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Computer, Information, and Multimedia Literacy among EFL Teachers: Construction and Validation of a Scale

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Abstract
Distance education pedagogy to be successful requires teachers with different levels of computer, information, and multimedia literacy. Teachers' computer literacy has caught considerable attention due to the great opportunities provided by modern technology for promoting language education. The present study explored computer, information, and multimedia literacy of 255 Iranian EFL teachers. To collect data, we developed and validated Computer, Information, and Multimedia Literacy Questionnaire for EFL Teachers (CIM-LQ for EFL Teachers), a five-point Likert scale questionnaire containing three sections to examine the participants' responses. The obtained data were analyzed using SPSS software version 20. The findings revealed that the level of EFL teachers' multimedia and information literacy ranged from low to moderate which necessitates improving teachers' training courses and preparing them for implementing technologies in real language teaching contexts. The findings have implications for both teacher education programs including both pre-service and in-service teacher training courses and EFL teachers' practice.

Key words
Distance learning, Computer literacy, Information Literacy, Multimedia Literacy.

Introduction

The emergence of CALL dates back to 1950s and 1960s when mainframe computers were used for language teaching. During this period, some important projects such as Stanford and PLATO were developed for writing instructional material. These early attempts were limited due to the cost of the mainframes and were based on behaviorist psychology. Later, the spread of inexpensive microcomputers in the early 1980s and the introduction of multimedia and the Internet in 20st century, as well as an awareness of potential benefits of technology in language learning, led to an increase in the use of technological tools in language instruction [1].

Instructors can exploit new technology facilities such as authentic materials, multimedia, and communication through networking for improving language pedagogy. The Internet can be used for designing more student-centered materials by considering learners' individual differences [2]. Moreover, technologies such as e-creation tools provide great opportunities for both teachers and learners to participate actively in creating educational products. These tools open

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up numerous potential dynamic zones for language learners' proximal development. Also, utilizing communicative, writing/reading, and listening facilitating e-tools (e.g., discussion boards, instant messaging, write board, wikis, podcasts, and vodcasts) promote language teaching and learning in terms of different language skills [3]. In addition, the use of technology in classrooms has been found to promote discovery learning, the autonomy of learners, and learner-centeredness of pedagogy as well as facilitating the implementation of differentiated instruction [3]. Computers and the internet empower language teachers to plan tasks and projects for language classroom [4]. These ongoing developments in the use of computer for language teaching necessitate literate teachers and learners in this field.

As a result, the traditional concept of literacy has been changed to a broader concept which includes computer literacy [5].This new definition of literacy is due to widespread use of computer which has exerted considerable influence on everyday lives and educational institutions. Accordingly, teachers should be prepared for technology-driven educational systems. To this end, the need for training knowledgeable teachers in terms of using and integrating computer in education appropriately appears vital [6]. Today computer literacy forms an essential part of undergraduate curriculum [7]. Zhang and Barber [8] emphasized on the role of computer in language learning and teaching and the necessity of taking advantage of computer scientists' knowledge for a more successful use of technology in the process of language teaching.

In spite of the importance of computer literacy, teachers are less skilled in relation to their students regarding the use of new technologies and this situation makes the teachers update their skills for the use and integrating new technologies in the process of language teaching [9]. In addition, Milman and Kortecamp [10] claimed that a large number of pre-service teachers are not computer literate. According to Winnas and Brown [11] teachers' low implementation of computer is due to their lack of knowledge and skills for computer.

Kessler [12] asserts that one of the teachers' obstacles in using technology for language teaching is the focus of training programs on digital literacy or software specific orientation. Although these programs help them in the use of technology, it cannot prepare them for employing technology in the process of language teaching. Compton [13] suggests offering trainee teachers virtual field experience in online language teaching. Hasselbring [14] states that merely providing teachers with powerful technology is not enough and there is a need for long term pre-service and in-service training for the efficient use of technology.

However, as Pilus [15] mentions, teachers should not think of computers as magicians or teachers' substitutes; instead, they must treat them like other teaching tools. In the other words, as Norman [16] states, technology should serve us. He believes in a learner centered approach toward technology use which means adopting multimedia and technologies in a way that enhances human learning and aids human cognition. So for adopting this approach, as it was mentioned by other researchers, teachers must be trained to use this tool appropriately [15, 17]. As luke and Britten [18] mention, teacher education programs is the starting point for teachers in acquiring technological knowledge. Also, Kern [19] emphasizes the need for being familiar with technology constraints and knowing when the use of computer is not appropriate. The

results of a study by Jahromi and Salimi [20] indicated that although high school language teachers had positive attitudes towards Computer Assisted Language Learning (CALL), they were moderate computer competent. They claim that teachers need further training on computer and its applications to improve their level of competency.

