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|Araştırma Makalesi / Research Article|

Revise and Update of Competencies about Using Practical Tools for Content Development Scale

Pratik İçerik Geliştirme Teknolojilerini Kullanma Yeterlilikleri Ölçeğinin Gözden Geçirilmesi ve Güncelleştirilmesi

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Öz

21. yüzyılda, öğretmenlerin kendi alanlarına özgü nitelikli içerik hazırlama yeteneğine sahip olmaları ve ayrıca lisans eğitimleri sırasında içerik geliştirme becerileri kazanmaları beklenmektedir. Bu çalışma kapsamında "İçerik Geliştirme için Pratik Araçların Kullanımı ile İlgili Yeterlilikler" ölçeği gözden geçirilmiş ve güncellenmiştir. Öğretmen adaylarının Web 2.0 araçlarını kullanımı konusunda öz yeterlik inançlarını ölçmeyi hedefleyen ölçekler vardır, ancak bu çalışmada geliştirilen ölçek özellikle öğretmen adaylarının pratik içerik geliştirme araçlarını kullanma konusundaki yeterliliklerini ölçmek için hazırlanmıştır. Ölçeğin önceki sürümünün güncellenmesinin temel sebebi pratik içerik geliştirme araçlarının son yıllardaki hızlı değişim ve gelişimidir. Aynı zamanda bu ölçekle araştırmacılara, öğretmen ve öğretmen adaylarına yönelik kolay anlaşılabilir maddeleri olan, kısa sürede ve kolay uygulanabilen bir ölçme aracı sunulmaktadır.

Abstract

In the 21st century, teachers are expected to have the ability to prepare qualified content specific to their field and also to acquire content development skills during their undergraduate education. Within the scope of this study, the "Competencies about Using Practical Tools for Content Development" scale was revised and updated. There are scales available that aim to measure self-efficacy beliefs of prospective teachers in using Web 2.0 tools, but the scale developed in this study was specifically designed to measure prospective teachers' competence in using practical content development tools. The main reason for updating the previous version of the scale is the rapid change and development of practical content development tools in recent years. At the same time, this scale provides researchers a comprehensible and easily applicable measurement tool for teachers and prospective teachers.

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INTRODUCTION

Social transformation and developments in science and technology are very rapid, which reshapes education and brought digital transformation to education. Prominent skills for individuals in this age are critical thinking and problem solving, effective communication, cooperation, creativity and innovation (Partnership for 21st Century Skills, 2011). Increasingly widespread digital technologies offer opportunities in teaching and learning to promote productivity, visualize content, collaborate and communicate (Finger, 2015). Accordingly, schools need to restructure teaching methods and materials to support students for acquire twenty-first century skills (Rotherham & Willingham, 2009). In order to design effective technological learning environments teachers are expected to have appropriate knowledge, beliefs and skills to effectively use technology in education (Chen et.al., 2009). Likewise, it is expected to increase the technology integration competencies of pre-service teachers so that they would be comfortable using the technological tools when they become in-service teachers. The ability of teachers to effectively use technology in their classrooms is linked to their knowledge of technology and their self-efficacy beliefs towards these technologies (Chen et al., 2009; Şensoy & Yıldırım, 2018).

In order to make the transformation in education happen, it is important to develop the digital competence of teachers who are the key actors of this process. There exist different types of digital competence such as interacting and sharing through digital technologies, developing, integrating and refining digital content, solving technical problems, and using digital technologies creatively (Brink, Kilbrink & Gericke, 2019). Providing a digital learning environment appropriate to the characteristics of new generation learners and using digital resources, as well as editing and designing digital content are among the competences expected from today's teachers (International Society for Technology in Education [ISTE], 2019). Infrastructure and hardware factors are crucial but not sufficient for effective technology integration in education, it is also critical that teachers gain knowledge and experience (Ertmer, Ottenbreit-Leftwich & York, 2006). Education Vision Document of the Ministry of National Education (MEB) for 2023 emphasize the importance of digital content and skill-based transformation in the learning processes, and it is aimed to train teachers who have acquired a culture of using and developing digital contents effectively and to spread this culture in schools (MEB, 2018).

