pre-service teachers who participated in the focus group discussion stated that they gained skills such as using computers, producing content, searching for content, and working in collaboration at the end of the process. Moreover, pre-service teachers stated that the mobile-assisted online flipped learning process was appropriate to use in different courses. However, some pre-service teachers argued that this process could not be used in different courses, while others stated that it could only be applied in theoretical courses. Some of the pre-service teachers' views on the process were as follows:

"I liked the mini-tests, I liked the things that were scored there. When we saved our answer, it showed us our mistakes and gave the correct answers, it helped us learn better." (S2)

"I watched the videos you uploaded to the application a couple of times in the parts where we had difficulty … I sent you an e-mail once or twice." (S3)

"…Before we came to the class, the lecture notes related to the topic we were going to cover that week were uploaded very clearly, so we could access them easily and understand what was being lectured." (S4)

"I mostly had difficulties in group work… Acting together in group work and trying to work collaboratively sometimes caused a dispute." (S3)

"…I also learned a lot about how to use it regarding the copyright issue or whether it is the right source." (S5)

"I socialized more with my friends in the group although they weren't my close friends." (S5)

"I liked the topics being split up week by week and also liked that it was so simple and entertaining." (S5)

"…Actually, my technology skills have increased, and I know how to use more applications. When I was online, I found out what to do, what not to do, which application to use, and my search skill has improved." (S3)

"I don't think it can be applied particularly in quantitative courses, but rather it can be applied theoretical courses... I don't think it is quite appropriate for our department." (S1)

4.3.2 Opinions of pre-service teachers regarding the developed mobile application

In the focus group discussion, pre-service teachers were asked for their opinions on the mobile application, and these opinions were presented in two sub-categories as positive and negative opinions about the mobile application and the mini-tests on the mobile application, as seen in Table 6.

Table 6.
Opinions of pre-service teachers regarding the mobile application used in the mobile-assisted online flipped teaching process

Theme	Category	Codes
Opinions of pre-service teachers on the developed mobile application	Positive	Content being intelligible,clear, and short Layout of the content Mini-tests related to content Podcasts related to content Visually impressive There is no part that I do not like
	Negative	Portrait mode in the app. Podcasts related to content
Opinions of pre-service teachers about mini-tests in the mobile application.	Positive	Feedback Scoring system Ability to re-solve questions Consecutive presentation of questions on the relevant subject Helping to learn topics There is no part that I do not like
	Negative	Failure to save the given answers Some of the questions being detailed.

When Table 6 was examined, pre-service teachers stated that they liked the short content, the layout of the contents, and the mini-tests the most, regarding the mobile application. Despite the fact that there were pre-service teachers who do not like the portrait mode and content-oriented podcasts in the application, it was understood that the majority of the pre-service teachers liked all parts of the application. Pre-service teachers stated that they appreciated the feedback, scoring system, and the opportunity to solve the questions again in the mini-tests in the mobile application. Although not able to save the answers given to the questions and there were some opinions about the questions were detailed, the pre-service teachers liked all the parts of the mini-tests. Some of the opinions of pre-service teachers about the developed mobile application were as follows:

"I also liked the podcasts and lecture notes, we could listen to them and it wasn't too long, we could learn easily without getting bored." (S4)

"I would say it would be okay even if there were no podcasts." (S2)

"While watching the videos, I sometimes had problems when I flipped them horizontally." (S5)(S6)

"It helped me a lot to reinforce the topics. I think that I learned the topics mostly by solving the tests." (S3)

"It resets when I exit and re-enter the mini-tests." (S4)

4.3.3 Opinions of pre-service teachers about the in-class activities carried out.

In the focus group discussion, pre-service teachers were asked for their opinions about the in-class activities, and these opinions were presented in four sub-categories as individual studies, group studies, problems encountered in the process, and solutions to problems as seen in Table 7.

Table 7.
Opinions of pre-service teachers regarding the activities carried out in the course in the mobile-assisted online flipped teaching process

Theme	Category	Codes
Opinions of pre-service teachers about the developed in-class activities	Opinions on individual studies	Individual achievement Ability to produce content My prejudice against technology has been broken My self-confidence towards technology has improved My computer skills have increased
	Opinions on group work	Unproductive I learned to workcollaboratively
	Problems encountered	Disagreements Communication problems Incorrect assignment of tasks Not taking responsibility I didn't have any problems
	Solutions to problems	Getting support from the instructor Taking extra responsibility in the distribution of tasks Coming together on various platforms Getting support from the mobile application Discussing in consensus

