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Evaluation of digital instructional materials developed by primary school teacher candidates with different learning styles

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Highlights

- Most of the primary school teacher candidates used visual learning style.
- The primary school teacher candidates used Web 2.0 tools particularly for measurement-evaluations.
- The Web-2.0-supported material development process significantly increased the digital teaching material development self-efficacy of the primary school teacher candidates according to their learning styles.

Article Info: Research Article

Keywords: *Instructional material, learning styles, self-efficacy, Web 2.0*

Abstract

This embedded design mixed-method study aimed to evaluate the teaching materials developed by primary school teacher candidates using Web 2.0 tools in line with their learning styles. The participants comprised 60 primary school teacher candidates identified via purposive sampling. The data were collected with the Maggie McVay Lynch Learning Style Inventory and the Digital Teaching Material Development Self-Efficacy Scale, and from the products of the primary school teacher candidates. Inventory data were subjected to descriptive statistics, the product data were subjected to descriptive analysis and the scale data were subjected to the paired sample t-test of inferential statistics techniques. The results indicated that the majority of the primary school teacher candidates had visual learning styles and used Kahoot and LearningApps Web 2.0 tools for measurement-evaluation and Canva and Emaze for presentation purposes. In addition, the material development process according to learning styles significantly increased the participants' self-efficacy in developing digital teaching materials. Based on these results, it was suggested to determine the learning styles of teacher candidates to develop teaching materials accordingly.

1. Introduction

Individuals differ in terms of cognitive, behavioral, emotional, economic, cultural and social characteristics due to their innate characteristics and the environment wherein they grow up. This differentiation diversifies the tendency, interest, desire and ability of the students (Ministry of National Education [MoNE], 2018a) and determines their learning styles and preferences. As a result, students' readiness, interest, cognitive ability and learning styles differ in the learning environment (Gülay, 2021). Learning style can be expressed as a preference for perceiving, processing, comprehending, and remembering information (Dunn & Dunn, 1993; Kolb, 1984). In other words, it is the innate desire and tendency of the individual to reach and comprehend information (Güven, 2004). Although various researchers explained learning styles (Butler, 1987; Canfield, 1988; Felder & Silverman, 1988; Fleming & Mill, 1987; Grasha & Riechmann, 1975; Gregorc, 1985; Hunt, 1979; Jung, 1971; Kolb, 1976; Lawrence, 1982; McCarthy, 1984; Reinert, 1976; Silver & Hanson, 1996), the model developed by Dunn and Dunn (1993) has attracted attention. Dunn and Dunn's (1993) model stands out among the models in the literature considering that it was developed for

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use in primary, secondary and other formal education institutions (Cassidy, 2004) and that teachers will work with the students in these schools. Expressed as ways of focusing on learning and processing information, this model associates learning with the stimuli in the environment and the stimuli preferred by individuals reveal the differences in their learning styles (Dunn, 1983).

According to the model cognitive, environmental, affective, physical, psychological and social factors affect learning. Cognitive characteristics of individuals such as receiving, processing, coding, storing, and decoding information differ. Individuals prefer to learn in different environments in terms of heat, light, environment, and sound (Aivazidi & Michalakelis, 2022; Zadja, 2023). In the learning process, the affective characteristics of individuals such as locus of control, attention, motivation, interest, excitement, determination, motivation, patience, progression, responsibility, and structure also differ. In addition, physical characteristics of individuals such as sensory preference, movement, food, and time differ (Putri et al., 2023; Schneider et al., 2022). Moreover, individuals have different psychological characteristics such as the way their brain works, their way of thinking and entrepreneurship in the learning process (Raj & Renumol, 2022; Troussas et al., 2023). Finally, individuals prefer different learning styles within their learning processes including different learning methods, authority images or learning groups (Aguilar et al., 2022). In summary, the learning preferences of individuals in this model differ such as working individually or in a group, making their own decisions or being directed, by hearing, seeing, touching, sitting or moving, working in a loud or silent environment, and working constantly or less. In the learning environment, the physical factors dimension of this model attracts attention (Anggraeny & Dewi, 2023; Chouhan et al., 2023). It has been accepted that students have three learning styles: visual, auditory and tactile/kinesthetic (Arono et al. 2022; Fithrotunnisa et al., 2022; Syofyan & Siwi, 2018). Visual learners, who highly consider order, are not interested in learning by the method of expression as they prefer to learn by using visuals such as computers, charts, lines, interactive boards, graphics, maps, posters, pictures, symbols, diagrams, and/or videos (Feruza, 2022; Uduak & Kasumu, 2022). Auditory learners, who are willing to talk, expect to learn by working with others, by listening, by speaking, by reading aloud, by chatting or by discussing. Kinesthetic learners do not like to stay where they are, are active, prefer to move constantly, and learn by doing (Ariastuti & Wahyudin; 2022; Gilakjani, 2012; S K & Helena, 2017). Thus, natural and historical travel activities, drama and role-playing techniques, laboratory work and experiments (Gülay, 2021), educational computer games, and Web 2.0 tools can be used for teaching these students (Antonio, 2022; Azid et al., 2022; Olaniran, 2009).

It is important to determine the learning styles of students to consider the individual differences in the learning environment, to meet the expectations, and thus to plan and perform the teaching accordingly (Aguilar et al., 2022; Munoz et al., 2022; Raj & Renumol, 2022). Being aware of the learning style of students contributes to the learning process in making it easy, fun and rich, in providing meaningful and permanent learning, in supporting academic success, in increasing motivation and self-confidence, in developing the ability to take responsibility and making decisions, and in enabling the individual to determine the appropriate methods and techniques (Ataseven & Oğuz, 2015; Çiloğulları, 2019; Yeşilyurt, 2019). In addition, determining the learning styles of students makes the classroom management and guidance process effective as the teacher prepares the materials and activities accordingly (Yeşilyurt, 2019). In classrooms where learning styles are not known and/or not considered, the teaching process will appeal to auditory learners who prefer to learn by listening to others, and partially to visual learners; as a result, visual and kinesthetic learners will be neglected and their expectations will not be adequately met (Gülay, 2021), resulting in learning difficulties (Ataseven & Oğuz, 2015). It is, therefore, of great importance for students and teachers to be aware of their learning styles. Learning styles are determined through various scales developed by different researchers in the literature. In addition, tools such as Kolb, Maggie McVay Lynch, the Vermunt Learning Style Inventory and the Grasha-Riechmann Learning Style Scale can be used to determine the learning styles of both students and teachers.