The term digital content includes any material accessed through a digital device, such as a computer, tablet or smartphone. Digital content is into three categories: commercial, freely available (open access) and teacher-generated materials (Friday Institute, 2016). Along with the concept of digital content, the concept of e-content is widely used in the literature. E-content is a digital information that is used in a network of devices. From these concepts, which are often used interchangeably, digital content could be online or offline, while e-content means online content (Buchholz & Zerfass, 2005). In Turkey, Education Information Network (EBA) has been established within the scope of FATİH Project of the Ministry of National Education. EBA aims to provide digital teaching contents such as e-books, presentations, animations, videos, infographics, and etc. However, in recent years, studies on EBA have shown that the existing content does not meet the requirements in teaching and learning environments adequately, and that more content enriched with multimedia elements appropriate to the learner level, learning outcomes and educational environment is needed (Arkan & Kaya, 2018; Becit-İşçiturk & Turan, 2018; Ceylan & Gündoğdu, 2017; Çakmak & Taskıran, 2017; Durmusçelebi, 2017; Erensayın & Güler, 2017; Saklan & Ünal, 2018; Timur, Yılmaz & İşseven, 2017; Yirci, 2018).

The content of EBA is coming from four main sources: a) universities, b) TÜBİTAK (The Scientific and Technological Research Council of Turkey), c) content providers and d) e-content developed by teachers (Alkan, Bilici, Akdur, Temizhan & Çiçek, 2011). Teachers are encouraged to develop content through the content development tools in EBA, in-service training activities, projects, and competitions. However, teachers' content development competencies and their level of using content development tools are not at the desired level (Ayan, 2018; Kayabaşı & Özerbaş, 2017; Kokoç, Erdoğdu & Çakıroğlu, 2016; Tekin & Polat, 2016). Soydan (2018) concluded that teachers were able to prepare materials that required less knowledge and skills, and they use ready to use materials for the ones that required more knowledge and skills such as animation and interactive experiments. To be able to prepare content that is appropriate for their purpose, teachers need learn about tools that are easy to use and require relative shorter amount of time to develop content. Today's teachers are expected to have the ability to prepare qualified content specific to their field. Therefore, future teachers need to acquire content development skills in undergraduate education. The content of the 'Information Technologies' and 'Instructional Technologies' courses included in the updated education programs of colleges of education by Higher Education Institution (YÖK) in 2018 aims to support pre-service teachers to gain the content development competencies. In the process of gaining these skills, it is also important to determine the content development competencies of pre-service teachers.

Commonly used tools for the development of course content is known as content development tools. Content development tools can be categorized as desktop tools vs. web-based tools, commercial vs. non-commercial tools, or categorized according to the content they produce such as multimedia content development tools, animation development tools, graphic development tools (Daş & Ersöz, 2013). According to another classification, they are divided into many sub-categories such as rapid material development tools, video content development tools, screen recording tools, measurement and evaluation tools (Berking, 2012). In this research, the concept of practical content development tools has been used and this concept has been focused on the tools that teachers and pre-service teachers can prepare professional-looking content fast and easy. In other words, we define practical tools for content development as they are mostly internet based and basic computer skills are usually adequate to use them, programming skills are not required (Çiçek & Yazar, 2013; Eren et.al., 2014; Eren, Yurtseven-Avcı & Seçkin-Kapucu, 2015). From

the definition, most of these tools emerged as Web 2.0 technologies such as online presentation tools (e.g. Prezi), online concept map tools (e.g. Gliffy), poster tools (e.g. Canva), avatar tools (e.g. Voki), cartoon tools (e.g. ToonDoo), animated video tool (e.g. Powtoon, GoAnimate), and several Google Applications etc. Web 2.0 tools are the commonly preferred technologies as practical and fast content development tools. Users prefer Web 2.0 tools, since they provide the opportunities to develop content, edit content, control content and socialize (Horzum, 2007). Research shows that pre-service teachers or teachers' perceptions and attitudes about use of Web 2.0 tools as content production tools have changed in time positively (Altıok, Yükseltürk & Üçgül, 2017; Balbay & Erkan, 2018; Ceylan & Gündoğdu, 2017; Demirkan, 2019; Yurtseven-Avcı, Eren & Seçkin-Kapucu, 2016).

