



DEVELOPING A SCALE FOR COMPETENCIES AND PERCEPTIONS OF NECESSITY ABOUT USING PRACTICAL TOOLS FOR CONTENT DEVELOPMENT

(PRATİK İÇERİK GELİŞTİRME TEKNOLOJİLERİNİ KULLANMA YETERLİLİKLERİ VE GEREKLİLİK ALGILARI ÖLÇEKLERİNİN GEÇERLİK GÜVENİRLİK ÇALIŞMASI*)

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ABSTRACT

It is an essential skill for pre-service teachers to have the competencies on preparing educational materials and developing the course content. The increase in technology use in recent years requires utilization of these new technologies in education and specifically for content development. Within the content of this study, practical tools for content development were defined as internet-based technologies that do not require having any computer programming skills. The aim of the current study is to develop a scale to measure pre-service teachers' competencies and necessity perceptions about using practical tools for content development. The study has been conducted during the spring semester of 2013-2014 academic year. The study group was composed of 203 pre-service teachers from Special Education, Program of Guidance and Psychological Counseling and Department of Computer Education and Instructional Technology. The process of developing the scale included many stages, such as a literature review, taking student opinions through essays, creating an item pool, taking expert opinions, a pretesting study as well as analysis for determining the structural validity and reliability. The Likert type scale had 26 items. The results of explanatory factor analysis showed that the scale has a structure of one dimension and consists of 26 items. It was seen that the factor weights of the scale items varied between 0.753-0.486 for competencies and 0.778-0.571 for necessity. The Cronbach alpha reliability coefficient is $\alpha=0.94$ for competencies and $\alpha=0.96$ for necessity. These results indicated that the validity and reliability of the scale were sufficient.

Key Words: Practical content development technologies, pre-service teachers, scale development, explanatory factor analysis

ÖZET

Alanlarıyla ilgili gerekli ve yeterli öğretim materyali hazırlamayı sağlayan içerik geliştirme becerisi tüm öğretmen adaylarının sahip olması gereken önemli niteliklerdir. Son yıllarda teknolojinin hızlı gelişimi, içerik

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geliştirme amacıyla bu teknolojilerden yararlanmayı gerektirmektedir. Bu çalışma kapsamında pratik içerik geliştirme araçları, internet tabanlı, program becerisi gerektirmeden içerik hazırlamaya olanak sağlayan teknolojiler olarak tanımlanmıştır. Araştırmanın amacı, öğretmen adaylarının pratik içerik geliştirme teknolojilerini kullanma yeterliliklerini ve bu teknolojileri kullanmayı ne ölçüde gerekli gördüklerini belirlemeye yönelik bir ölçek geliştirmektir. Çalışma 2013-2014 eğitim-öğretim yılı bahar döneminde Zihin Engelliler Öğretmenliği, Psikolojik Danışmanlık ve Rehberlik, Bilgisayar ve Öğretim Teknolojileri Eğitimi bölümlerinde öğrenim gören 203 öğrenciyle gerçekleştirilmiştir. Ölçeğin geliştirilmesi sürecinde; alan yazın tarama, madde havuzu oluşturma, uzman görüşleri alma, ön deneme çalışması yapma, geçerlik ve güvenilirlik analizleri yapma işlemleri gerçekleştirilmiştir. Ölçek 26 maddeden oluşup Likert tipinde hazırlanmıştır. Ölçeğin geçerlik ve güvenilirlik çalışmaları için açımlayıcı faktör analizi kullanılmıştır. Analizler sonucunda ölçeğin tek boyutlu bir yapıya sahip olduğu ve 26 maddeden oluştuğu görülmüştür. Ölçeğin yeterlik için toplam varyansı açıklama oranı %38.916 iken gereklilik için %50.528'dir. Ölçek maddelerinin faktör yükleri yeterlilik için 0.753-0.486; gereklilik için 0.778-0.571 arasında değişmektedir. Genel ölçeğe ait Cronbach alpha içtutarlılık katsayısı, yeterlilik için $\alpha=0.94$; gereklilik için $\alpha=0.96$ 'dır. Bu ölçeklerin pratik içerik geliştirme teknolojilerini kullanma yeterliliklerini ve gereklilik algılarını ölçmede kullanılabileceği sonucuna varılmıştır.