One of the technological materials that teachers can use to consider their students' different learning styles (Pürbudak, 2020) and that students with individual differences can use to reach proper content is Web 2.0

tools (Hargadon, 2009; Yapıcı, 2022). Web 2.0 tools are environments where users can be active, contribute to existing content, make additions (Zdravkova, 2023), and share with large audiences in a short time (Magnuson, 2012) regardless of time and place (Çelenk & Tatlı, 2022; Karamete & Yaşar, 2018). These tools with their remarkable content (Yapıcı, 2022) and instant detailed feedback, simultaneous and collaborative use, and interactive structure (Erol-Şahin & Kara, 2022) are used in determining and eliminating the learning deficiencies of students and considering individual differences such as learning styles (Tatlı et al., 2019). Web 2.0 tools are used in education for presentations, word clouds, concept maps and diagrams, measurement-evaluations, information graphic (infographic) creation, games and gamification, animation preparation, online meetings, augmented reality, and blog creation (Uysal, 2020). Frequently used tools for this purpose are Creately, EDpuzzle, Edraw Max, Glogster, IMindMap, Kahoot, Mindmeister, Pixton, PowToon, Quickworksheets, Smartdraw, Storyboard That, Wizerme, (Tatlı, 2020a) and Crowdsignal, Gradecam, Kubbu, Learningapps, Mentimeter, Plickers, and Tools such as Proprofs, Quick Key App, Quizizz, Quiz Maker, Socrative, Surveymonkey, and Testmoz (Tatlı, 2020b). Teachers' ability to use these tools effectively is related to their self-efficacy in developing digital learning materials (Birişçi et al., 2018), which is their beliefs about being able to develop content by using technological opportunities and tools in their teaching processes (Sun et al., 2008). The use of Web 2.0 tools in teaching environments will not be effective when teachers' beliefs are low (Pan & Franklin, 2011). On the contrary, when their digital teaching material development self-efficacy is high and Web 2.0 tools are used effectively for teaching purposes, interest and motivation increase, interaction and cooperation between students are ensured, and active, fun, meaningful and permanent learning is realized (Çelebi & Satırlı, 2021; Erol-Şahin & Kara, 2022; Karamete & Yaşar, 2018; Oon et al., 2023; Özcan, 2022; Uyulgan & Akkuzu-Güven, 2022). In addition, these tools enable teachers to produce easy content and to provide guidance to students (Çelenk & Tatlı, 2022). Teachers learning to use Web 2.0 tools that have such benefits for students and themselves in the pre-service period provide alternative learning environments and materials when face-to-face education cannot be provided in such cases as the pandemic to enrich distance education. However, it is stated in the literature (Aksoy et al., 2021; Bakır, 2016; Bediroğlu, 2021; Gökbulut, 2021; Karakuş & Gürbüz, 2019; Keskin & Küçük, 2021; Yıldırım, 2015) that there is not a training program for primary school teachers to develop digital teaching materials during their undergraduate education. As a matter of fact, when the primary school teaching undergraduate program is examined, it is seen that there is no course for such education (Council of Higher Education [CoHE], 2018). On the other hand, it is obvious that only teachers who have a good command of technology will use knowledge effectively. Therefore, in this information age of fast sharing and production, teachers should acquire digital material development skills and use them throughout their professional lives (Keskin & Author, 2015). Accordingly, the educational content provided to teacher candidates should support this process.

The basic principle in the sixth article of the National Education Basic Law Number 1739 states that "Individuals are directed to various programs during their education in line with their interests, talents and abilities" (National Education Fundamental Law, 1973, p. 5102). In addition, the current Life Studies Curriculum recommends that "Teachers in and out-of-school practices should take into account the cognitive, affective and psychomotor development of students and their individual differences" (MoNE, 2018a, p. 10). Moreover, it is expressed in the 2023 Education Vision Document that, "A goal-structure-behavior relationship that considers the individual differences of learners should be aimed at all school levels" (MoNE, 2018b, p. 22). It is emphasized in all the above-mentioned articles that our education system and teachers are expected to consider the individual differences of students such as learning styles and to carry out the learning process properly (Gülay, 2021). There are several studies in the literature in which the learning styles of teacher candidates are examined according to variables such as gender, program, and grade level (Bezen & Demirkasımoğulları, 2023; Çiloğulları, 2019; Çokbilir, 2019; Demir, 2010; Eskici, 2008; Gökdağ, 2004; Güneş, 2004; Güven, 2004; Hakim et al., 2022; Otrar, 2006, Yılmaz, 2004). There are also studies examining the effects of learning styles on academic achievements, permanent learning, self-confidence, self-efficacy, problem-solving skills, epistemological belief levels, metacognitive learning strategies, critical thinking disposition, test anxiety, and technology use intention (Azizoğlu & Çetin, 2009;

Baydar, 2012; Çağlayan, 2007; Feruza, 2022; Gülözer, 2010; Günal, 2019; Keleşoğlu, 2011; Önder, 2012; Özkan, 2013; Qian et al., 2023; Tepehan, 2004; Utanır, 2008; Ünal, 2021, Yılmaz, 2014). Studies examining the effects of teacher candidates' learning styles on their teaching are limited. In these studies, science teacher candidates preparing lesson plans and portfolios according to their learning styles (Balaban, 2016), mathematics teacher candidates creating problems according to learning styles (Akbay, 2021), the effect of web-based education based on learning styles on the academic success of secondary school students (Pürbudak, 2020; Wang et al., 2006), and its effect on the success and permanent learning of high school students (Bayır, 2007) were examined. In the literature, no research could be found that examines the effect of primary school teacher candidates' learning styles on their teaching. Taking the learning styles into consideration will also provide an understanding of the fact that students labeled as lazy or naughty cannot learn or behave in an undesirable way simply because their learning styles are not taken into account (Boydak, 2017). How important it is for teachers to determine and take into account individual differences such as students' learning styles is realized in terms of general competencies of the teaching profession and to teach accordingly. Teachers' learning styles affect their understanding of teaching (Yılmaz, 2014) and consequently their teaching (Şentürk & Yıldız-İkikardeş, 2011). Therefore, determining the learning styles of teacher candidates and examining the materials they will prepare accordingly will support the quality of the teaching process (Claxton & Murrell, 1987). In this regard, that the teachers who will teach according to the learning styles of the students be aware of their own learning style, taking into account the individual differences of the students such as learning styles and teaching accordingly will contribute to the education process and the literature. In addition, the research will also contribute to the literature since it is necessary to examine the self-efficacy of teachers in developing digital teaching materials before and during the service in today's rapidly developing technology (Birişçi et al., 2018; Korkmaz et al., 2019). In line with this purpose, this research seeks answers to the following questions:

1. What are the learning styles of primary school teacher candidates?
2. What is the relationship between the learning styles of primary school teacher candidates and the digital instructional materials they create?
3. What is the effect of digital instructional materials education for primary school teacher candidates on their digital instructional materials development self-efficacy?