A number of studies related to content development and Web 2.0 self-efficacy beliefs are conducted to understand teachers` or pre-service teacher's competency level on content creation or use of Web 2.0 technologies (Baran & Ata, 2013; Birişçi, Kul, Aksu, Akaslan & Çelik, 2018; Horzum & Aydemir, 2014; Polat & Tekin, 2017). Scales that are employed by these studies are either too broad or detailed. They also have several items with long statements or focus on only some particular technologies or not appropriate for the target population for this current study.

Polat and Tekin (2017) applied "E-Content Development Skills" scale developed by Polat (2014) to evaluate the e-content development skills of the teacher candidates. The scale consisted of 48 items and seven factors. The seven factors are "Educational and Design Criteria," "Technical Criteria," "Animation Criteria," "Video Criteria," "Evaluation Criteria," "Graphic and Photograph Criteria," and "Voice Criteria." According to the results, the participants provided answers in the "Neither agreed" interval on Technical Criteria, Animation Criteria, Video Criteria, Graphic and Photograph Criteria, Evaluation Criteria of the scale and they provided answers in the "Agreed" interval on Educational and Design Criteria and Voice Criteria. The authors concluded that in order to increase the pre-service teachers' ability to develop e-content and use information technology devices, technology integration should be part of the curriculum. Similarly, Birişçi et al. (2018) developed "Web 2.0 Practical Content Development Self-Efficacy Belief Scale" (W2SEB) to determine the proficiency levels of pre-service teachers for using the rapid content development tools for educational purposes. The main purpose of the scale is to understand the self-efficacy levels of pre-service teachers related to how Web 2.0 practical content development tools can be included during a lesson planning process, including preparation, presentation and evaluation of a course. It was concluded that within the scope of technology-based courses in pre-service education process, pre-service teachers should be made aware of Web 2.0 technologies and necessary trainings should be provided in order to benefit from these tools. Similarly, Efe (2015) indicated that today's pre-service teachers will become future's in-service teachers; they should be able to actively use Web 2.0 technologies. The study by Efe (2015) investigated the relationship between the proficiency of pre-service teachers' use of Web 2.0 technologies and their sense of computer self-efficacy. They used Baran and Ata's (2013) "Web 2.0 technologies Educational Use Scale" to identify pre-service teachers educational use of Web 2.0 technologies (blogs, wikis, podcasts, video sharing sites, instant messaging and Facebook). The scale included questions to find out university students' use of Web 2.0 technologies "in terms of frequencies, skill levels and educational use and to understand whether or not these variables differ for gender, foreign language levels, computer ownership and the Internet connection duration" (Baran & Ata, 2013, p. 192). The result of the study indicated that pre-service teachers' frequency of using Web 2.0 technologies for educational means was very low and they used most frequently Facebook to communicate access class material, hold discussions and form academic groups. Baran and Ata (2013) claimed that the frequent use of Web 2.0 by pre-service teachers provides those future teachers to design student-centered learning environment.

Purpose of the Study

The purpose of this study was to update and validate the scale "Competencies about Using Practical Tools for Content Development" that was developed by Eren et al. (2014, see Appendix B for the 2014 version of the scale). While there are a number of other scales that were targeted to specifically measure pre-service teachers' self-efficacy beliefs of Web 2.0 tools, the scale in this study was developed to particularly measure pre-service teachers' competencies about using practical tools for content development. The previous version of the scale was updated because of the rapid changes and advances in technology. The other purpose of the revision was to provide researchers a compact, easy-to-apply measure, while providing teachers or pre-service teachers a scale in which the items can be understood easily and takes short time to answer.