According to Table 7, pre-service teachers stated that their individual achievements increased the most, their prejudices against technology were broken down and their self-confidence improved. Regarding the group activities carried out, the pre-service teachers shared that they were generally inefficient and the reason, was disagreements and communication problems. The pre-service teachers stated that they developed a solution to these problems by getting support from the instructor, taking more responsibility than necessary, or getting support from the developed mobile application. Thus, there were also pre-service teachers who do not have any problems and learn to work cooperatively in group activities, unlike the pre-service teachers who have problems. Some of the opinions of the pre-service teachers about the in-class activities were as follows:

"I broke my prejudice against technology and my self-confidence improved." (S5)

"It was nice because I could get along with my friends and I didn't have communication problems in group work. So, I liked group work more." (S4)

"…There were communication problems in group work. Even if I took responsibility, my other group friends did not take any responsibility." (S2)

"…I watched the videos or did individual activities in the mobile application, or I sent you an e-mail and I could solve it that way." (S4)

"I took too much responsibility, I think the burden was on me." (S2)

"I don't think I got any results from group work because we couldn't get along." (S2)

4.3.4 Opinions of pre-service teachers about the post-class activities carried out

In the focus group discussion, pre-service teachers were asked for their opinions on post-class activities, and these views were presented in three sub-categories as positive, negative, and the contribution of the pre-service teachers to learning, as seen in Table 8.

Table 8.
Opinions of pre-service teachers about the post-class activities carried out in the mobile-assisted online flipped teaching process

Theme	Category	Codes
Opinions of pre-service teachers on the extracurricular activities developed	Positive	Producing content in Web 2.0 tools
		Creating fun and different content
		Enhanced keyboard and productivity skills
	Negative	Problems with some Web 2.0 tools
		Some activities being hard
		Web 2.0 tools costing
	Contribution to pre-service teachers' education	Enabled us to produce content
		It made me look at my future working life from a different angle
		It attracted our interest and enabled us to actively participate
		I learned the tools that can be used in the lessons
		I learned effective ways of learning

As table 8 displayed, the pre-service teachers stated that the most positive aspect of the post-class activities was producing content in Web 2.0 tools, while they stated that some tools had problems and some activities were difficult as a negative aspect. Pre-service teachers stated that being able to produce content and contribute to future business life, post-class activities contribute to their learning most. Some of the opinions of the pre-service teachers about the extracurricular activities were as follows:

"In general, applications were not something I could learn outside of the classroom. It contributed a lot to me as a pre-service teacher." (S5)

"Sir, I liked Pixton the most, you dress him in clothes, you design them yourself, and it is very nice." (S2)

"… Memberships in powtoon were causing problems." (S3)

"I didn't even know how to prepare slides. Above all I learned how to prepare slides." (S2)

"I also learned effective teaching methods and it really broke my prejudices apart." (S5)

5. Discussion

As a result of the current study, there was a significant difference between the pre-service teachers in the experimental group in the course taught through the mobile-assisted online flipped teaching process. And, the pre-service teachers in the control group in the course taught through the leacture-based online instruction process in terms of information literacy skills. Although the pre-service teachers in both groups had a high level of information literacy skills at the beginning, the mobile-assisted online flipped teaching process increased the information literacy skills of the pre-service teachers more. Similar to the research findings in the studies on information literacy skills in the related literature, results show that pre-service teachers have high information literacy skills (Adıgüzel, 2014; Demiralay, 2008; Gülnar, 2016; Korkut & Akkoyunlu, 2008; Önal & Çetin, 2014; Tekkol & Demirel, 2018) and they have high information literacy self-efficacy (Usluel, 2006). On the other hand, there are also studies showing that teachers' or pre-service teachers' information literacy self-efficacy beliefs are low (Akkoyunlu & Kurbanoğlu, 2004) and that their information literacy levels are insufficient (Smith, 2013; Ünal & Er, 2015). In general, the research findings are similar to most of the studies in the literature. The studies in the related literature (Herold, 2012; Lage

et al., 2010; Mason, Shuman, & Cook, 2013) indicate that the flipped learning affects the learning experience in the classroom positively and time is used more efficiently along with this method. Hamdan et al. (2013) found in their study that the grades and the job satisfaction of 450 people who participated in the flipped learning practice increased and their general situation improved. Similarly, the mobile-assisted flipped learning environment used in quantitative courses is successful (Bolatlı, 2018). On the other hand, Hava and Gelibolu (2018) investgated the effect of flipped classroom model and digital citizenship teaching on various variables in their study. And, they concluded that there was no differentiation in the information literacy levels of the students as a result of the study. In the current study, the flipped learning process had an effect on the information literacy skills of the pre-service teachers, as in most studies in the literature.