2. Methodology

2.1. Research Model

In this study, a mixed method was used to determine the relationship between the learning styles of the pre-service classroom teachers and the Web-2.0-supported teaching materials they developed, and to evaluate the effect of the material development process based on the learning styles on digital teaching material development self-efficacy. In this approach, the scope of the research was expanded by collecting both quantitative and qualitative data (Çepni, 2010). Moreover, more findings and results related to the purpose of the research could be obtained and presented (Christensen et al., 2015). In the research, the embedded design mixed method was used. In this context, the products obtained from the Web 2.0 tools developed by the students were examined and the relationship of these materials with the students' respective learning styles was evaluated. In addition, the Web-2.0-supported material development process was evaluated using an experimental study according to this learning style. In this context, qualitative and quantitative data for research questions were collected simultaneously (Creswell, 2016).

2.2. Participants

The study group of the research was determined with the purposive sampling method, since it provided in-depth research, descriptions, and rich information (Büyüköztürk et al., 2016; Ekiz, 2015). Considering that the participants would develop digital teaching materials according to their learning styles, second grade teacher candidates studying instructional technologies were included in the study. Convenience sampling was employed to contact qualified primary school teacher candidates more easily and to speed up the

process (Christensen et al., 2015; Ekiz, 2015). In this context, the study group consisted of 60 (42 female, 18 male) primary school teacher candidates studying in their second year at a state university in the Black Sea Region. In line with the ethical principles of the research, the participants were informed about the process and their consent was obtained. In addition, to respect the privacy rights of the individuals, to ensure confidentiality, and to follow ethical principles, the names of the university and the faculty and teacher candidates were not mentioned in the research report (Çepni, 2010; Ekiz, 2015).

2.3. Data Collection Tools

The data were collected with the Maggie McVay Lynch Learning Style Inventory and the Digital Teaching Material Development Self-Efficacy Scale, and from the products of the primary school teacher candidates. The Maggie McVay Lynch Learning Style Inventory, which is used to determine the learning styles of prospective classroom teachers, was adapted into Turkish by Dağhan and Akkoyunlu (2011). The validity and reliability study of the 3-point Likert-type inventory was conducted. This inventory consisted of three dimensions and 59 items: visual learning style (21 items), auditory learning style (19 items), and kinesthetic (moving) learning style (19 items). All these dimensions explained 88.358% of the total variance, which is an acceptable value since it is at least above 50-60% (Williams et al., 2010). The standardized Cronbach Alpha reliability coefficient value of the inventory was 0.95 and this value was sufficient since it was over 0.70 (Büyüköztürk, 2015; Cronbach, 1990; Pallant, 2010). In addition, the split half reliability estimate of the scale was 0.94, which is an acceptable value since it was above 0.80 (Büyüköztürk, 2002). Therefore, the inventory was considered valid, reliable, and useful in determining the learning styles of teacher candidates (Dağhan & Akkoyunlu, 2011).

Web-2.0-supported products were used in the evaluation of the teaching materials developed by the primary school teacher candidates according to their learning styles. The study participants developed these teaching materials after deciding on the targeted primary school grade level and course in line with their purpose (assessment-evaluation, presentation, etc.) by using their preferred Web 2.0 tool (Kahoot, Canva, etc.) according to their learning styles. In this context, 11 of the teaching materials were prepared for the first grade, 42 for the second grade, 87 for the third grade, and 68 for the fourth grade. In the context of the course, four of these teaching materials were developed for the English language subject, 25 for mathematics, 42 for Turkish, 42 for life studies and 95 for science.

The five-point Likert-type Digital Teaching Material Development Self-Efficacy Scale (Korkmaz et al., 2019) was used to determine the effect of the material development process on digital teaching material development self-efficacy according to the learning styles of the primary school teacher candidates. The scale consisted of three dimensions and 38 items: Web 2.0 development, design, and negative view. All these dimensions explained 62,001% of the total variance, which was an acceptable value since it was above 50-60% (Williams et al., 2010). The Cronbach Alpha reliability coefficients were 0.96 for the whole scale and between 0.87 and 0.97 for the dimensions, which were sufficient as is the values were all over 0.70 (Büyüköztürk, 2015; Cronbach, 1990; Pallant, 2010). In addition, the test-retest correlation of the scale as 0.95, which was an acceptable value since it was over 0.80 (Büyüköztürk, 2002). In this respect, it can be stated that the scale was valid, reliable, and useful in determining the self-efficacy of the educators in developing the digital teaching materials (Korkmaz et al., 2019).

2.4. Data Collection Process

This study aimed to evaluate the Web-2.0-supported teaching materials developed by the primary school teacher candidates according to their learning styles. The flow of the research is summarized in Figure 1.

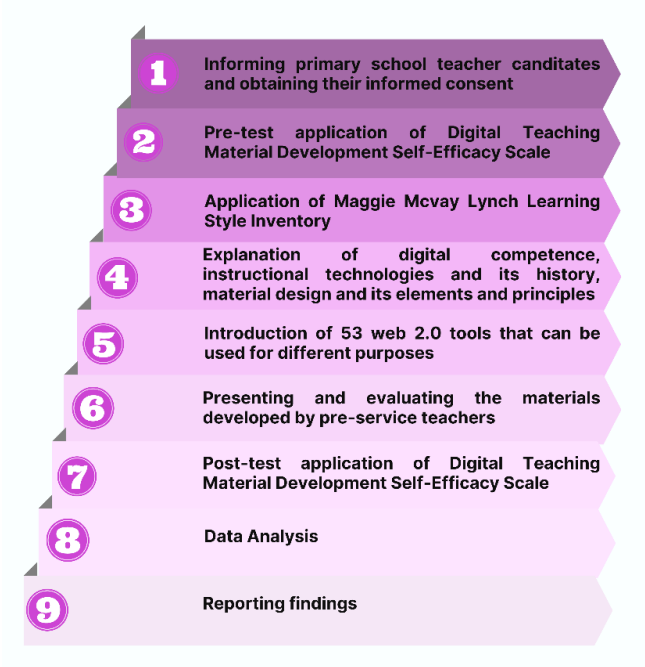


Fig. 1. Research flow

As can be seen in Figure 1, first, the primary school teacher candidates were informed about the process and their informed consent were obtained. Then, the Digital Teaching Material Development Self-Efficacy Scale was administered online to the study participants as a pre-test. In addition, the Maggie McVay Lynch Learning Style Inventory was applied online to determine the learning styles of the students. Then, for 14 weeks (two lesson hours each week), which is a long time in terms of the reliability of the research (Creswell, 2016; Ekiz, 2015), the participants were theoretically and practically introduced to Web 2.0 tools online, and they were asked to develop and present teaching materials. In this process, digital competence in the first week, instructional technologies and their history in the second week, and material design, elements, and principles in the third week were explained to the primary school teacher candidates. Over the next nine weeks, the use of 53 different Web 2.0 tools for presentations, word clouds, infographics, concept maps and diagrams, measurement-evaluations, games and gamification, animations, online meetings, augmented reality, and blogging were introduced, and the primary school teacher candidates were asked to develop materials using the Web 2.0 tool they selected. In the last two weeks, these products were presented to the study participants and then evaluated. After the Web-2.0-supported teaching materials were developed, the Digital Teaching Material Development Self-Efficacy Scale was provided online to the students as a post-test. In the last two weeks, these products were presented to the participants and then evaluated. After completing the Web-2.0-supported teaching material development, the Digital Teaching Material Development Self-Efficacy Scale was applied online to the students as a post-test.