The study was guided by the following research questions:

1. Is the revised scale a reliable and valid measure of pre-service teachers' competency for using practical tools for content development?
2. What factors comprise pre-service teachers' competency for using practical tools for content development?

METHOD

The adaptation process of the *Competency for Using Practical Tools for Content Development* scale is presented in this section. The validation process contained both qualitative and quantitative methods. The qualitative work includes item construction and review of items by experts, and the quantitative work includes content validation, factor analysis, and modification of the scale.

Participants of the Study

This study was conducted at a public university in Central Anatolia, Turkey. Convenience sampling technique was applied for the participant selection. All of the participants were taking Computer II course. The data was collected from 216 pre-service teachers who were studying at the College of Education during 2017-2018 spring semesters. The participants were from five different departments: Elementary Education (50), Elementary Science Education (59), Elementary Mathematics Education (34), English Language Education (39), and Special Education (34). The forms completed by the participants were examined, 202 of them were appropriate for the analysis. From these 202 participants, 160 of them were female and 42 of them were male. This sample size is acceptable for factor analysis. Studies report that sample size is acceptable between fivefold and tenfold of the number of items (Bryman & Cramer, 2001; Pett, Lackey & Sullivan, 2003). The initial updating scale had twenty-three items (see Appendix B for the full version of the initial updating scale).

Development of the Instrument

The aim of this study was to update the *Competency for Using Practical Tools for Content Development* scale. Originally, the scale was developed by the researchers in 2014. The steps that were followed for the modification and the validation of the scale were 1) item construction, 2) review of items by experts, 3) content validation, 4) factor analysis, 5) modification of scale (Holincheck, 2012).

The first step for the development of a scale is the generation of a pool of items and evaluate them for how much they reflect the scale's purpose (DeVellis, 2003). For this study, the initial item pool included twenty-three items (Appendix B). Experts during this process are expected to ensure content validity of the items such as clarity and conciseness of the items (DeVellis, 2003).

First, items in the earlier version of the scale were reviewed by a panel of experts. Based on their field experience and reviewed studies in educational technology, four questions were reduced from the existing scale and six new items were added. *Sharing videos* and *sharing photos* items in the old scale were combined in one item as *sharing the content developed*. This process ended up twenty-three items in the new scale.

Pre-service teachers were asked to express their opinions for their competency level for the given items. They reported their opinions on a 5-point Likert-type rating scale where "5" means "I am very competent" and "1 - I am not competent at all." Additionally, statements of the items were changed in the new scale for ten of the items for clarity.

Data Collection

The revised scale was administered to the participants on paper. The pre-service teachers from five different departments were completed the scale. The participants were taking the Computer II course completed the scale at the end of the semester and it took 10-15 minutes for them. At the beginning of the scale, participants were provided a consent form informing them about the research and results would be used only for research purposes. Then, there were five demographic questions asking for their gender, department, age, internet accessibility, and daily internet use.

Data Analysis

After the collection of data from 216 participants, all data was entered to the Microsoft excel file. In order to check the incorrect data entry and missing values, the frequency table for all items was created. The incorrect data entries were corrected, and the missing values were filled with an adequate method. Moreover, all items were converted to z-scores to check the outliers. Finally, there were 202 students' answers in the data set.

The data obtained from 202 students to analyze with exploratory factor analysis (EFA) and confirmatory factor analysis (CFA). First of all, the EFA was used to explore the factor structure with 23 items. In the literature, it was reported that item-person ratio should be between 5 to 10 for EFA (Ho, 2006; Gorsuch, 1983). In addition to ratio, the KMO and Bartlett's test of Sphericity were conducted to ensure sample size. A KMO value higher than .50 means that factor analysis can be conducted (Huck, 2012; Tabachnick & Fidell, 2015). The suitability of the sample size was checked and 202 was found sufficient to conduct an EFA (see findings).