The study findings also revealed that the highest educational philosophy in the experimental and control group was "Existentionalism", and the lowest educational philosophy was "Essentialism". Thus, the pre-service teachers in the both experimental and control groups mostly adopted the existentionalism philosoply of education. Also, that the pre-service teachers in the experimental group were higher than the pretest scores in terms of all sub-dimension of educational beliefs scale. In contrast, the posttest scores of the control group in terms of all sub-dimension of educational beliefs scale were lower than the pretest scores. When educational beliefs were examined on the basis of sub-dimensions, the difference between pretest and posttest is the most increased "Essentialism" sub-dimension in both experiment and control groups. However, although Essentialism education belief showed the highest increase in the experimental group due to the freedom that comes with mobile-assisted flipped learning, it did not have an effect on the direction of educational beliefs in general. In the related literature, there are studies showing that pre-service teachers' educational beliefs are high. For instance, Yeler (2022), in a study in which he examined the educational beliefs of primary school teachers who took drama courses, found that the educational belief levels of the participants were high. Balcı and Küçükoğlu (2018) found that teachers and pre-service teachers had high self-efficacy beliefs. Çelik and Orhan (2016), on the other hand, found no difference in the educational beliefs of pre-service teachers in their study. In these studies on the educational belief dimensions of pre-service teachers in the literature, educational beliefs were high in the dimension of contemporary phlisophy of education (Alkın-Şahin, Tunca, & Ulubey, 2014; Aslan, 2017; Berkant & Özaslan, 2019; Biçer, Er & Özel, 2013; Demirtaş & Battal Karaduman, 2016; Gökbulut, 2020; Kahramanoğlu & Özbakış, 2018; Sönmez Ektem, 2019; Tunca, Alkın-Şahin, & Oğuz, 2015; Yaralı, 2018; Yılmaz, Altınkurt, & Oğuz, 2012). In addition, Eğmir (2019) concluded that teachers and pre-service teachers generally had a belief in contemporary philosophy of education, in a study that analyzed studies conducted in Türkiye on educational beliefs. Accordingly, the findings of the research are in line with the literature. While no research has been found on the educational beliefs of the flipped learning process, there is a study that the traditional learning environment does not have an effect on the educational beliefs of the pre-service teachers whereas the constructivist learning environment has an effect on their educational beliefs (Duru, 2014). Thus, the flipped teaching process, which provides a reconstructivist learning environment, has an effect on educational beliefs. The findings of the research support this fact.

As a result, the pre-service teachers in the experimental group who experienced the mobile-assisted online flipped learning process mostly had positive opinions. Most of them have stated that the model is useful. Most of the pre-service teachers stated that the model should be applied in different courses as well. Student's pleasure regarding the flipped learning process is prominent in the literature. In the studies examined on this model, it is clear that most of the students' opinions in the groups in which the model was applied were positive (Datig & Ruswick, 2013; James, Chin & Williams, 2014; Pinto & Little, 2014; Roach, 2014). In addition to these studies, student groups who experienced the model in different studies found the model entertaining (Lemmer, 2013) and expressed that they wanted to use it again in their courses (Rivera, 2015). The studies reviewed are in line with the results of this study. In the study, pre-service teachers stated that the videos on the mobile application were useful in preparing for the lesson. They stated that it is

substantial that the videos be short and that the contents be clear and short. Ekren and Akkul (2013) stated that the videos used in training would be beneficial to students in explaining the subject. At the same time, videos that appeal to more than one sense contribute positively to the motivation of the students. This results is in line with the current study findings. Therefore, the pre-service teachers stated that the videos motivate them and that they can perform whenever and wherever they would like to. Bergman and Sams (2007) stated that videos form the basis of the flipped learning process. Moreover, they have shown that the videos can be turned into the advantage of learning technology by designing them in accordance with all senses. Bishop and Verleger (2013), on the other hand, argued that the flipped learning process without video would be limited in achieving success. In the research, pre-service teachers also stated that they can access the content whenever they want with the application they install on their mobile devices, they can get prepared before the class and repeat the content as much as they want. In this way, they expressed that they have a more positive attitude towards technology, also overcome their prejudices against technology and that their self-confidence has improved. They also stated that they learned how to search on the internet, how to use the information they obtained, and that their technology skills increased. Francl (2014) stated that the flipped learning approach is a practicable system in the era of technology that the courses and activities taught in the traditional teaching environment are left behind, and that smartphones and portable tablets should now be used in the internet era. This finding is also parallel with the results of information literacy and educational beliefs being high.