2.5. Data Analysis

The Maggie McVay Lynch Learning Style Inventory data were analyzed with descriptive statistics. The data were summarized as average, frequency, etc. values (Christensen et al., 2015; Creswell, 2016). In this context, first, the arithmetic mean of each of the scores of the "visual learning style, auditory learning style, and kinesthetic learning style" dimensions of the classroom teacher candidates was calculated. Then, it was determined that each participant had the learning style for the dimension with the highest arithmetic mean. In cases where the arithmetic means were equal or close, it was accepted that the individual had more than one learning style (Dağhan & Akkoyunlu, 2011). These learning styles were visualized using graphics. The products of the Web-2.0-supported teaching materials developed by the participants were subjected to descriptive analysis. In this analysis technique, in which a situation is directly defined and explained, the

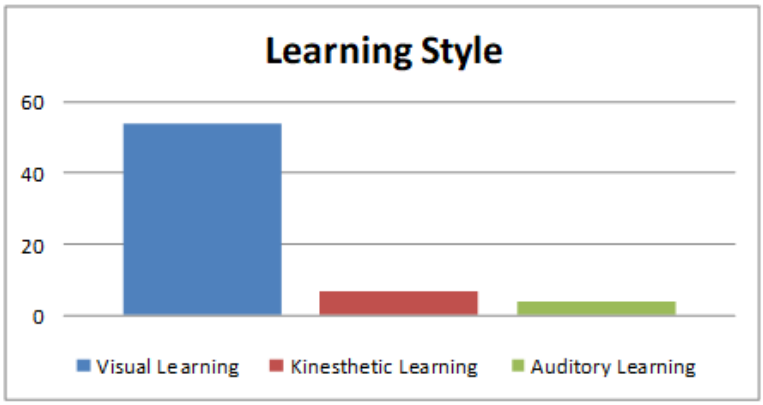
data are placed in predetermined codes and categories (Ekiz, 2015). In this context, first, 208 materials were classified according to their development purposes (assessment-evaluation, presentation, etc.). Then, the material development purposes preferred by the participants for each learning style were determined. Finally, the purposes of using each of the Web 2.0 tools with each learning style were revealed. In terms of the reliability of the research, this process was carried out by two researchers, presented for review by another two researchers, and then a consensus was reached by discussing the findings (Creswell, 2016; Ekiz, 2015). These findings were presented in a more understandable and holistic way using graphics and tables. While analyzing the Digital Teaching Material Development Self-Efficacy Scale data, first, the reverse items of the "negative view" dimension in the SPSS program were reversed. Then, inferential statistics were used to statistically compare the mean scores of the participants between the pre-test and post-test (Ak, 2010) and to make inferences about them (Christensen et al., 2015). After confirming that the data showed a normal distribution, the paired sample t-test, one of the parametric hypothesis tests, was performed (Karaatlı, 2014). The result of this test was presented in a more holistic way using a table.

3. Results

The findings of the data analysis carried out to determine the learning styles of the primary school teacher candidates, the relationship of these styles with the Web-2.0-supported teaching materials they developed, and the effect of the material development process on digital teaching material development self-efficacy according to these styles and their interpretation are included in this section.

3.1. Findings on the Distribution of the Learning Styles of the Primary School Teacher Candidates

The results of the data analysis carried out to determine the distribution of learning styles of the primary school teacher candidates is presented in Graph 1.



* Five primary school teacher candidates have more than one learning style

Graph 1. Primary school teacher candidates' learning styles

Graph 1 revealed that the majority of the primary school teacher candidates used the visual learning style (f=54), seven participants used the kinesthetic learning style and four participants used the auditory learning style.

3.2. Findings on Digital Teaching Materials Developed by Primary School Teacher Candidates According to Their Learning Styles

The findings regarding the purpose of developing digital teaching materials according to the learning styles of the primary school teacher candidates are presented in Figure 2.

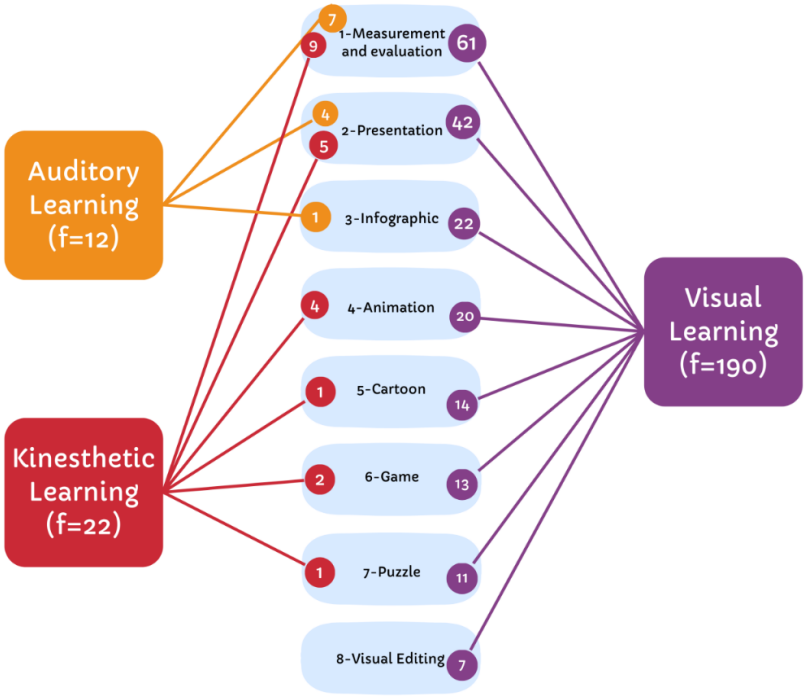


Fig. 2. Purposes of developing digital instructional materials according to the learning styles of the primary school teacher candidates

Figure 2 revealed that most of the digital teaching materials were developed by primary school teacher candidates using the visual learning style. The participants prepared their materials for measurement and evaluation (f=61), for presentations (f=42), for infographics (f=22), for animations (f=20), cartoons (f=14), for games (f=13), for puzzles (f=11), and for visual arrangements (f=7). The participants using the kinesthetic learning style developed digital teaching materials for measurement and evaluation (f=9), for presentations (f=5), for animations (f=4), for games (f=2), for cartoon (f=1), and for puzzles (f=1). The participants using the auditory learning style developed digital teaching materials for measurement and evaluation (f=7), for presentations (f=4) and for infographics (f=1).

