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A Study on Developing a Scale for Determining the Educational Usage of Mobile Communication Apps

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Abstract: The aim of this study was to develop a scale to determine the educational usage of mobile communication apps among teacher candidates. 52 draft statements were prepared by researchers through literature review and opinions of teacher candidates. Statements were reduced to 40 statements based on expert opinions. The draft scale was administered to 412 teacher candidates who applied to the Pedagogical Formation Certificate Program at Near East University during the academic year of 2014-2015. Factor analysis was applied for the structural validity of the scale and Cronbach Alpha coefficients were calculated. Exploratory factor analysis was applied for the construct validity and Cronbach Alpha internal consistency coefficients were calculated for the reliability of the scale. 4-factor scale consisting of 33 statements was obtained based on the factor analysis. Cronbach Alpha internal consistency coefficient of the scale was calculated as 0.94. According to these results, it is revealed that the scale is highly reliable and this scale is considered to be a guide for the researchers who would like to use mobile communication technologies for educational purposes.

Keywords: Scale Development, Educational Mobile Communication Apps, Teacher Candidates
Categories: K.3, L.0.0, L.3.0, L.3.5

1 Introduction

Design, application, evaluation and development of learning-teaching processes which would ensure effectiveness and efficiency in education are the basic functions of educational technologies [Alkan, 05]. The components of educational technologies has been overwhelmed by the experienced conversion with the widespread use of mobile technologies after wireless internet among teachers, instructors, educational materials and educational environments [Domingo & Garganté, 16; Webb, 11, Ozdamli, 11]. Recently, the number of people using mobile technology devices has been reached to very high levels [Soykan & Uzunboylu, 15]. No other technology has been still developed apart from the internet which facilitates globalization to that extent in the areas of communication and education within the history of humanity [Fer, Cirik, Altun, Colak, Ozkilic, Sahin, Avci, Yuksel & Turan, 14]. Statistical data about the use of internet in the world and its effects on communication environments are provided in Figure 1 [WeAreSocia, 15].

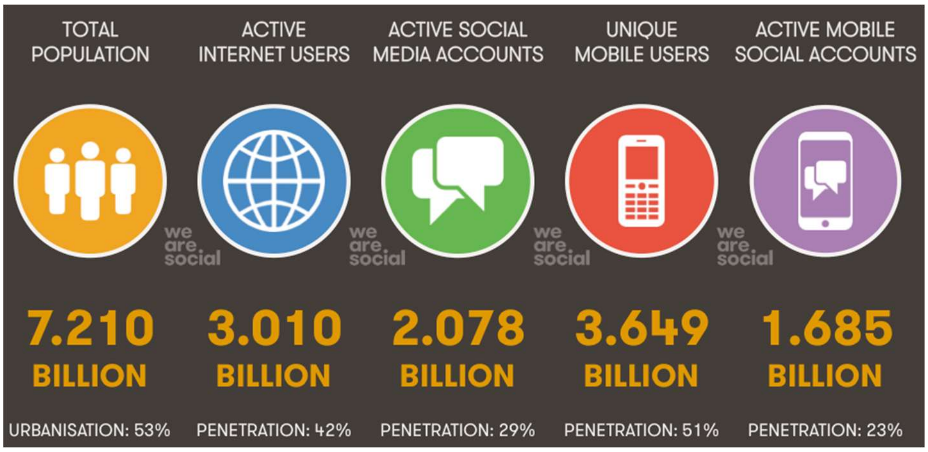

Figure 1: A Snapshot of the World's Key Digital Statistical Indicators

Mobile device technologies arise as the most advanced form of mobile communication among communication technologies [Roschelle, 03]. Advancements in the last few years and inclusion of powerful competitors in the market with the newest technologies have brought along the permanent development of the mobile market [Trentin & Repetto, 13; Ozdamli & Tugun, 12]. Young population tends to contact social relationships with their peers through technological devices in recent days [Abass & Ayo, 2013]. The development of mobile internet technologies (4G/3G/2G/EDGE or Wi-Fi) with mobile devices facilitates the contact of young people and allows them to keep in touch with another permanently [Chen, 07]. Incidences of internet used with digital devices are provided in Figure 2 [Global Web Index, 14].

The process of becoming mobilized in communication has led to an increase in the number of mobile apps [Bicen & Kocakoyun, 13]. There are expressions such as “Instant Messaging (IM)”, “Mobile Messaging”, “Mobile IM”, “Mobile Chat” “Messaging Apps”, “Mobile Messenger Apps” and “Mobile Communication Apps” in the literature. In this study, “Mobile Communication Apps” was preferred to be used since it covers all these expressions.