Anahtar Kelimeler: Pratik içerik geliştirme teknolojileri, öğretmen adayları, ölçek geliştirme, açımlayıcı faktör analizi.

INTRODUCTION

One of the essential components of any teaching and learning processes is the *content development*, which includes the creation of course materials, content modules, learning objects, resources, etc. (İşman, 2011). The development of appropriate teaching, learning, and assessment strategies has always been a big challenge for educators (Witney & Smallbone, 2011), the advancements in technology also force today's teachers to utilize those technologies through new teaching styles and techniques (Elmas & Geban, 2012). Additionally, this rapid and constant evolution of digital technology puts pressure on teachers to keep pace with the technological changes, and to make decisions about which technologies are most suitable for use within education (Connolly et al., 2011).

On the other hand, Turkish Ministry of National Education employs the project "Movement of Enhancing Opportunities and Improving Technology" abbreviated as FATİH, to integrate current technologies in the classrooms. However, studies revealed that even if classrooms are getting equipped with new technologies, most of the teachers do not have adequate level of competencies to use those technologies effectively while teaching (Elmas & Geban, 2012; Erdemir, Bakırcı, & Eydur, 2009).

One of the 5 components of FATİH project is "Providing Educational e-content and Management of e-content". It is known that the available educational content, which was developed by private sector, is inadequate. Even though, Ministry of National Education makes a lot of effort to support teachers with the e-content through the website: www.eba.gov.tr/; the available educational content is still not sufficient. In this context, content development tools can help teachers to create their own content.

Within the scope of the study, *Practical Tools for Content Development* were defined as the internet-based technologies that do not require installation and do not require having any computer programming skills for the purposes of this study. This term was first used by Çiçek and Yazar (2013) suggesting that preparation of content using internet technologies mostly take a long time and effort, but practical content development tools make this process much shorter and easier.

Not all, but majority of the technologies meant by the term practical tools for content development in this study are Web 2.0 technologies, which “refers to the current generation of Internet applications that allow users to collaboratively generate their own content” (Oliver, 2010, p. 50). These tools offer easy and professional looking material preparation for teachers and they are also suggested as a solution to enhance classroom teaching (Elmas & Geban, 2012; Witney & Smallbone, 2011). One of the features of Web 2.0 technologies is *user generated content* and these technologies offer a new way for use of web as a platform for generation, re-purpose and consumption of content (Franklin & van Harmelen, 2007). Some of these technologies are presentation and interactive presentation tools, animation creation tools, creating online learning environments, e-book creation tools, and online assessment tools.

Kumar (2009) has conducted a survey development study investigating ‘how teaching and learning can benefit from the inclusion of Web 2.0 applications’ at undergraduate level. It was reported that online forums / blogs, class-captures in the form of video-casts, audio podcasts, or Smart Board captures and Google Documents were listed among the most useful new technologies for learning by undergraduate students. Similarly, Coutinho (2008) presented the results of a research project, which was developed with Web 2.0 tools in pre-service teacher education programs that aimed to provide them technology-rich experience to promote their effective integration of those technologies in the real classrooms. Pre-service teachers used blogs, Google Pages and wikis for building individual/group e-portfolios, for cooperation and collaboration among peers, for developing skills in searching, organizing and sharing web resources, etc. Based on the findings, Coutinho (2008) stated that Web 2.0 tools are multi-functional tools that may serve to various pedagogical purposes ranging from providing a space for interaction, communication, and collaboration to build individual sites for group work for students and course management systems for educators.

