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Original Article

Validating the Persian Version of ICT Engagement Questionnaire

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ABSTRACT

Background: Regarding to the importance of ICT Engagement of students, it is necessary to have a reliable and valid method for evaluating it in this group. ICT Engagement questionnaire of Zylka et al have been designed for this purpose. This study aimed to validate that questionnaire in a representative sample of Iranian students.

Methods: The Questionnaire was translated into Persian and its face and content validities was assessed by the members of Education faculty at the University of Tabriz, Iran. Its population included the faculty members of that University and the students studying in technical and vocational schools in Urmia. Of the faculty members, 8 experts were selected by purposeful sampling for face and content validities, and 370 students were selected by cluster random sampling. The research tool was Zylka et al ICT engagement Questionnaire. We used SPSS 26 to analyze data.

Results: The students' ages ranged from 16 to 18 and 38.6% of them were male and 61.4% were female. The reliability of the questionnaire was 0.91 based on the Cronbach's alpha. The results of exploratory factor analysis revealed that five factors of ICT in Zylka et al questionnaire were similar to seven factors in the present study, namely positive ICT self-esteem (explained variance=29.87%), self-confidence in ICT (explained variance=6.84%), online exposure (explained variance=4.69%), social exposure (explained variance=3.83%), interest in computers, tablets and mobile phones (explained variance=3.46%), spending time on ICT (explained variance=3.36%), and the negative ICT self-concept (explained variance=3.18%).

Conclusion: PCA results revealed that seven factors can affect ICT Engagement. In total these seven factors can account for 55.19% of the variance in ICT Engagement. Validating the questionnaire reveals that constructs of "ICT engagement" may vary among populations in different countries. This difference may be due to the cultural differences and varied facilities between the two statistical populations.

Keywords: ICT engagement, Educational technology, Face validity, Factor analysis, Computer literacy

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Introduction

Nowadays information and communication technology (ICT) has become an essential part of most businesses and organizations (1). Using technology in the educational and learning process, on the one hand leads to progress and on the other hand facilitates the learning processes (2). Using ICT in the classroom is very important because it provides opportunities for students to learn to deal with the issues in the information age (3). UNESCO considers the major aspects of ICT application in education as facilitating universal ways of accessing education, integrating separate learnings, supporting teachers' professional development, education inclusiveness, and promoting education (4). In the present era, the rapid growth and expansion of ICT has influenced our lives in various cultural, social and economic aspects. All aspects of human life have been affected by the ICT, and one of them is teaching and learning (5). Utilizing ICTs can enhance the quality of access to up-to-date materials and topics (6). In today's digital societies, ICT literacy is needed in almost all fields of work, and its related capabilities are among the important skills required for recruitment. It is inevitable for today's learners living in the digital age to engage with ICT (7). A major conditioning personal characteristic that affects the development and adaptation of ICT skills in a self-regulated way is considered to be ICT engagement (7).

Zylka et al. has revealed a five-factor model for ICT engagement: initially, ICT-related Interest dimension. It means feeling-related esteems, feelings such as involvement and enjoyment, whereas value-related capacities refer to the subject's personal development and understanding of problems or competence. Therefore, ICT engagement leads to well-developed long-term interests in the area of ICT as well as favorite ICT topics or types of ICT activities. This dimension is suggested to distinguish two factors: first, interest in computers and second, interest in mobile phones and portable electronic devices (8). Third, Positive Self-Concept in relation to the use of ICT (8). It points towards personal notions about ICT-related abilities that facilitate motivated behavior. This factor refers to individual ICT experiences, beliefs and attitudes and as such is an important determinant of ICT-related achievement and behavior (9, 10). The positive effect of a positive self-concept related to the use of ICT on outcomes of ICT-related performance and it can be mediated by ICT-related interest (11). Fourth, Negative Self-Concept (8). Fifth, Social Exposure to ICT (8). This facet of ICT engagement refers to the extent that students make ICT a subject of interpersonal interaction and communication, such as, talking about the features of the latest smartphone or about problems with their computers. Frequent social exchange with peers, teachers, parents, or the class room community may increase the amount of time and the extent of ICT use, and will foster long-term involvement (12).