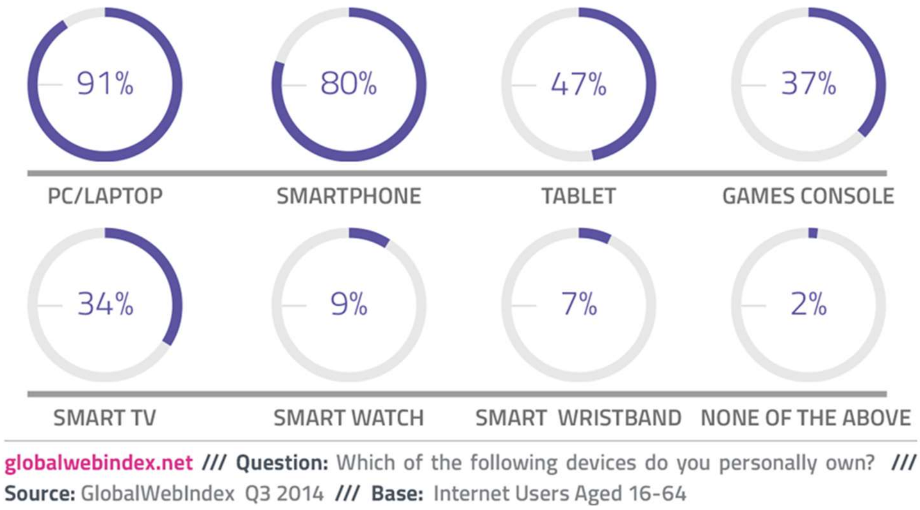

Figure 2: % Internet Users Who Personally Own The Following

Mobile communication apps have taken the place of traditional Short Message Service (SMS) and Multimedia Service (MMS) because of their popularity and easy usage [Olson, 13]. Users can share various types of attachments such as text, voice messages, photograph, video, file, location check-in and personal information through these applications at real times [Bansal & Joshi, 14]. Mobile communication apps are free since they only require the internet [Al-Emran, Elsherif & Shaalan, 16]. Data related with the incidence of the use of ten most popular mobile communication apps are demonstrated in Figure 3 [Statista, 15].

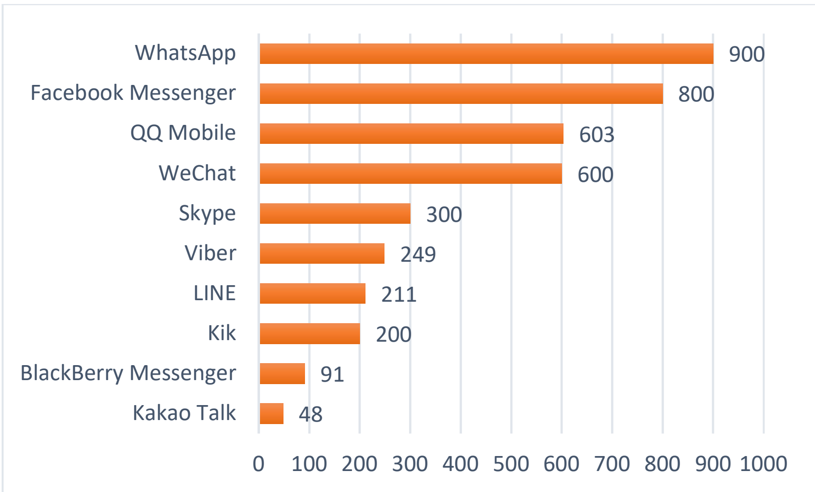

Figure 3: Most Popular Global Mobile Communication Apps as of August 2015, Based on Number of Monthly Active Users (in millions)

In Figure 3, it is seen that WhatsApp application has maintained its popularity with approximately 900 million active users in august. When Facebook administration which is the leading social network realized this situation, they bought this application in exchange for 19 million $ (Reed, MacMillan & Rusli, 14].

Similarly, researchers from countries such as South Africa, Ghana and Kuwait who realized the potential of mobile communication apps have begun to conduct research about mobile communication apps for educational purposes and especially the use of WhasApp application from the year of 2013 [Amry, 14; Atta & Salem, 13; Basma & Ahmad, 14; Bere, 13; Bouhnik & Deshen, 14; Chipunza, 13; Church & Oliveira, 13; Fischer, 13; Maniar & Modi, 14, Plana, Escofet, Figueras, Gimeno, Appel & Hopkins, 13; Salem, 13; Yeboah & Ewur, 14].