The findings regarding the Web 2.0 tools used by the primary school teacher candidates in developing digital teaching materials for measurement and evaluation according to their learning styles are presented in Figure 3.

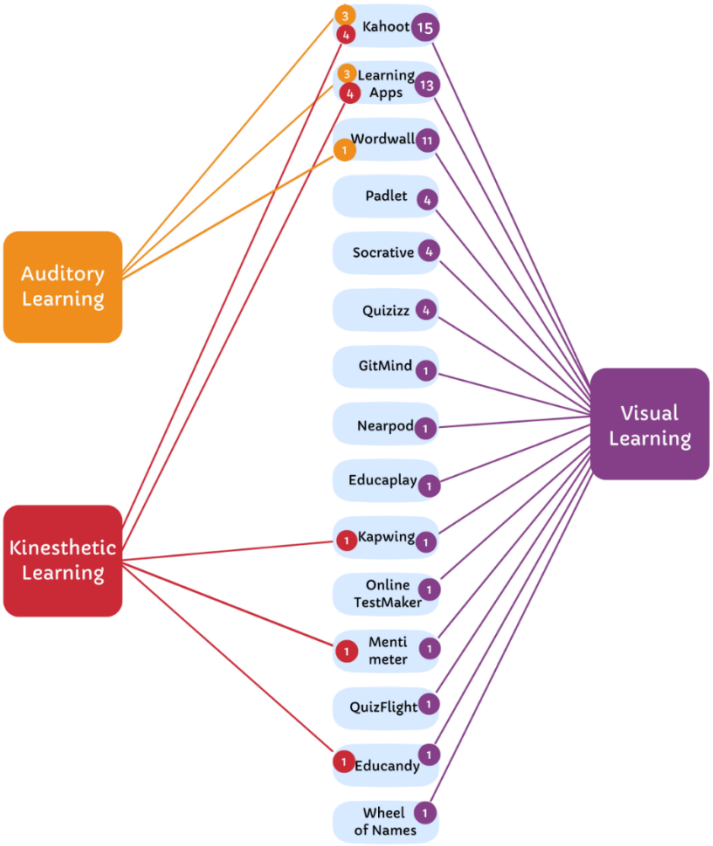


Fig. 3. Web 2.0 tools used by primary school teacher candidates in developing digital instructional materials for measurement and evaluation according to their learning styles

Figure 3 revealed that the primary school teacher candidates using the visual learning style who developed most of the digital teaching materials used 15 different Web 2.0 tools, primarily Kahoot (f=15), Learning Apps (f=13), Wordwall (f=11), Padlet (f=4), Socrative (f=4), and Quizizz (f=4), for measurement and evaluation purposes. The participants using the auditory learning style used Kahoot (f=3), Learning Apps (f=3), and Wordwall (f=1) for this purpose. The participants with kinesthetic learning style preferred Kahoot (f=4), Learning Apps (f=4), Kapwing (f=1), Mentimeter (f=1), and Educandy (f=1).

The findings regarding the Web 2.0 tools used by the primary school teacher candidates in developing digital teaching materials for presentation purposes according to their learning styles are presented in Figure 4.

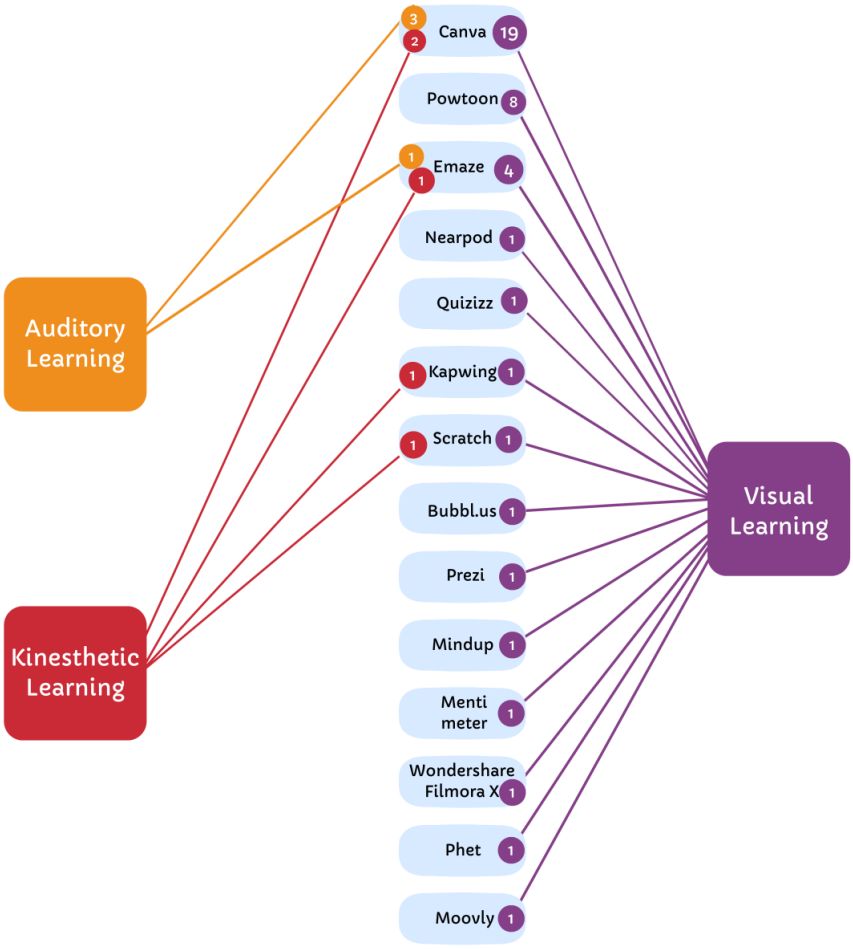


Fig. 4. Web 2.0 tools used by primary school teacher candidates in developing digital instructional materials for presentation purposes according to their learning styles

Figure 4 revealed that the participants using the visual learning style essentially developed Web 2.0 tools for presentation purposes. These participants used 14 different Web 2.0 tools, primarily Canva (f=19), Powtoon (f=8), and Emaze (f=4), for presentation purposes. The participants using the auditory learning style used Canva (f=3), and Emaze (f=1). The participants using the kinesthetic learning style preferred Canva (f=2), Emaze (f=1), Kapwing (f=1), and Scratch (f=1).