Therefore, this study was conducted in view of the importance and necessity of dealing with the challenges of ICT and engagement with it especially among the younger generation. It is also a critical research given the lack of a similar questionnaire in Persian, and helps with clarifying the other researchers' approach in this field.

So far a number of studies have been conducted to better understand the factors and outcomes of ICT engagement. One study explored the adoption of information communication technology. The results showed that there was a relationship between ICT adoption and academic performance in a conservative environment. Additional findings also stated that ICT adoption causes improvement in the performance of female students more than their male peers (13). In another paper, researchers investigated the effective integration of ICT to facilitate secondary education. They revealed that ICT education and English language proficiency are significant demographic predictors of ICT utilization. Results also revealed the positive impact of ICT on teachers' professional performance (14). Also, the findings of a research in 2013 indicate a significant

relationship between such variables as access to educational and IT facilities, teachers and parents' mastery of IT skills, student's access to educational and IT facilities at home, and their academic achievement (15).

A study in UK investigated the levels of ICT engagement inside and outside of schools. The analysis showed that students' engagement with ICT, especially at school, was superficial and cursory. While most students felt that ICT use would lead to better learning, this study showed how the nature of schools that deliver formal and often location-based education affects ICT use (16).

Considering the studied literature and the necessity of investigating the issues related to students in the information age, it is evident that there is a lack of research on validating questionnaire Zykla et al. identifying the factors of ICT in Iran. Therefore, the main objective of the present study is to validate ICT engagement Questionnaire among students in district 1 of Urmia in Iran.

Methods

This is an applied research and its purpose is to analyze and validate Zylka et al. ICT Engagement Questionnaire (8). The population of study were the faculty members of department of Education at the University of Tabriz as experts to assessing the validity of the questionnaire and all the female and male students studying in technical and vocational schools during academic year 2019-2020, in the district 1 of Urmia (1200 people). Of Education faculty members, 8 members were selected by purposive sampling method. They were from various fields of expertise: two of them were experts in educational technology, three curriculum study experts and three educational psychology experts. For selecting students, we used cluster random sampling and divided the population into 40 separate clusters based on their fields of study (40 fields), and randomly selected 8 clusters. In the second stage of cluster sampling, we selected a simple random sample from each cluster, that is, one school for each field of study. Finally, among the participants, 370 students were selected from the fields of computer, architecting, electronics, graphics, food industry, agriculture, construction and accounting. Before filling in the questionnaires, all participants were fully informed about the purpose and procedure of study, voluntary nature of participation and confidential nature of the study.

The research tool was the ICT Engagement Questionnaire, designed by Zylka et al (8) with 36 items. The questionnaire was designed on the five-point Likert scale (1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree). The ICT engagement questionnaire of Zykla et al (8) was translated and implemented for the first time in Iran. Therefore, to determine the content validity of this tool, the original version of the questionnaire was first translated into Persian and then it was reviewed to verify the translations by 3 English language experts. To ensure the accuracy of the translations, the Persian text of the questions was translated into English by the English language expert and matched with the original text and translated back into Persian until the final version of the questionnaire was prepared. Then the face and content validity of the Questionnaire were assessed by 8 members of Education faculty at the University of Tabriz. Content validity ratio (CVR) was 0.83 and the validity of the Questionnaire was confirmed based on Lawshe table for CVR. To examine the reliability of implementation in the Iranian society, questionnaire was distributed among a population consisting of 30 students. Based on this preliminary study, the sentence structure of some questions was reviewed until the final version was prepared. Reliability was obtained using Cronbach's alpha coefficient (α=0.91), which shows that the used instrument has a good reliability. Then, the questionnaire was distributed among 370 students studying technical and vocational schools.

Everyone participated in the study voluntarily and with their consent. The faculty members ranged in age from 34 to 56 years old and student from 16 to 18 years and

willing to participate in the study. Exclusion criteria included a non-return and failure to respond to all questions in the questionnaire. After gathering data, 10 questionnaires were excluded from the research process, because they were filled incorrectly. Then we used SPSS version 26 and descriptive and inferential tests including Kaiser-Meyer-Olkin (KMO) Measure of sampling adequacy and exploratory factor analysis to determine factors of the questionnaire. Kaiser-Meyer-Olkin (KMO) Test is a measure of how suited one's data is for Factor Analysis. The test measures sampling adequacy for each variable in the model and for the complete model. The statistic of the test is a measure of the proportion of variance among variables that might be common variance (19).