The concept of Technological Pedagogical Information (TPI) deals with how teaching and learning could change when certain technologies are used. TPI covers the application of pedagogical strategies towards technology use. This involves technology use through appropriate pedagogical approaches considering the contributions of technological devices or materials to the learning process based on a certain purpose and their limitations. Another point about TPI is that teachers should have knowledge and skills towards using many technologies which are not designed for education through educational purposes by restructuring them in the learning process. In this way, teachers should creatively use technology in order to increase the learning of students [Koehler & Mishra, 08, Ozdamli, 11].

Pedagogical formation is the occupational knowledge about teaching provided by faculties of education at universities. Since teaching is a profession of cultivating individuals, teacher should certainly have "pedagogical love" which we define as humanity. This can also be called love of profession [Van Driel, Veal & Janssen, 01]. Teacher candidates determine their own teaching approaches by imitating the methods, tactics and strategies applied during the lectures by their teachers in the learning and teaching process [Alkan, 00]. Teachers could be able to share their developing and innovating knowledge with their students and colleagues by creating appropriate learning environments and using different teaching methods. They should display flexible approaches which can adjust to the different and changing needs of the society and students [Martin & Ertzberger, 13, Silva & Andrade, 09]. Teachers should also know that their role is to convert whole school, close and far environment into appropriate educational environments beyond achieving in-class learning [Oktay, 88].

Mobile learning is a powerful environment which integrates the areas of mobile application and e-learning. Therefore, it is expected to have an important allocation in the learning processes which will be used in the future [Prensky, 04; Cavus, 10]. In this context, it is important to determine the use of mobile communication apps for educational purposes among teacher candidates. It is also important to determine the advantages and disadvantages of the use of mobile communication apps for educational purposes. It is considered that this study would light the way for researchers who would like to use mobile communication apps for educational purposes. There are no studies or scale prepared about mobile communication apps for educational purposes in Turkey and North Cyprus cited in the literature. The aim of this study was to develop a scale for determining the educational usage of mobile communication apps among teacher candidates.

2 Method

2.1 Sample of the Study

Population of the study consisted of 2876 teacher candidates who applied to the pedagogical formation certificate program during the academic year of 2014-2015 at Near East University Distance Learning Center. Since it would be difficult to reach the whole population because of time, cost and control, sampling method was preferred and sample was selected through using simple random sampling method. It was appropriate to reach 339 teacher candidates with 95% confidence interval and 5% sampling error based on simple random sampling method. In this study, 412 teacher candidates have been reached and sampling error was calculated as 4.47%.

61.8% of the candidates included in the sample of this research were male and 38,2% of them were female. Besides, 66,5% of the participants were from Turkish Republic (TR) and 34,5% of them were from Turkish Republic of Northern Cyprus (TRNC). Ages of 30% of the teacher candidates was between 18-22, 51% of them was between 23-27, 12% of them was between 28-32 and 7% of them was 33 and above. Besides, 8,3% of the teacher candidates use mobile devices for less than 2 years, 16% of them use for between 2-4 years 20,1% of them use for 4-6 years 20,1% of them use for 6-8 years, 23,5% of them use for 8-10 years and 31,8% of them use for 10 years and more. 92,5% of the teacher candidates have access to the internet through mobile devices. 23,5% of the teacher candidates who have internet access through their mobile devices use the internet less than 1 hour during the day, 27,7% of them use the internet between 1-3 hours, 23,3% of them use 4-6 hours and 25,5% of them use more than 6 hours through their mobile devices.

2.2 Instrument

Content validity ratios have been developed by Lawshe [75]. Therefore, steps known as Lawshe method were used in this study when preparing the data collection tool:

1. Writing positive and negative statements related with the attitude which is desired to be measured,
2. Submitting the statements to expert opinion,
3. Applying the necessary editing's based on the feedbacks from experts,
4. Arranging the remained statements randomly and writing appropriate instructions,
5. Determining the sample which will be applied and conducting the first application,
6. Performing the statistical calculations and excluding the statements which are not found as significant.

Questionnaire form consisting of two sections was used as data collection tool in this research. There was a demographic information form in the first section and draft form of the scale on the educational use of mobile communication apps in the second section of the questionnaire form.

Questions about the informatory characteristics of the teacher candidates such as gender, age, their use of mobile devices, their status and duration about internet access through mobile devices were asked in the demographic information form. In the second section of the questionnaire form, there is the draft form of the scale consisting of 40 statements on the educational use of mobile communication apps.