Connolly et al. (2011) conducted a study with students and teachers from various educational sectors to evaluate the results of the use of a novel Web 2.0 platform by teachers. The results indicate that teachers were most proficient at using: YouTube, Facebook, Blogs, Google Docs and Wikis and least proficient at using Twitter, podcast and e-portfolios. Additionally, teachers considered: YouTube, blogs, wikis, social bookmarking and Google Docs to be more useful in an educational setting, whereas Flickr, online collaborative games and Twitter were found to be the

least useful tools. It was reported that students had higher perceived proficiency than teachers for each Web 2.0 tool and teachers found each Web 2.0 tools significantly more useful than students. Teachers also reported that they enjoyed the use of the platform and they found the Web 2.0 tools easy to use.

Kumar (2009) suggests that subject-matter or learning goals are important when teaching with Web 2.0 and the usefulness of certain Web 2.0 applications over others may differ according to disciplines. For example, Holcomb and Beal (2010) introduce several Web 2.0 tools particularly for using in the social studies context and provide suggestions about how to apply them in the classroom. They also warn educators to be selective and careful when they use Web 2.0 tools they have chosen, however many of them do not block or filter unwanted material and content. So, even though, pre-service teachers' perceptions about Web 2.0 technologies are positive and their acceptance and willingness to use these technologies are reported to be high for various disciplines (Coutinho, 2008; Baltacı-Göktalay & Özdilek, 2010), it is also important to educate teacher candidates about safe and appropriate use of Web 2.0 tools. Nelson, Christopher, and Mims (2009) suggest that in order to reduce the extra time and effort that educators may spend to learn about meaningful technology-rich learning opportunities for their students, school districts and teacher preparation programs should initiate widespread curricular use of Internet technologies.

After all, while the new generation of Internet applications provide more opportunities for users to actively participate in the exchange and creation of the content (Slotta & Najafi, 2013), it is inevitable to use these technologies in educational settings, especially in Turkey with the FATİH (Movement of Enhancing Opportunities and Improving Technology) project. However, since most of these tools are newly used by educators, there is not any measurement tool available to determine their competencies and perceptions of necessity about using practical tools for content development. Studies about content development and content authoring tools (Diwakar, Patwardhan, & Murthy, 2012; Gupta, 2010) emphasize that the structure of developing materials using web-based technologies differs from traditional methods and it is important and challenging to choose appropriate authoring tools for instructors.

Finally, when we examine the survey or scale development or adaptation studies for various technologies (Elmas & Geban, 2012; Erdemir, Bakırcı, & Eyduran, 2009; Kabakçı Yurdakul et.al., 2012; Marsh & Pountney, 2009; Timur & Taşar, 2011); we see that usually the terms *technology* or *Web 2.0* is used in the scales instead of naming the specific technologies and purposes of use (e.g. Kabakçı Yurdakul et. al., 2012), and only a couple of Web 2.0 tools were listed under only one or a couple of items in the whole scale (e.g. Timur & Taşar, 2011). Thus, existing scales about technology usage do not specifically measure competencies and perceptions of necessity about using practical tools for content development. Some qualitative studies attempts to classify Web 2.0 technologies according to the purpose of use (e.g. Elmas & Geban, 2012), but

again there is not any scales available for measuring educators' competencies about using these different types of tools. Marsh and Pountney (2009) claimed that there was awareness about the web tools that could be employed for pedagogical use, but there were some factors influencing the creation and sharing of digital learning materials, like copyright, incentive and reward. If we educate pre-service teachers to create their own content, it would solve most of the copyright issues. At the same time, when they use practical tools, content development will be easier and will take less time. So, they may even feel rewarded to prepare their own professional looking materials in a short amount of time and also it would be safe and reliable to use the content that they have produced. The Web 2.0 content created by pre-service teachers would form a knowledge base or learning resource for future students (Gray, Thompson, Sheard, Clerehan, & Hamilton, 2010). Still, we need valid and reliable measurement tools to assess their competencies. Greenhow, Robelia and Hughes (2009) pointed out the need to pursue understanding of the opportunities and existing barriers that prevented scholars, teachers, administrators, students, and families from using Web 2.0 technologies because of the emphasis of emerging research and institutional practices inside and outside of the education field featuring the possibilities and pitfalls of Web 2.0 for teaching and learning. This study can contribute to the literature by providing a reliable scale to measure competencies and perceptions of necessity for using practical tools for content development.