For exploratory factor analysis SPSS 22 statistical package was used. The principal component analysis with varimax rotation method was used to extract factors from the data set. Both eigenvalues and scree plot were considered to determine the appropriate number of factors. Kaiser's criterion was applied and the factors which had higher than 1.0 eigenvalue were extracted. After the creation of factor structure, the confirmatory factor analysis was applied with LISREL 8.1 program. Maximum likelihood estimation method was preferred for CFA. Path diagram and fit indices showed that the three-factor model fit the data well.

In order to get an evidence for construct validity, both exploratory and confirmatory factor analysis results were checked by the researchers. For reliability analysis, internal consistency coefficients for factors and full scale were calculated by Cronbach alpha.

RESULTS

Findings related to the modification process of "*Competency for Using Practical Tools for Content Development Scale*" are presented in this section.

Scale Modification Process

Panel of Experts

Three experts from Computer and Instructional Technology Education Department reviewed the earlier version of the scale. All of them were teaching Computer II course and have been conducting research about various educational technologies. Two of the experts had PhD degree in Educational Technology and one of them had PhD in Computer and Instructional Technology Education. Experts decided which items should be included in the modified scale and which items will be eliminated based on their field experience and literature review. They also change wording for ten of the items for the content validity. All of the item changes are given in Table 1 below.

Table 1. Item changes in the revised scale

Eliminated items	
Preparing interactive presentations (2)	
Preparing tests (Quizmaker vb.) (7)	
Text based e-book creation (21)	
Creating interactive e-books (22)	
Additional items	
Creating infographics (5)	
Creating educational cartoons (7)	
Developing educational games/competitions (13)	
Creating assessment tools such as surveys and scales (19)	
Creating interactive assessment tools (multiple choice, fill in the blanks, etc.) (20)	
Creating digital stories (23)	
Combined items	
Sharing videos (YouTube etc.) (14)	New item:
Sharing Photos (Flicker etc.) (15)	Sharing content online (15)
Reworded items	
Preparing presentations (1)	Preparing online presentations (Prezi, etc.) (1)
Recording voice (3)	Creating and editing audio for educational purposes (2)
Preparing brochures (5)	Preparing banners/posters/ brochures (4)
Designing characters (6)	Creating educational avatars (6)
Creating puzzles (8)	Creating puzzles (hooked puzzle, word hunt, etc.) (8)
Creating videos (9)	Creating/ editing videos (9)
Digital story book preparation (ToonDoo etc.) (10)	Digital story book preparation (10)
Creating animations (GoAnimate etc.) (11)	Creating animated presentations/videos (Powtoon, GoAnimate, etc.) (11)
Concept mapping (Gliffy, Webspiration, etc.) (12)	Concept mapping (12)
Creating interactive maps (Google maps etc.) (13)	Creating personalized maps (Google maps etc.)

Validity and Reliability

After the creation of the item pool, the scale was applied to participants. The missing values were filled with the average value of the item. Prior to conducting the item analysis, the outlier examination was performed. The standardized values for each item were calculated and the values out of -3 and +3 were extracted from the data set. Exploratory factor analysis was performed to demonstrate factor structure and to find evidence for construct validity. The Kaiser-Meyer-Olkin measure of sampling adequacy was .91 and Bartlett test showed significant results (1334.86 (df: 105), $p < .05$). These results demonstrated that the respondent data is suitable for factor analysis (Büyüköztürk, 2015).

Some items had low factor loadings (< .50) and some of them loaded into two different factors at the same time. According to Nunally (1978), items that had factor loadings lower than .50 can be removed from the data. As a result, item4, item 6, item 7, item 13, item 14, item 17, item 21, item 22 had been deleted. In this step, all of the researchers came together and agreed to remove those from the data set. A final set of 15 items was retained for the next and final step of scale development process.