Results

Sample Characteristics

The main purpose of the present study was to validate the ICT Engagement Questionnaire among high school students in Urmia. For that purpose, we conducted some descriptive statistical analysis. The results are shown in Table 1.

The students' ages ranged from 15 to 18 and 38.6% of the participants were male and 61.4% were female. One can also observe the frequency of participants in each of the academic fields in Table 1. The highest number of participants was in electronics (23.1%) and the lowest in construction (7.8%).

Construct and Validate of Questionnaire

To answer the research question formulated in this study, the following factor analytic procedures were used.

First the correlation matrixes were computed. Then Bartlett's Test of Sphericity and Kaiser-Meyer test were done. The results of Bartlett's Test of Sphericity (df=360, P=0.0001 <0.05) showed that the items were correlated, supporting the validity of data for factor analysis. Then we tested the sampling adequacy, using Kaiser-Meyer-Olkin (KMO) Measure of sampling adequacy. The results showed that KMO was above 0.06, indicating that the sample size was suitable for factor analysis.

After ensuring the suitability of data for factor analysis, we used principle components analysis (PCA) to identify the factors. PCA was performed on 36 items of the questionnaire, revealing a positive relationship between the variables. Since the number of factors exceeded two, varimax rotation was necessary to identify how the initially extracted factors differed from each other, and to provide a clear picture of the items loading on the factors. Kaiser Criterion was used to decide on the number of factors (Table 2).

As can be seen in Table 2, at the time of applying Kaiser Criterion only seven factors had eigenvalues greater than 1 (16).

Table 3 displays information on the positive relationship between the variables and the numbers of extracted factors. Using rotation, a seven-factor solution for ICT was identified.

Tables 3 shows Items loaded into factors and extracted from the rotated matrix. To examine the relationship between factors and label them, the loadings greater than 0.3

Table 1: Frequency Distribution of Participants by Field

Study field	Frequency	Frequency percent
Computer	51	14.2
Architecting	42	11.7
Electronics	83	23.1
Graphics	31	8.6
Food industry	51	14.2
Accounting	33	9.2
Agriculture	41	11.4
Construction	28	7.8
Total	360	100

Table 2: Initial Eigen values and extracted sums of squared loadings

Factor	Initial Extraction			Extraction sums of squared loadings			Rotation sums of squared loadings		
	Total	% of variance	Cumulative %	Total	% of variance	Cumulative %	Total	% of variance	Cumulative %
1	10.756	29.878	29.878	10.756	29.878	29.878	6.153	17.093	17.093
2	2.465	6.846	36.725	2.465	6.846	36.725	3.067	8.519	25.612
3	1.689	4.692	41.417	1.689	4.692	41.417	2.550	7.083	32.695
4	1.379	3.830	45.247	1.379	3.830	45.247	2.394	6.651	39.346
5	1.246	3.461	48.707	1.246	3.461	48.707	2.318	6.439	45.786
6	1.212	3.368	52.075	1.212	3.368	52.075	1.710	4.750	50.536
7	1.122	3.117	55.192	1.122	3.117	55.192	1.676	4.656	55.192
8	0.994	2.762	57.954						
9	0.952	2.645	60.598						
10	0.942	2.618	63.216						
11	0.858	2.384	65.600						
12	0.842	2.340	67.940						
13	0.782	2.179	70.119						
14	0.760	2.110	72.229						
15	0.734	2.039	74.268						
16	0.714	1.983	76.251						
17	0.651	1.807	78.059						
18	0.607	1.686	79.745						
19	0.576	1.600	81.344						
20	0.551	1.530	82.874						
21	0.537	1.492	84.367						
22	0.518	1.438	85.805						
23	0.495	1.375	87.180						
24	0.465	1.291	88.471						
25	0.451	1.253	89.724						
26	0.449	1.247	90.971						
27	0.4250	1.181	92.152						
28	0.388	1.078	93.231						
29	0.369	1.025	94.256						
30	0.357	0.993	95.248						
31	0.320	0.888	96.136						
32	0.310	0.861	96.998						
33	0.300	0.833	97.830						
34	0.284	0.788	98.618						
35	0.267	0.743	99.361						
36	0.230	0.639	100.000						