Purpose

The aim of the current study is to develop a scale to measure pre-service teachers' competencies and perceptions of necessity about using practical tools for content development.

METHOD

To measure how much pre-service teachers feel competent about using practical tools for content development and how necessary they view these tools in educational settings, a Likert-type scale has been developed following the steps summarized below.

Research Group

For this study, convenience sampling (students who took Computer II course) technique has been carried out for participant selection. The study was conducted in a university in Eskisehir during spring fall of 2013-2014 academic year. Although there are different opinions about the sampling size for factor analysis in the scale development studies, it is usually accepted that sampling size should be between fivefold and tenfold of the number of items (Bryman & Cramer, 2001; Pett, Lackey, & Sullivan, 2003). The study group for our current study consisted of 203 pre-service

teachers from Special Education, Program of Guidance and Psychological Counseling and Department of Computer Education and Instructional Technology.

The Process of Developing the Pilot Form of the Scale

During the preparation of the pilot form, various actions, such as literature review, taking student opinions through open-ended questions by applying an online survey, creating an item pool, consulting to expert opinions have been taken.

Since there was not a particular body of literature on practical tools for content development, several related topics on literature were scanned. The studies were reviewed about Web 2.0 technologies (e. g. Baltacı-Göktalay & Özdilek, 2010; Conole & Alevizou, 2010; Connolly et al., 2011; Coutinho, 2008; Elmas & Geban, 2012; Franklin & van Harmelen, 2007; Greenhow, Robelia, & Hughes, 2009; Holcomb & Beal, 2010; Kumar, 2009; Nelson et al., 2009; Oliver, 2010; Gray et al., 2010); studies about content development and content authoring tools were reviewed (Diwakar, Patwardhan, & Murthy, 2012; Franklin & van Harmelen, 2007; Gupta, 2010), as well as survey or scale development or adaptation studies for various technologies were reviewed (Erdemir, Bakırcı, & Eyduran, 2009; Jang & Tsai, 2012; Kabakçı Yurdakul et.al., 2012; Marsh, Pountney, & Prigg, 2008; Timur & Taşar, 2011).

In addition to the literature review, an online survey with four open-ended questions was applied to pre-service teachers from different departments. The questions were featuring: what are the competencies that they consider as important to have for a teacher, what they would like to learn about educational technologies as a pre-service teacher, what kind of problems they face when they use educational technologies, and what are their suggestions to support them while using educational technologies.

The literature review and student answers to open ended questions shaped the composition of the items. Through the use of literature and similar scales' expressions, a pool consisting 34 items, aiming to assess to what extent pre-service teachers feel competent about using practical tools for content development and how necessary they view these tools in educational settings were created. Expert opinions were taken for the content and face validity. Two experts from Program of Educational Administration, Supervision, Planning and Economics, experienced on technology integration in education; one expert from Computer Education and Instructional Technology, and one expert from Program of Guidance and Psychological Counseling and Department, who is experienced on developing scales were consulted.

After the experts' consultations, 26 items that were related to skills for performing a task using practical tools for content development were left in the scale. Pre-service teachers were asked to express their opinions about both their competence and necessity of those tasks. 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” for competency; and “5” means “very necessary” and “1 - not at all necessary” for necessity.

Data Analysis

In order to assess the appropriateness of the data for factor analysis, Kaiser-Meyer- Olkin (KMO) coefficient was calculated and Bartlett Test of Sphericity was done. Then to assess the construct validity of the scale, Explanatory Factor Analysis (EFA) was carried out. Moreover internal consistency (Cronbach’s alpha) coefficient was calculated to check reliability.

Researchers suggest that Kaiser-Meyer- Olkin (KMO) coefficient and Bartlett Test of Sphericity can be used to assess the appropriateness of the respondent data for factor analysis (Büyüköztürk, 2009; Williams, Brown, & Onsmann, 2010). In order to be suitable for factor analysis, KMO should be equal to or higher than 0.50 and the Bartlett's Test of Sphericity should be significant ($p < .05$) (Can, 2013; Hair, Anderson, Tatham, & Black, 1998). The obtained KMO coefficient and the results of the Bartlett's Test of Sphericity for the scale are given in Table 1.