Draft form of the measurement tool was prepared by using Likert-type with 5-point rating system. All of the statements in the draft form of the scale was positive and answers to the statements were rated as “1 point for strongly disagree”, “2 points for disagree”, “3 points for undecided”, “4 points for agree” and “5 points for strongly agree”. Mean values obtained from identified ratings and numerical values in order to examine the statements in the scale according to teacher candidates were determined as follows;

1. Strongly Disagree	1.00–1.79
2. Disagree	1.80–2.59
3. Undecided	2.60–3.39
4. Agree	3.40–4.19
5. Strongly Agree	4.20–5.00

2.3 Data Collection

Open source coded LimeSurvey was installed to the server by using web-based survey management and teacher candidates who applied to the Pedagogical Formation Certificate Program at Near East University during the academic year of 2014-2015 were reached online. Teacher candidates who were reached by e-mail have been informed about the aim of the research.

It was stated that answers will not be shared with third parties and the obtained data will only be used by the researchers in order to ensure that teacher candidates would answer the questions in an accurate and sincere way.

2.4 Data Analysis

Data obtained from the questionnaire form used as the data collection tool in the research were entered into an electronic database and analysed with SPSS 20,0 statistical data analysis package program. Informatory characteristics of the teacher candidates and status of internet access through mobile devices of teacher candidates participated in this research were determined with frequency analysis. Content validity of the scale was ensured based on expert opinions and draft form of the scale was formed. In order to ensure construct validity of the draft scale, exploratory factor analysis was applied. Appropriateness of the data set for factor analysis was tested with Kaiser-Mayer-Olkin and Bartlett’s Sphericity tests before applying exploratory factor analysis. After determining the appropriateness of the data set for factor analysis, exploratory factor analysis was applied by using principal components analysis and varimax rotation. Steps for the exploratory factor analysis were applied again after excluding the statements which were found to have factor loadings below 0,50. Factors which have eigenvalues above 1 were considered when determining the number of factors in the scale and statement-total statement correlation was used to determine the statements which will be in the scale. Internal consistency test was used for the reliability of the scale. Cronbach alpha values which have internal consistency coefficients were calculated for both overall and sub-dimensions of the scale in the internal consistency test. Cronbach alpha coefficient is the weighted standard change mean obtained by the proportion of total variance of k statements in the scale to the general variance [Bryman & Cramer, 11].

Lastly, correlation test was applied in order to determine the correlation between sub-dimensions of the scale. Appropriateness of the total scores from sub-dimensions for normal distribution was tested with Kolmogorov-Smirnov test before deciding to which correlation test will be applied and it was determined that scores from sub-dimensions are inappropriate for normal distribution and Spearman correlation analysis was used to figure out the correlation between sub-dimensions. It is a non-parametric statistical measurement and it reveals the relation, in other words, correlation between two variables [Hollander & Wolfe, 73].

3 Results and Interpretations

Results of the study are provided in two sections as the results of validity and reliability analysis.

3.1 Results Related with the Validity of the Scale

3.1.1 Content Validity

A question pool consisting of 52 statements was constituted by the researcher through literature review in the scale development stage and this was submitted to 4 academicians in total from the areas of Computer and Instructional Technology Education, Measurement and Evaluation, Turkish Language and Statistics to get their opinions about the statements. Draft scale consisting of 40 statements was constituted through excluding 12 statements based on the recommendations of the experts and adding 2 statements based on the expert opinions. In the pilot application of the draft scale to 40 subjects, teacher candidates were asked to indicate the questions that they did not understand and/or had difficulty in answering and it was concluded that the prepared scale is sufficient for assessing the educational usage of mobile communication apps at the end of the pilot application.

3.1.2 Construct Validity

Exploratory factor analysis (EFA) was used for the construct validity of the scale. Appropriateness of the data set for factor analysis was examined based on Kaiser-Mayer-Olkin and Bartlett's Sphericity tests before applying factor analysis. Kaiser-Mayer-Olkin sampling measurement value of the scale was 0,92. Since KMO coefficient is quite high, it is seen that sample size is appropriate for factor analysis [Tavsancil, 02]. KMO test is a number related with the appropriateness of the sample size. It means that data are appropriate for analysis when KMO is close to 1 and there is a perfect match if it is 1. It can be said that this result is sufficient based on the literature and expert opinions. [Bryman & Cramer, 11]. Nevertheless, X2 was calculated as 18138 based on Bartlett's Sphericity test and $p=0,00<0,05$ value was significant. According to these results, the scale was regarded as appropriate for factor analysis.