Extraction Method: Principal Component Analysis

were adequate for labeling the factors, and the loadings less than 0.3 were disregarded because they were random (18). Thus, item number 9 was excluded and 35 items remained. Also, Table 4 shows Factor's load on each item.

As shown in Table 4, all items had loadings greater than 0.3. These results confirm that we have 14 items in the first factor, 6 items in the second factor, 3 items in the third factor, 3 items in the fourth factor, 4 items in the fifth factor, 3 items in the sixth factor and finally, the seventh factor have three items.

Based on the theoretical basis and content of the items, the above seven factors were named respectively: Factor 1: Positive ICT self-concept (explained variance=29.87%), Factor 2: Self-Confidence in ICT (explained

Table 3: Rotated Component Matrix

Items	Component							Variance %
	1	2	3	4	5	6	7	
15. Working with computers brings me a lot of fun	0.711	0.149	0.049	0.210	0.248	0.098	0.086	29.878
16. I am able to install new programs on my computer without help	0.711	0.317	0.272	-0.016	-0.034	0.070	-0.074	
22. I easily forget about the time, when I am dealing with a computer	0.705	-0.027	0.051	0.034	0.219	0.124	0.151	
34. It is important for me to be able to work with a computer to find information on the internet	0.662	0.178	0.051	0.140	0.167	0.123	-0.030	
33. Given appropriate time, I can solve computer problems on my own	0.639	0.143	0.193	0.137	-0.049	0.064	-0.172	
17. I would like it, if I had to do more things on a computer	0.629	0.256	0.036	0.276	0.058	0.179	-0.130	
30. I think that most of the computer programs are easy to understand	0.611	0.181	0.132	0.009	0.091	0.103	-0.248	
29. I prefer doing my homework on a computer	0.605	-0.071	0.093	0.032	0.289	0.100	-0.043	
26. It's easy for me to get familiar with new computer programs	0.567	0.192	0.316	0.150	0.074	-0.007	-0.088	
24. On internet platforms, I exchange views with others on computers, videogames or mobile phones	0.530	0.315	0.149	0.211	0.189	-0.044	-0.196	
25. I can handle the majority of my computer programs confidently	0.521	0.027	0.171	0.354	0.296	0.104	-0.107	
4.With my computer at home, I get on easily	0.441	0.362	0.158	0.392	0.085	-0.119	-0.138	
5. I get on with computers that I normally never use	0.420	0.293	0.258	0.394	0.060	-0.164	-0.201	
10. I think that I can handle tablet computers (e.g. iPad) confidently	0.189	0.663	-0.051	0.181	0.363	-0.071	-0.113	6.846
2. I know how to download new apps for a mobile phone from the internet	0.248	0.663	0.235	-0.088	0.079	0.121	-0.160	
3. The internet is very useful to find practical information	0.082	0.630	-0.138	0.143	-0.014	0.122	0.132	
14. I think that I can handle mobile phones confidently	0.136	0.547	0.061	-0.010	0.313	0.018	-0.205	
8.I have the notion that I can handle computers confidently	0.291	0.539	0.035	0.180	0.027	-0.006	-0.120	
11. I am interested in new features of new program versions	0.302	0.409	0.155	-0.034	0.125	0.167	-0.077	
36. I am or was a member in a union of computer players	0.156	0.025	0.732	0.191	0.000	0.118	0.004	4.692
24.On internet platforms, I exchange views with others on computers, videogames or mobile phones	0.140	0.125	0.686	0.218	0.150	0.073	-0.012	
23. Sometimes I go to LAN-parties	0.160	-0.076	0.646	-0.027	0.188	0.103	0.198	