Table 1. Investigation of the Suitability of the Respondent Data for Factor Analysis

		Competence	Necessity
Kaiser-Meyer- Olkin Measure of Sampling Adequacy		.895	.928
Bartlett's Test of Sphericity	Approx. Chi-Square	3000,567	3793,998
	Df	325	325
	Sig.	.000	.000

As seen in Table 1, the KMO coefficient is higher than 0.70 for both competence and necessity, which implies the sampling size is appropriate; and $p < 0,05$ that shows Bartlett's Test of Sphericity is significant.

Validity of the Scale

Explanatory Factor Analysis (EFA) with varimax was carried out for the construct validity of the scale. Field (2013) defines factors analysis as ‘a technique for identifying groups or clusters of variables’ (p. 619). EFA is an analysis method helping to group items, which were developed by the researchers, into factors that consist of items with similar structure or nature (Büyüköztürk, 2009; Maroof, 2012). As a result of the factor analysis, it was seen that the factor loadings of all items were higher than 0.45, which was reported as being a fair number to include an item in the scale (Büyüköztürk, 2009). It was observed that the scale has one dimensional structure and consists of 26 items measuring two characteristics (competency and necessity) based on the factor loadings and the scree plot. The factor loadings and the total variance explained by the scale are given below.

Cumulative percentage of explained variance (criterion) is an area of disagreement of factor analysis in different disciplines (Williams et al., 2010). The cumulative percentage of explained variance was 38.916% for competence and 50.528% for necessity. For one dimensional scale, explaining 30% variance is seen as acceptable (Büyüköztürk, 2009). The factor weights of the scale items varied between 0.753-0.486 for competencies and between 0.778-0.571 for necessity. The results of the factor analysis for Practical Tools for Content Development Scale are given in Table 2.

Table 2. The Factor Analysis Results for Practical Tools for Content Development Scale

<i>A) The Results of the Explanatory Factor Analysis for Competency</i>		
Items	Communality	Factor Loading
1: Preparing presentations	0.370	0.608
2: Preparing interactive presentations	0.400	0.632
3: Recording voice	0.365	0.604
4: Image/photo editing	0.381	0.617
5: Preparing fliers/ posters	0.433	0.658
6: Preparing brochures	0.477	0.691
7: Designing characters	0.566	0.753
8: Creating tests	0.498	0.706
9: Creating puzzles	0.456	0.675
10: Creating videos	0.552	0.743
11: Digital story book preparation	0.495	0.703
12: Creating animations (GoAnimate etc.)	0.484	0.696
13: Concept mapping	0.376	0.614
14: Preparing educational games	0.406	0.637
15: Creating interactive maps (Google maps etc.)	0.337	0.581
16: Sharing presentations (SlideShare etc.)	0.297	0.545
17: Sharing videos (YouTube etc.)	0.388	0.623
18: Sharing Photos (Flicker etc.)	0.296	0.544
19: Creating virtual libraries using social bookmarking sites	0.303	0.550
20: Creating digital portfolio (Blog etc.)	0.387	0.622
21: Creating and sharing collaborative documents (Google Docs. etc.)	0.367	0.606
22: Creating surveys (Survey Monkey etc.)	0.337	0.580
23: Using social networking to create groups for educational purposes	0.334	0.578
24: Creating online learning environments	0.237	0.486
25: Text based e-book creation	0.299	0.546
26: Creating interactive e-books	0.278	0.527
<i>B) The Results of the Explanatory Factor Analysis for Necessity</i>		
Items	Communality	Factor Loading
1: Preparing presentations	0.326	0.571
2: Preparing interactive presentations	0.476	0.690
3: Recording voice	0.497	0.705
4: Image/photo editing	0.591	0.769
5: Preparing fliers/ posters	0.508	0.712
6: Preparing brochures	0.557	0.746