The findings regarding the Web 2.0 tools used by the primary school teacher candidates in developing digital teaching materials for infographic purposes according to their learning styles are presented in Figure 5.

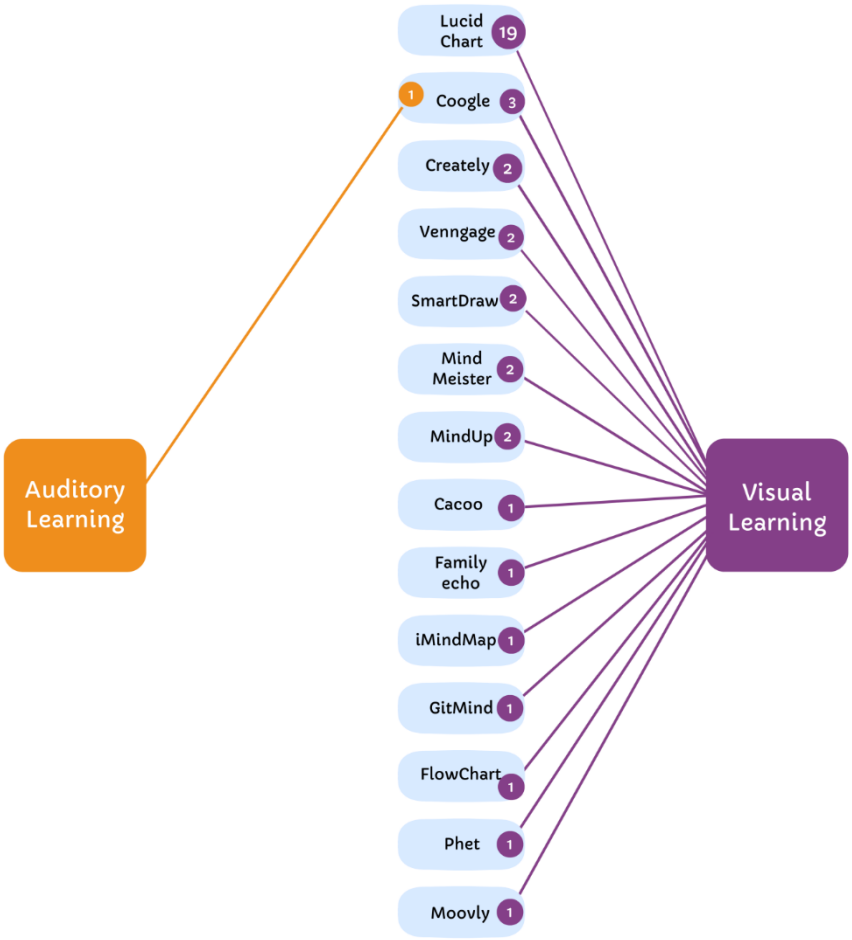


Fig. 5. Web 2.0 tools used by primary school teacher candidates in developing digital instructional materials for infographic purposes according to their learning styles

Figure 5 revealed that the participants using the visual learning style essentially developed Web 2.0 tools for infographic purposes. These participants used 14 different Web 2.0 tools, primarily Lucid Chart (f=19), Coogle (f=3), Creately (f=2), Venngage (f=2), SmartDraw (f=2), MindMeister (f=2), and MindUp (f=2), for infographic purposes. The participants using the auditory learning style used Coogle (f=1). The participants using the kinesthetic learning style, on the other hand, did not prefer to use Web 2.0 tools for this purpose.

The findings regarding the Web 2.0 tools used by the primary school teacher candidates in developing digital teaching materials for animation according to their learning styles are presented in Figure 6.

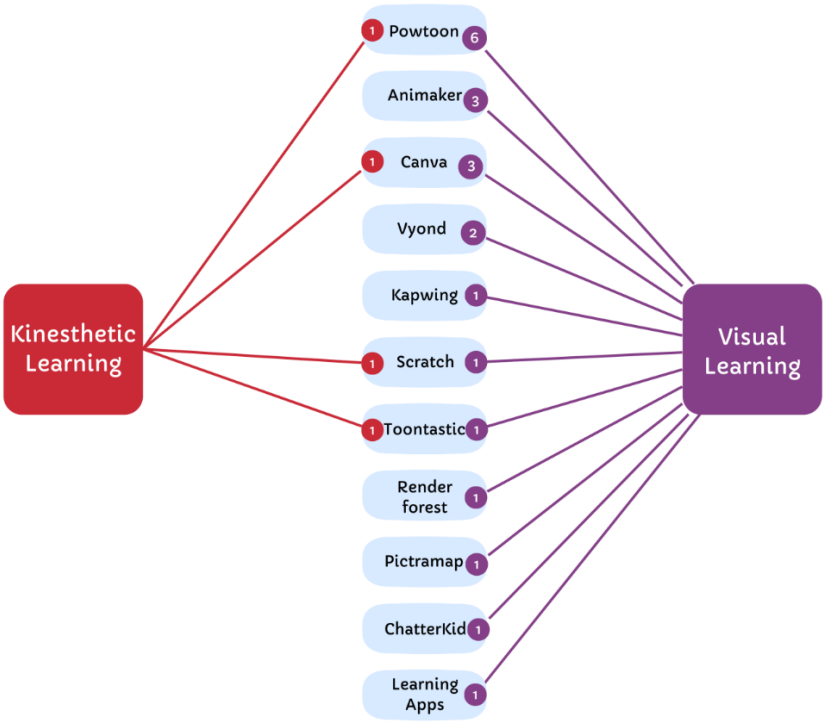


Fig. 6. Web 2.0 tools used by primary school teacher candidates in developing digital instructional materials for animation purposes according to their learning styles

Figure 6 revealed that the participants using the visual learning style essentially developed Web 2.0 tools for animation purposes. These participants used 11 different Web 2.0 tools, primarily Powtoon (f=6), Animaker (f=3), Canva (f=3), and Vyond (f=2). The participants using the kinesthetic learning style used Powtoon (f=1), Canva (f=1), Scratch (f=1), and Toontastic (f=1). The participants using the auditory learning style, on the other hand, did not prefer to use Web 2.0 tools for this purpose.

The findings regarding the Web 2.0 tools used by the primary school teacher candidates in developing digital teaching materials for gaming purposes according to their learning styles are presented in Figure 7.