7. I am or I was participating with schoolmates in a computer project group	0.325	0.140	0.012	0.588	-0.087	0.240	-0.071	3.830
12. I go to computer fairs with friends	0.134	-0.059	0.067	0.574	0.089	0.034	0.043	
6. I discuss with others in internet platforms, how to solve computer problems	0.318	0.135	0.247	0.484	0.002	0.361	0.059	
9. The computer help me more, especially in doing my homework	0.256	0.286	0.018	0.272	0.160	0.140	-0.011	
21. I am always curious when new smartphones are released	0.191	0.058	0.323	-0.114	0.681	0.075	-0.060	3.368
19. I am interested in tablet computers (e.g. iPad)	0.029	0.275	-0.056	0.197	0.627	-0.071	0.025	
1. I am interested in the latest mobile phones and smartphones	0.225	0.230	0.129	0.015	0.593	0.112	0.029	
20. I am very interested when friends show me new things on the computer	0.253	0.103	0.110	0.090	0.488	0.287	0.049	
18. I discuss with friends when I have a question about my computer or my mobile phone	0.050	0.124	0.078	0.057	-0.004	0.785	0.109	
32. I like to talk to my friends about recent developments in computers	0.334	-0.004	0.180	0.120	0.219	0.540	-0.080	
27. To learn news about computer or videogames, I like to talk with my friends	0.198	0.012	0.218	0.109	0.282	0.453	-0.068	
35. If my computer doesn't work, I soon get tired of dealing with the computer	0.060	0.112	0.145	-0.147	-0.026	-0.114	0.799	3.117
31. I like to talk to my friends about recent developments in computers	-0.272	-0.188	0.142	0.053	0.107	0.060	0.565	
13. If I have problems operating my mobile phone, I can't solve them	-0.135	-0.223	-0.126	0.036	-0.079	0.136	0.506	

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization

variance=6.84%), Factor 3: Online Exposure (explained variance=4.69%), Factor 4: Social Exposure (explained variance=3.83%), Factor 5: Computer, Tablet and Mobile Phone Interest (explained variance=3.46%), Factor 6: Spending Time with ICT (explained variance=3.36%) and Factor7: Negative ICT self-concept (explained variance=3.18) (Table 2).

The percentage of total variance was used as an index to determine how well the total factor solution accounted for the represented variables together. According to Table 2, in total these seven factors can account for 55.19% of the variance for ICT Engagement. This percentage indicates that it is a useful extraction as it reduced 36 items to only seven factors. Table 3 also shows the presence of seven possible factors for 36 items. Factor 1 loaded highly on items 4,5,15 16,17,22,24,25,26,29,30,33,34; factor 2 on items 2,3,8,10,11,14; factor 3 on items 23,24,36; factor 4 on items 6,7,12; factor 5 on items1,19,20,21; factor 6 on items 18,27,32; and factore7 on items 13,32,35.

Discussion and Conclusion

According to the results, the most important factor of ICT Engagement among Iranian students was the positive ICT self-concept, and in total all seven factors could explain more than fifty-five percent of the variance. These factors reveal the factorial structure of the ICT engagement questionnaire and indicates that constructs of "ICT engagement" are different among populations in various countries. These results are similar