7: Designing characters	0.534	0.731
8: Creating tests	0.474	0.689
9: Creating puzzles	0.497	0.705
10: Creating videos	0.505	0.710
11: Digital story book preparation	0.509	0.713
12: Creating animations (GoAnimate etc.)	0.436	0.660
13: Concept mapping	0.495	0.704
14: Preparing educational games	0.441	0.664
15: Creating interactive maps (Google maps etc.)	0.529	0.727
16: Sharing presentations (SlideShare etc.)	0.541	0.735
17: Sharing videos (YouTube etc.)	0.565	0.752
18: Sharing Photos (Flicker etc.)	0.562	0.750
19: Creating virtual libraries using social bookmarking sites	0.421	0.649
20: Creating digital portfolio (Blog etc.)	0.484	0.695
21: Creating and sharing collaborative documents (Google Docs. etc.)	0.605	0.778
22: Creating surveys (Survey Monkey etc.)	0.555	0.745
23: Using social networking to create groups for educational purposes	0.540	0.735
24: Creating online learning environments	0.498	0.706
25: Text based e-book creation	0.467	0.684
26: Creating interactive e-books	0.525	0.725

Reliability of the Scale

Cronbach alpha coefficient was calculated to check reliability of the scale. Cronbach alpha internal consistency coefficient of scale calculated for the “competencies” of pre-service teachers for using practical tools for content development was $\alpha=0.94$ and $\alpha=0.96$ for the perceptions of “necessity” of pre-service teachers for using practical tools for content development. Alpha coefficient being higher than 0.80 means that scale is a highly reliable scale (Özdamar, 1999).

DISCUSSION, CONCLUSION AND RECOMMENDATIONS

FATİH project has been implemented by Ministry of National Education to schools with large investments, including distributing tablets to teachers and students which resulted with the increasing need towards digital content. Custom software developed by the companies was not enough to fully meet the needs and for the teachers it was difficult to obtain programming skills required for content development software; thus, educators had to search for an alternative pathway. At this point, practical content development technologies emerged. Many of these technologies are web-based and do not require computer setup. It is possible to categorize these tools according to their content, such as presentation, graphics, video, animation, development tools. Teachers can process digital content quickly and easily to fulfill their needs without having a need for any programming skills, with drag-and-drop method. In addition, since they are expected to increase popularity among the educators, the use of the tools is simple, fast and user-friendly. Furthermore, it is suggested that use of these tools will add diversity to the teaching-learning process and

will make learning more effective and engaging. The introduction of these technologies will provide learning environments that allow active students' participation more. It will also help students to become digital citizens by offering more communication options with their peers and teacher outside of the class.

With the completion of FATİH project, it is expected that the need for digital content will increase every day, thus it is essential for teachers to gain the digital content development skills. There is a need for a reliable and valid scale to measure pre-service teachers' competencies and perceptions of necessity about using practical content development tools. In the literature review, such a scale was not encountered, which increases the significance of this study. This research was conducted to meet this requirement.

To develop the scale measuring pre-service teachers' competencies and perceptions of necessity about using practical tools for content development; literature review, taking student opinions through open-ended questions applying an online survey, creating an item pool, consulting to expert opinions, and validity and reliability checks were performed. After applying the scale to 203 teachers, an exploratory factor analysis was conducted. It has been found that the scale has one factor (dimension) with 26 items. Total variance explained by the scale was 38,916% for competencies and 50.528% for necessity. The Cronbach alpha reliability coefficient was $\alpha=0.94$ for competencies and $\alpha=0.96$ for necessity. Exploratory Factor Analysis results, performed to determine the construct validity of scale, and Cronbach's alpha reliability coefficients showed that the scale was valid and reliable.

As a result, this scale can be used for need analysis of pre-service teachers to identify competencies and perceptions of necessity for practical content development tools. It can be applied to see if there is a difference among pre-service teachers' competencies and perceptions of necessity for practical content development tools according to demographic factors. Conducting further researches with students from different departments are recommended for the reliability and validity of the scale. A qualitative study with deeper analysis could also be more informative. The scale can also be applied to teachers working in schools under the Ministry of National Education (public schools) and to middle and high school students.

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