6. Conclusion and Suggestions

6.1. Conclusion

To conclude, it is clear that the posttest scores of the pre-service teachers in the experimental group are higher than the pretest scores in terms of information literacy. Thus, the teaching conducted through the mobile-assisted flipped learning model applied in the experimental group improved the information literacy skills of the pre-service teachers. In terms of information literacy skills, the posttest scores of the pre-service teachers in the control group were lower than the pretest scores. When the difference between the posttest scores of the pre-service teachers studying in the mobile-assisted online flipped teaching environment and the pre-service teachers studying in the leacture-based online instruction environment according to the information literacy scale was examined, it was observed that there was a significant difference in favor of the experimental group. In other words, the information literacy skills of pre-service teachers studying in a mobile-assisted online flipped learning environment increased more than the pre-service teachers studying in a leacture-based online instruction environment. Considering the sub-dimensions of the information literacy scale, “ethical and legal settings in use of information” were identified as the most developed sub-dimension in the experimental group. When the sub-dimensions of the scale were examined in terms of posttest, the highest sub-dimension in the experimental and control groups was the “ethics and legal settings in use of knowledge”. In the control group, on the other hand, there was no positive change in their information literacy skills in general. As a consequence of the research, the posttest scores of the pre-service teachers in the experimental group were higher than the pretest scores with respect to their educational beliefs scale scores. So, the teaching performed via the mobile-assisted online flipped learning model applied in the experimental group increased the education beliefs scale scores of the pre-service teachers. The posttest scores of the pre-service teachers in the control group were lower than the pretest scores in terms of all sub-dimension of educational beliefs scale. The difference between the posttest scores of the experimental group and control group regarding the educational belief scale displayed that the educational beliefs scale scores of pre-service teachers studying in experimental group increased more than control group. The analysis of sub-dimensions of the educational belief scale shows that the most developed sub-dimension was the “Essentialism” sub-dimension in the experimental group. When the sub-dimensions of the scale were analyzed regarding the posttest, it was determined that the highest sub-dimension in the

experimental and control groups was the "Existentionalism". In the control group, on the other hand, there was no positive change in the level of their educational beliefs in general.

In the current study, the mobile-assisted online flipped learning process contributed positively to the learning process of pre-service teachers. It has been detected that the favorite part of the pre-service teachers in the process is that the content is clear and intelligible, and the most difficult parts are being given a short time. Pre-service teachers stated that they received help from their friends and instructors to overcome the difficult parts of the process and stated that the process provided them with the skills of using computers, searching for content, and producing content. Moreover, they shated that alongside their individual and group activities, also their individual success in the class increased. And also, their prejudices against technology were broken down and their self-confidence improved. They indicated that they gained skills such as using a computer, producing content, searching for content, and working in collaboration. Thus, the mobile-assisted online flipped learning process contributed positively to the pre-service teachers. The pre-service teachers underlined that the favorite part of the mobile application they used in the flipped teaching process was the detailed and regular content, the short videos, the instructive aspect of the mobile application, and the ability to access the classes again as much as they desired. They also expressed that being prepared for the lesson motivated them to attend the lessons. Although they atgued that they had difficulty with the limited time given and intense activities, they used the mobile application and received support from their friends and the instructor to overcome this problem. Most of the pre-service teachers who participated in the focus group discussion expressed the applicability of the flipped learning process in different courses. When evaluated in general, the learning environment was found entertaining and instructive by the pre-service teachers who had the experience of flipped learning, the pre-service teachers could use the mobile application efficiently, and that the contents' being brief was effective for them to learn.

6.2. Suggestions

The effect of the mobile-assisted online flipped learning process on information literacy and education beliefs of merely pre-service teachers was analyzed in the current study. In the following studies, the effect of mobile-assisted online flipped learning process on 21st-century skills such as creative thinking, problem-solving and critical thinking can be investgated. The current study was carried out on pre-service teachers studying in the Guidance and Psychological Counseling Department. In further research, information literacy and educational beliefs of pre-service teachers in different teaching programs can be studied. Additionally, to ensure the generalizability of the research, it can be studied on a larger sample group. As a result of the research, the developed mobile application decreases prejudices and increases the technological knowledge of the pre-service teachers. In following studies, the effects of different settings such as chat, forum, augmented reality and virtual reality, which will be added to the mobile application, on the prejudice and motivation towards technology can be researched. Most of the participants in the study are female. By means of the next research to be carried out, the mobile-assisted online flipped learning process can be examined in terms of gender variables. As a result of the research, the mobile-assisted online flipped learning process contributed positively to the information literacy skills and educational beliefs of the pre-service teachers. Therefore, mobile-assisted flipped learning model can be used to increase the quality of the online teaching process. In the focus group discussion, pre-service teachers stated that the short, clear, and clear content of the mobile application had a positive outcome in the process. While designing technological settings, it can be ensured that the contents such as video, audio, and text to be short, clear, and intelligible. By adding games to the mobile application, it can be turned into a more enjoyable process.

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