Statements	Factor 1	Factor 2	Factor 3	Factor 4	$\overline{x}$	s
Statement 9	0,79				3,97	0,66
Statement 10	0,77				3,84	0,81
Statement 14	0,77				3,99	0,72
Statement 18	0,71				3,88	0,80
Statement 20	0,68				4,07	0,61
Statement 22	0,65				3,78	0,80
Statement 24	0,62				3,88	0,67
Statement 28	0,62				3,73	0,86
Statement 31	0,58				3,90	0,83
Statement 35	0,58				3,95	0,76
Statement 36	0,57				3,99	0,74
Statement 40	0,54				4,21	0,62
Statement 11		0,75			4,01	0,67
Statement 15		0,67			4,04	0,57
Statement 27		0,66			3,88	0,81
Statement 7		0,65			3,95	0,84
Statement 12			0,83		3,93	0,75
Statement 17			0,78		4,01	0,69
Statement 24			0,73		3,82	0,77
Statement 25			0,72		3,90	0,78
Statement 26			0,71		3,88	0,80
Statement 30			0,71		3,35	1,08
Statement 32			0,68		4,02	0,57
Statement 34			0,65		3,88	0,72
Statement 37			0,63		3,93	0,71
Statement 39			0,60		4,07	0,63
Statement 8			0,58		4,05	0,67
Statement 19			0,52		3,98	0,77
Statement 13				0,74	3,98	0,68
Statement 29				0,69	4,05	0,74
Statement 33				0,62	3,98	0,63
Statement 38				0,57	3,93	0,87
Statement 5				0,53	3,98	0,86
Statement 6				0,53	3,99	0,70

Table 1: Sub-dimensions of Educational Use of Mobile Communication Apps Scale

Factor analysis which was used to test the validity of the scale was applied by using principal components analysis method and varimax rotation. Principal Components Analysis was considered as more appropriate here since it was aimed to reveal an existing situation empirically rather than examining the appropriateness of statements for a predetermined constructs [Tabachnick and Fidell, 96]. Based on the exploratory factor analysis, it was revealed that there were 6 factors which have total eigenvalues above 1 in the scale consisting of 40 statements and these factors explain 76,86% of the total variance. 6 statements in which the factor loadings are below 0,50 were excluded from the scale and exploratory factor analysis was repeated by using principal components analysis method and varimax rotation.

KMO value of the scale consisting of 33 statements was figured out as 0,96 and the result of Bartlett's Sphericity test was significant. Factor loadings, mean and standard deviation values based on the new EFA applied by using principal components analysis and varimax rotations are demonstrated in Table 1.

When EFA results in the Table 1 are examined, it was figured out that there are 4 factors named as "Instant Access to Information", "Usage for Lecture Topics", "Instant Communication" and "Mobile Communication Apps" in the Educational Use of Mobile Communication Apps Scale consisting of 33 statements and these factors explain 63,15% of the total variance. According to these results, sub-dimensions and statements of the scale are provided in Table 2 as follows;

Sub-Dimensions	**Questions**
Instant Access to Information	S9,S10,S14,S18,S20,S22,S24,S28,S31,S35,S36,S40
Usage for Lecture Topics	S11, S15, S27, S7
Instant Communication	S12, S17, S24,S25, S26, S30,S32,S34,S37,S39,S8,S19
Mobile Communication Apps	S13, S29, S33, S38, S5, S6

Table 2: Sub-dimensions of Educational Use of Mobile Communication Apps Scale

3.2 Results Related with the Reliability of the Scale

Internal consistency test was applied for the reliability of the scale. According to the internal consistency results, Cronbach alpha value of the overall scale was found as 0,94. Cronbach alpha values related with sub-dimensions of the scale were calculated as 0,83 for instant access to information, 0,76 for usage for lecture topics, 0,89 for instant communication and 0,77 for mobile communication apps. It was accepted that the scale is highly reliable based on these results.

4 Discussion and Conclusion

In this study, a process of developing a scale to determine the educational use of mobile communication apps among teacher candidates was explained. Reliability and validity analysis of the scale was conducted with 412 teacher candidates. According to the internal consistency results, Cronbach alpha value was found as 0,94 for the overall scale. Exploratory factor analysis (EFA) was used for the construct validity of the scale. Reliability values obtained for overall scale and four factors are above 0,70 which is the accepted coefficient value in scales [Bryman & Cramer, 11]. “Educational Use of Mobile Communication Apps Scale” consisting of **33** statements and 4 sub-factors was developed based on the reliability and validity analysis. According to these results, it is revealed that the scale is highly reliable and it is expected that it will be a guide for the researchers who would like to use mobile communication apps for educational purposes.

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