Table 2. Competency for Using Practical Tools for Content Development Scale (15 items)

Items
Preparing online presentations (Prezi, etc.) (1)
Creating and editing audio for educational purposes (2)
Editing images/photos (3)
Preparing infographic (5)
Creating puzzles (hooked puzzle, word hunt, etc.) (8)

Items
Creating/ editing videos (MovieMaker, screen recording, etc.) (9)
Digital story book preparation (10)
Creating animated presentations/videos (Powtoon, GoAnimate, etc.) (11)
Concept mapping (12)
Sharing content online (15)
Creating digital library with social bookmarking sites (16)
Creating and sharing collaborative online documents (Google Docs., etc.) (18)
Creating measurement tools such as surveys/scales (Google Form, Survey Monkey vb.) (19)
Preparing interactive exercises (multiple choice, fill in the blank, true-false, etc.) (20)
Creating digital stories (23)

Final exploratory factor analysis demonstrated 3 factors with eigenvalues of 1 or higher. All three factors explained 60.95% of the data. All factor loadings were from .515 to .797. The communality values are in the acceptable values (higher than .40, Guris & Astar, 2015). The results of the exploratory factor analysis with 15 items are reported in the Table 3.

According to Table 3, there were 7 items in the first factor, 4 items in the second factor and 4 items in the third factor. The first factor was called "content preparation", because all items in the factor consisted related with content development. The second factor contained the statements reflecting the collaboration of using practical tools for content development and this factor was called "communication and cooperation". The final factor was named as "product presentation" because the items in the third factor reflected the development of instructional products.

Table 3. Results of the exploratory factor analysis

Items	Factor 1	Factor 2	Factor 3	Communalities	Item-total Correlations
item1	**.782**	.166	.163	.666	.628
item 2	**.660**	.453	.081	.647	.667
item 3	**.626**	.157	.180	.449	.525
item 8	**.664**	.148	.154	.487	.529
item 9	**.729**	.324	.096	.646	.644
item 11	**.695**	.266	.138	.573	.610
item 20	**.515**	.102	.453	.481	.556
item 5		**.797**		.667	.520
item 10		**.740**		.741	.708
item 12		**.633**		.595	.655
item 23		**.664**		.481	.650
item 15			**.690**	.640	.506
item 16			**.742**	.646	.427
item 18			**.736**	.599	.503
item 19			**.663**	.642	.650
Eigenvalues	6.45	1.47	1.23		
Percentage of explained variance	42.99	9.79	8.16		
Cumulative explained variance	42.99	52.78	60.95		
Cronbach's alpha	.857	.830	.766		

Internal consistency of the three factors of the modified scale was assessed by calculating Cronbach's alpha. The first factor's Cronbach alpha coefficient was .857, the second factor's coefficient was .830 and the third factor was .766. The whole scale the Cronbach alpha coefficient was calculated as .90. Internal reliability coefficients of all factors and full scale were found to be satisfactory, exceeding the threshold of .70 (Nunnally & Bernstein, 1994).

Table 4. Reliability table

Scale	Cronbach alpha coefficient
F1	.857
F2	.830
F3	.766
Full Scale	.900

In the other phase of the scale development process, a confirmatory factor analysis was conducted. Since the data showed a normal distribution, maximum likelihood estimation method was preferred. Fit indices are Chi-square value= 159.05; *df* = 87; p< 0.001; CFI = 0.94; GFI= .91, NNFI= .93, RMSEA = 0.047. The three-factor measurement model provided a good fit to the data (Kline

2011; Tabachnick & Fidell, 2015). Table 5 demonstrated the fit indices and Figure 1 shows the path diagram with the factor loadings and error variances for each item.

Table 5. Confirmatory factor analysis model-fit indices

Fit index	Acceptable limits	CFA results
Chi-square (df)	p > .05	159.05(87) p < .05
Chi-square/df	smaller than 4	159.05/ 87 = 1.83
RMSEA	smaller than .08	.047
CFI	higher than .90	.94
GFI	higher than .90	.91
NNFI	higher than .90	.93