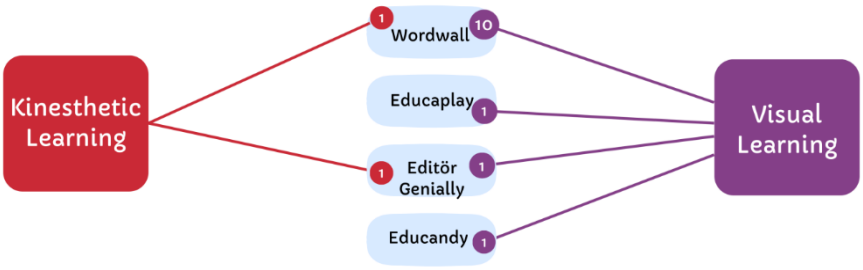


Fig. 7. Web 2.0 tools used by primary school teacher candidates in developing digital instructional materials for gaming purposes according to their learning styles

Figure 7 revealed that the participants using the visual learning style essentially developed Web 2.0 tools for gaming purposes. These participants used Wordwall (f=10), Educaplay (f=1), Editor Genially (f=1), and Educandy (f=1) for gaming purposes. The participants using the kinesthetic learning style used Wordwall (f=1) and Editor Genially (f=1). The participants using the auditory learning style, on the other hand, did not prefer to use Web 2.0 tools for this purpose.

The findings regarding the Web 2.0 tools used by the primary school teacher candidates in developing digital teaching materials for cartoon purposes according to their learning styles are presented in Figure 8.

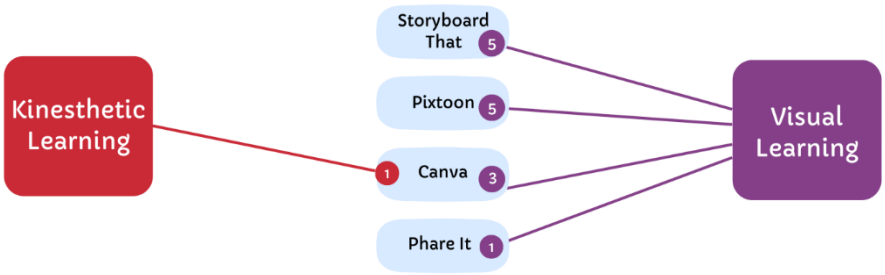


Fig. 8. Web 2.0 tools used by primary school teacher candidates in developing digital instructional materials for cartoon purposes according to their learning styles

Figure 8 revealed that the participants using the visual learning style essentially developed Web 2.0 tools for cartoon purposes. These participants used Storyboard (f=5), Pixtoon (f=5), Canva (f=3), and Phare It (f=1) for cartoon purposes. The participants using the kinesthetic learning style only used Canva (f=1). The participants using the auditory learning style, on the other hand, did not prefer to use Web 2.0 tools for this purpose.

The findings regarding the Web 2.0 tools used by the primary school teacher candidates in developing digital teaching materials for puzzle purposes according to their learning styles are presented in Figure 9.

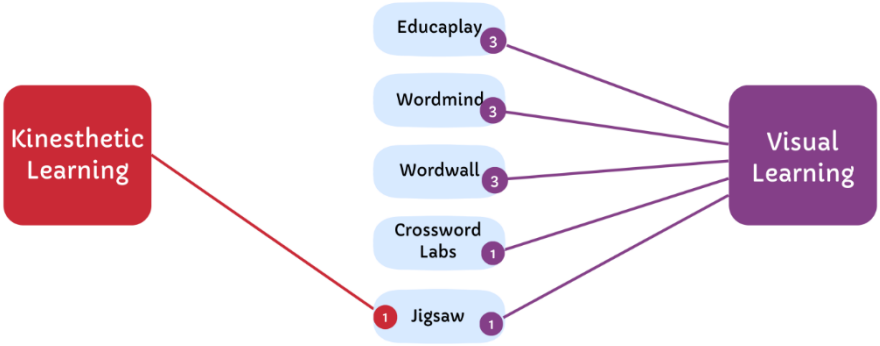


Fig. 9. Web 2.0 tools used by primary school teacher candidates in developing digital instructional materials for puzzle purposes according to their learning styles

Figure 9 revealed that the participants using the visual learning style essentially developed Web 2.0 tools for puzzle purposes. These participants used Educaplay (f=3), Wordmind (f=3), Wordwall (f=3), Crossword Labs (f=1), and Jigsaw (f=1) for puzzle purposes. The participants using the kinesthetic learning style only used Jigsaw (f=1). The participants using the auditory learning style, on the other hand, did not prefer to use Web 2.0 tools for this purpose.

The findings regarding the Web 2.0 tools used by the primary school teacher candidates in developing digital instructional materials for visual editing according to their learning styles are presented in Figure 10.

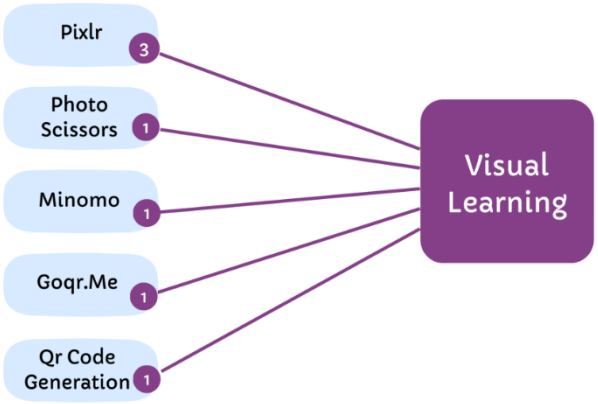


Fig. 10. Web 2.0 tools used by primary school teacher candidates in developing digital instructional materials for visual editing purposes according to their learning styles

Figure 10 revealed that only the participants using the visual learning style preferred to use Web 2.0 tools for visual design purposes. These participants used Pixlr (f=3), Photo Scissors (f=1), Mindomo (f=1), Goqr.Me (f=1), and Qr Code Generation (f=1) for visual editing.

3.3. Findings on the Effect of the Material Development Process According to Learning Styles on Primary School Teacher Candidates' Self-Efficacy in Developing Digital Instructional Materials

The results of the paired sample t-test, which was conducted to determine the effect of the material development process on digital teaching material development self-efficacy of the primary school teacher candidates according to their learning styles, are presented in Table 1.

Table 1.

The effect of the material development process according to learning styles on digital teaching material development self-efficacy of primary school teacher candidates

Test	N	$\bar{X}$	Ss	sd	t	*p*	Effect Size (d)
Pre-test	60	131.01	15.89	59	-5.86	0.000*	0.75
Post-test	60	146.68	16.92				

Table 1 revealed that the Web-2.0-supported material development process significantly increased the primary school teacher candidates' self-efficacy in developing digital teaching materials according to their learning styles ($p<0.05$). In addition, eta square ($\eta 2$) value was examined and interpreted in line with Cohen's d index to explain the level of the positive effect. This value is considered as low between 0.2 and 0.5, moderate between 0.5 and 0.8, and high if it is greater than 0.8 (Cohen, 1988). Since it is .75 in the study, the effect is moderate.