Table 4: Items loaded into factors, extracted from the rotated matrix

Factors	Items	Factor's load
Factor 1: Positive ICT self-concept	15. Working with computers brings me a lot of fun	0.711
	16. I am able to install new programs on my computer without help	0.711
	22. I easily forget about the time, when I am dealing with a computer	0.705
	34. It is important for me to be able to work with a computer to find information on the internet	0.662
	33. Given appropriate time, I can solve computer problems on my own	0.639
	17. I would like it, if I had to do more things on a computer	0.629
	30. I think that most of the computer programs are easy to understand	0.611
	29. I prefer doing my homework on a computer	0.605
	26. It's easy for me to get familiar with new computer programs	0.567
	24. On internet platforms, I exchange views with others on computers, videogames or mobile phones	0.530
	25. I can handle the majority of my computer programs confidently	0.521
	4. With my computer at home, I get on easily	0.441
	5. I get on with computers that I normally never use	0.420
Factor 2: Self-confidence in ICT	10. I think that I can handle tablet computers (e.g. iPad) confidently	0.663
	2. I know how to download new apps for a mobile phone from the internet	0.663
	3. The internet is very useful to find practical information	0.630
	14. I think that I can handle mobile phones confidently	0.5478.
	8. I have the notion that I can handle computers confidently	0.539
	11. I am interested in new features of new program versions	0.409
Factor 3: Online Exposure	36. I am or was a member in a union of computer players	0.732
	24. On internet platforms, I exchange views with others on computers, videogames or mobile phones	0.686
	23. Sometimes I go to LAN-parties	0.646
Factor 4: Social Exposure	7. I am or I was participating with schoolmates in a computer project group	0.588
	12. I go to computer fairs with friends	0.574
	6. I discuss with others in internet platforms, how to solve computer problems	0.484
Factor 5: Computer and Tablet and Phone Interest	21. I am always curious when new smartphones are released	0.681
	19. I am interested in tablet computers (e.g. iPad)	0.627
	1. I am interested in the latest mobile phones and smartphones	0.593
	20. I am very interested when friends show me new things on the computer	0.488
Factor 6: Spending Time with IT	18. I discuss with friends when I have a question about my computer or my mobile phone	0.785
	32. I like to talk to my friends about recent developments in computers	0.540
	27. To learn news about computer or videogames, I like to talk with my friends	0.453
Factor 7: negative ICT self-concept	35. If my computer doesn't work, I soon get tired of dealing with the computer	0.799
	31. I like to talk to my friends about recent developments in computers	0.565
	13. If I have problems operating my mobile phone, I can't solve them	0.506
Excluded Item	9. The computer help me more, especially in doing my homework.	

to findings of Nikolopoulou and Gialamas, that demonstrated four factors in the 36-item questionnaire (20). The questionnaire is suggested to be used with other populations of different countries, in order to reveal possible similarities and differences.

In comparison with the Zylka et al. Questionnaire, factors 1 and 2 of this study (Positive ICT self-concept, Self-Confidence in ICT) together refer to the third factor of Zylka et al. Questionnaire (Positive ICT-self-concept). The 3rd and the 4th Factors in this study (Online Exposure, Social Exposure) correspond to the fifth factor

in that questionnaire (Social Exposure). The fifth factor in this study (interest in computers and mobile devices) pointed to two factors in that questionnaire (1,2: interest in computers and interest in mobile devices). The sixth factor (Spending Time with ICT) extracted from this study, is a new one that has been identified in a different statistical population. The seventh factor of this study is identical with the fourth factor in Zylka et al. Questionnaire (Negative ICT self-concept). The descriptive analysis revealed that there are some similarities in students' views across different cultures, but in some other aspects they can be different. This difference may be due to the cultural diversity and the differences between the facilities available to two statistical populations.

In a world almost intertwined with ICT, it appears that students should be able to engage with ICT and enjoy its benefits in learning. Accordingly, it is of paramount importance to identify ICT factors for educational enhancement. Applying ICT in teaching and learning in the educational systems of the world is very essential and it can be developed by creating appropriate conditions and facilities and by applying ICT in the right way. Therefore, students should be persuaded to engage in ICT and should learn how to use it correctly. In addition, changes must be made to school curricula to encourage students to engage in ICT. Therefore, based on the findings of the present study, the following topics are suggested for future research: investigating the extent of ICT engagement among different students and its impact on their motivation and academic achievement, investigating family and social factors that influence students' engagement in ICT, evaluating teachers' engagement with ICT and finally suggesting strategies for optimal use of ICT in Iranian schools.

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Ethical Declarations

At the beginning of the study the researchers introduced themselves and explained the objectives of the study to the participants. Informed consent was obtained from all participants. They were also assured that all information collected will remain confidential.

Availability of Data and Materials

The supporting data that lead to the results of this study are available from the corresponding author on request.

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Authors' Contributions

F. M. devised the study concept, designed the study, analyzed the study, and critically revised the manuscript. S.B.A. collected data, ran the study intervention, participated in the study concept, performed the analyses and revised the manuscript. N.T. contributed to data collection of the study, and drafted the manuscript.

Conflict of interests

The author declares that they have no conflict of interests.

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