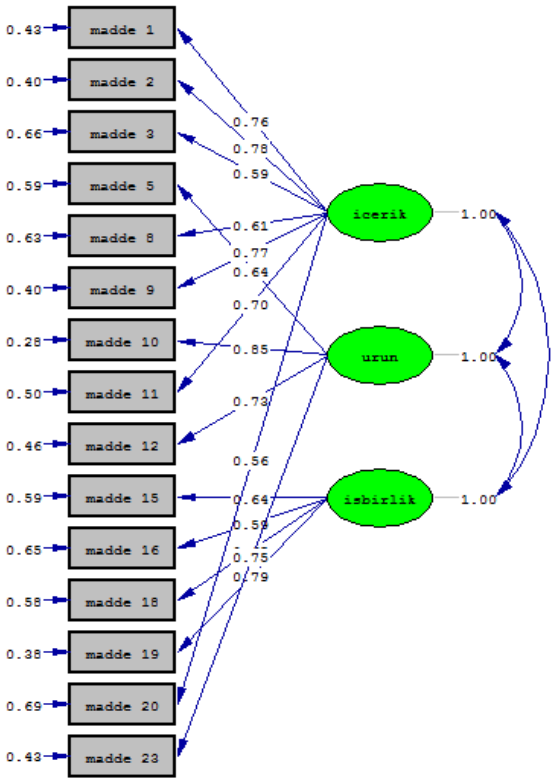

Figure 1. Standardized estimates of factor loadings and error variances from DFA

DISCUSSION AND CONCLUSION

The purpose of this study was to update and validate the scale "Competencies about Using Practical Tools for Content Development" that was developed by Eren et al. (2014). The previous version of the scale was updated because of the rapid changes and advances in technology. The other purpose of the revision was to provide researchers a compact, easy-to-apply measure, while providing teachers or pre-service teachers a scale in which the items can be understood easily. The new version of the scale includes 23 items under 3 factors. The scale designed with 5-point Likert scale of "5" means "I am very competent" and "1 - I am not competent at all."

During the modification process of "Competency for Using Practical Tools for Content Development Scale," the experts in the field determined the content validity and exploratory and confirmatory factor analysis techniques were used to determine the construct validity. As a result of the exploratory factor analysis, a three-dimensional scale was obtained: content preparation, product presentation, communication and cooperation. Preparing the content which is the first dimension of the scale involves the creation of multimedia elements such as visual, sound and text. The product presentation dimension defines content prepared using multiple multimedia elements. Finally, the dimension of communication and cooperation refers to sharing with content

preparation. The three-dimensional scale model was confirmed by the confirmatory factor analysis which demonstrated the acceptable fit indices. The Cronbach alpha reliability coefficient of the developed scale was calculated as .90. Assuming that the reliability coefficient predicted for the measurement tools should exceed the threshold of .70 (Nunnally & Bernstein, 1994), the internal reliability coefficients of all factors and full scale were found to be satisfactory. In summary, the updated "Competency about Using Practical Tools for Content Development" scale found to be a valid and reliable measurement tool to measure pre-service teachers' competencies about using practical tools for content development. The revised version of the scale might be used as a compact and easy-to-apply measurement tool by the researchers in the field.

While there are a number of other scales that were targeted to specifically measure pre-service teachers' self-efficacy beliefs of Web 2.0 tools, the scale in this study was developed to particularly measure pre-service teachers' competencies about using practical tools for content development. Considering the benefits of using Web 2.0 tools in education, such as easy integration into classroom environment (Konstantinids, Theodosiadou & Pappos, 2013), the low level of complexity (Grosseck, 2009), quick and easy access (Liu, Wang & Tai, 2016), increasing students' active participation into the learning environment (Huang, Jeng & Huang, 2009), opportunity to create and edit the content (Grosseck, 2009), creating collaborative and interactive learning environment (Kam & Katerattanankul, 2014), it can be concluded that the in-service teachers should be able know how to use these tools effectively in teaching. In the 21st century, teachers are expected to have the ability to prepare qualified content specific to their field and they are also expected to acquire content development skills during their undergraduate education. Since teacher education is completed at the universities, during the undergraduate degree, pre-service teachers might take more technology integration courses with a focus on application of these Web 2.0 tools. In addition, there might be a course for e-content development skills in teacher education programs or the content of the existing courses should be changed for this purpose.