4. Discussion, Conclusions and Suggestions

In this study, it was determined that most of the primary school teacher candidates used visual learning, some of them used the kinesthetic learning style and only a few teacher candidates used the auditory learning style. The learning styles of pre-school teacher candidates (Cokbilir, 2019), undergraduate students (Çağlayan, 2007; Tepehan, 2004), high school students (Gülözer, 2010; Pazarlı, 2009), secondary school students (Çiloğulları, 2019; Eskici, 2008; Küçük, 2021; Utanır 2008), and individuals from different age levels (Reid, 1987) were in the same order in other studies. In addition, mathematics teacher candidates (Önder, 2012), undergraduate students (Güneş, 2004; Güven, 2007), high school students (Baydar, 2012;

Demir, 2010), secondary school students (Azizoğlu & Çetin, 2009; Gökdağ, 2004), primary and secondary school students (Özkan, 2013), preschool students (Günal, 2019), and individuals from different age levels (McVay Lynch, 2004) in other studies also identified the visual learning style as the most prevalent learning style. However, some studies revealed different results. Sports science faculty students (Ünal, 2021), high school students (Keleşoğlu, 2011; Otrar, 2006; Yılmaz, 2004), and primary and secondary school students and teachers (Bedir, 2007) mostly used the kinesthetic learning style. In summary, individuals mostly used the visual learning style, the results of this research are similar to the results found in literature, and primary school teacher candidates used the visual learning style to a large extent.

In the research, the primary school teacher candidates used Web 2.0 tools particularly for measurement-evaluations and presentations followed by infographic and animation preparation. Baran and Sadık (2021) stated that one of the most appropriate uses of Web 2.0 tools is measurement-evaluation, which can be explained by the fun and easy use of Web 2.0 tools in measurement and evaluation (Çelenk & Tatlı, 2022). In this study, participants of all learning styles mostly used Kahoot and LearningApps for measurement and evaluation and Web 2.0 tools such as Canva and Emaze for presentation preparation. In fact, it was stated in the literature that Kahoot (Erdoğan, 2022; Yürük, 2019) and LearningApps (Karamete & Yaşar, 2018; Tatlı, 2020b) are tools that can be used for measurement and evaluation and Canva (Erdoğan, 2022) and Emaze (Çelebi & Satırlı, 2021) for preparing a presentation. In addition, Wordwall, Padlet, Socrative, and Quizizz were found to be the most frequently used tools for measurement and evaluation, and Powtoon was the most frequently used tool for presentation purposes in this research. Some studies in the literature highlighted that one of the tools that can be used specifically for measurement and evaluation in primary school is Quizizz (Çelebi & Satırlı, 2021) and one of the tools that can be used for presentation purposes is Powtoon (Çelebi & Satırlı, 2021; Pürbudak, 2020). In addition, this study revealed that the participants mostly used Lucid Chart for infographics, Powtoon and Animaker for animations, Wordwall for games, Storyboard That and Pixton for cartoons, Educaplay for puzzles, and Pixlr for visual editing. As a matter of fact, it was stated in the literature that Powtoon (Pürbudak, 2020) and Animaker (Çelebi & Satırlı, 2021) are among the tools that can be used in the preparation of animations, and Storyboard That and Pixton for cartoon preparation (Erdoğan, 2022; Pürbudak, 2020; Tünkler, 2021). In addition, the results of this research demonstrated that the teacher candidates using the visual learning style preferred to use different Web 2.0 tools, while the teacher candidates with kinesthetic and auditory learning styles used fewer tools. Particularly, the primary school teacher candidates with the auditory learning style did not prefer to prepare materials other than measurement-evaluations, presentations, and infographics, while the participants with the kinesthetic learning style preferred to prepare measurement-evaluations, presentations, animations, cartoons, games, and puzzles. In addition, the teacher candidates with the visual learning style also benefited from using Web 2.0 tools for visual editing. The type of material on which all learning styles work comes to the fore as measurement-evaluation and presentation. In summary, when the primary school teacher candidates are offered the opportunity to develop materials according to their learning styles, they use various Web 2.0 tools for different purposes, which have positive effects on their learning processes. As a matter of fact, the contributions of web-based education based on learning styles such as increasing the academic success of students (Wang et al., 2006) and providing easy, fast, active, effective, and permanent learning by having fun (Pürbudak, 2020) have been revealed in the literature. In addition, considering that teacher candidates try to prepare and use materials, though limited, for visual, auditory, and physical learners taking their learning styles into account (Cunningham, 2006; Gülay, 2021; Zoraloğlu, 2016), the learning experience according to learning styles may contribute to their professional lives.

In this study, the Web-2.0-supported material development process significantly increased the digital teaching material development self-efficacy of the primary school teacher candidates according to their learning styles. The literature revealed that Web-2.0-supported education improves the self-efficacy of science teacher candidates in developing digital teaching materials (Erdoğan, 2022), mathematics teacher candidates' digital rapid content development self-efficacy (Arabacı, 2021), teacher candidates' self-efficacy for educational technology standards (Taşlıçay-Arslan, 2019), social studies teacher candidates'

proficiency in using information and communication technologies (Tepe & Çelik, 2021), and computer and instructional technology teacher candidates' self-efficacy in teaching (Durusoy, 2011). Some studies in the literature also showed that Web 2.0 tools improve pedagogical web content knowledge (Baki, 2022; Horzum, 2012; Yazar & Şimşek, 2015) and digital literacy skills (Baki, 2022; Nerse, 2021; Tepe & Çelik, 2021). In addition, material development using Web 2.0 tools and the application process significantly increased self-efficacy (Baltaci-Goktalay & Ozdilek, 2010; Baran & Ata, 2013; Hartshorne & Ajjan, 2009; Howe, 2006; Maloney, 2007; Pan & Franklin, 2011; Timur et al., 2021). Although the computer proficiency of the primary school teacher candidates differed, the high quality of the end-product with its ease of use, the fact that it allowed interactive material development, and the introduction of how to use the offered Web 2.0 tools with the focus of material development may have been effective in the emergence of this result. In this context, the result of this research is in parallel with the literature and Web 2.0 tools have a positive contribution to the self-efficacy of primary school teacher candidates in developing digital teaching materials.

In line with these results of the study, the following suggestions can be made:

- It should be ensured that the learning styles of students at all levels of education, especially teacher candidates, are identified and that teacher candidates should be prevented from developing fixed materials while developing teaching materials with such awareness.
- It is suggested that pre-service teachers are introduced to the different uses of Web 2.0 tools within the scope of an instructional technologies course. In this direction, Kahoot, LearningApps, Canva, and Emaze tools can be included as along with other tools in the process as they appeal to all learning styles.
- Research can be conducted to evaluate the effectiveness of the education given to students with different learning styles using different Web 2.0 tools.

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