Providing a digital learning environment appropriate to the characteristics of new generation learners and using digital resources, as well as editing and designing digital content are among the competences expected from today's teachers (ISTE, 2019). Closely related to the competencies, effective use of technology in classrooms is linked to teachers' knowledge of technology and their self-efficacy beliefs towards the technologies (Chen et al., 2009; Şensoy & Yıldırım, 2018). When the university students' access to and use of technology is improved during their education, their use of Web 2.0 technologies in their future classrooms might increase. In return, this would increase their technological skill levels and their educational utilization. Thus, within the scope of technology-based courses, pre-service teachers should be informed about Web 2.0 education and necessary trainings should be provided in order to benefit from these tools.

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Appendix A. Initial scale

	Maddeler
1.	Sunum hazırlama
2.	Katılımcıların sesli, yazılı yorum eklemelerine izin veren etkileşimli sunum hazırlama
3.	Ses kaydı yapma
4.	Resim/ fotoğraf düzenleme
5.	Broşür hazırlama
6.	Karakter tasarlama
7.	Test oluşturma (Quizmaker vb.)
8.	Bulmaca oluşturma (Puzzle-maker vb.)
9.	Video oluşturma
10.	Dijital hikâye kitabı hazırlama (Toondo vb.)
11.	Animasyon hazırlama (GoAnimate vb.)
12.	Kavram haritası oluşturma (Gliffy, Webspiration vb.)
13.	İnteraktif haritalar oluşturma (Google maps vb.)
14.	Video paylaşma (Youtube vb.)
15.	Fotoğraf paylaşma (Flicker vb.)
16.	Sosyal imleme sitelerini kullanarak sanal kütüphane oluşturma
17.	Dijital portfolyo (Blog vb. oluşturma)
18.	İşbirliğine dayalı doküman (Google Docs., Wiki, vb.) oluşturup paylaşma
19.	Sosyal ağları kullanarak eğitsel amaçlı gurup oluşturma
20.	Çevrimiçi öğrenme ortamı (Edmodo vb.) oluşturma
21.	Metin tabanlı e-kitap oluşturma (FlipBook Maker vb.)
22.	Görsel işitsel öğeleri içeren etkileşimli kitap oluşturma

Appendix B. Updated scale

	Maddeler
1.	Çevrimiçi sunum hazırlama (Prezi, vb.)
2.	Eğitsel amaçlı ses oluşturma ve düzenleme
3.	Resim/ fotoğraf düzenleme
4.	Afiş/poster/broşür hazırlama
5.	İnfografik hazırlama
6.	Eğitsel avatar oluşturma (Voki, vb.)
7.	Eğitsel karikatür oluşturma
8.	Bulmaca oluşturma (çengel bulmaca, kelime avı, vb.)
9.	Video oluşturma/düzenleme (MovieMaker, ekran kaydı, vb.)
10.	Dijital hikâye kitabı hazırlama
11.	Animasyonlu sunum/video hazırlama (Powtoon, GoAnimate vb.)
12.	Kavram haritası oluşturma
13.	Eğitsel oyun/yarışma hazırlama
14.	Kişiselleştirilmiş haritalar oluşturma (Google maps vb.)
15.	Hazırladığı içeriği çevrimiçi paylaşma
16.	Sosyal imleme sitelerini kullanarak sanal kütüphane oluşturma
17.	Dijital portfolyo oluşturma (Blog vb.)
18.	İşbirliğine dayalı doküman (Google Docs., vb.) oluşturup paylaşma
19.	Anket/ölçek gibi ölçme araçları oluşturma (Google Form, Survey Monkey vb.)
20.	Etkileşimli alıştırmalar hazırlama (çoktan seçmeli, boşluk doldurma, doğru-yanlış, vb.)
21.	Sosyal ağları kullanarak eğitsel amaçlı grup oluşturma
22.	Çevrimiçi öğrenme ortamı oluşturma (Edmodo, Beyaz Pano, canvas vb.)
23.	Dijital öykü/hikâye oluşturma