The above mentioned benefits of utilizing technology for language instruction and the need for competent teachers in computer sciences to implement technology in language teaching, has encouraged researchers to design scales for measuring teachers' computer, information, and multimedia literacy [21, 22, 23]. However, these three types of literacy were not measured separately and the scales were mostly concentrated on one type of literacy. So, this study aims to provide a more comprehensive scale to measure EFL teachers' literacy.

Literature Review

Computer literacy

Computer literacy is the ability to use computer adequately for creating, communicating, and collaborating in a literate community [23] and the mere existence of computer without training both teachers and students is useless. So, teachers and students must be trained continuously to employ the latest innovations and applications for teaching.

Ozsevgec [7] in a study investigated the computer literacy of sophomore and senior pre-service teachers. The result showed no difference between these two groups in terms of computer literacy. He suggested that the content of computer courses should be improved and re-designed. Son and Robb [23] examined the level of computer literacy of in-service EFL teachers and found teachers were low competent in the use of CALL and there is a need for offering them opportunities to use different applications and improve their competency. Dashtestani [24] investigated the computer literacy level of 263 EFL teachers. It was found that the teachers were not literate enough to implement CALL and they were low users of computer applications. In addition, it was found that their level of computer literacy was under the influence of individual differences which implies a need for different training programs for teachers.

In another study, Dashtestani [24] investigated EFL teacher trainers' view about the difficulties and challenges of computer literacy. Although the trainers were aware of the importance of training teachers for successful implementation of computer applications for teaching foreign languages, they were limited by the institutions' policies and could not employ changes to training programs for improving teachers' level of computer literacy. In addition, not being obliged to use computer application in EFL contexts is another obstacle which demotivates teachers for enhancing their computer literacy.

Ozsevgec [7] investigated the computer literacy of 270 sophomore and senior pre- service teachers. The result indicated no difference between the two groups in this regard. The result implies a need for improving the content of computer courses and skills. In another study, Sardegna and Yu [25] examined the computer literacy of 32 in-service elementary school

teachers attending in an EFL teaching certification program. According to the result, most of the teachers assessed their computer literacy as adequate. However, some of them need to be trained on some basic computer skills. The results of a study by Jahromi and Salimi [20] indicated that although high school language teachers had positive attitudes towards CALL, they were moderate computer competent. They claim that teachers need further training about computer and its applications for improving their level of competency. The results of an experimental research by Dellicarpini and College [26] suggest that highly contextualized practice during pedagogy courses allows language teachers to improve their knowledge and skills in terms of technology use in the classroom.

Information literacy

According to Bawden [27], information literacy refers to recognizing a need for information, identifying, locating, evaluating, and using that information effectively for dealing with a problem. This definition is similar to that of American Library Association [28] and Aharony and Bronstein [29]. An information literate person discerns the necessity for information and is able to locate, evaluate, analyze, and use the information appropriately [30]. The Internet has offered us numerous opportunities for gathering, producing, and disseminating information [31]. This massive information available on the Internet shows the importance of information literacy in academic settings [32]. Saracevic [33] compares the information environment to a jungle which includes rapid changes and evolvements. Moreover, Bruce [34] considers complexity and the constant change of this environment as the main factors which necessitate equipping learners with competencies for handling this situation. Korobili, Malliari, Daniilidou, and Christodoulou [22] state that the importance of information literacy is widely accepted by teachers according to the results of previous studies; however, they come up with difficulties in promoting it for different reasons. Korobili, et al. [22] examined the information literacy level of 500 high school teachers in Greece. The results showed that teachers were low users of e-sources and they were not at a level to help students in attaining information literacy. So, they recommended teachers to attend information literacy training seminars to improve their competencies. Probert [32] in a study among teachers of three schools in New Zealand found that although a number of teachers had some understanding of information literacy, they were not successful at conveying helpful strategies and skills to students.

Multimedia literacy

Mayer [35] defines multimedia literacy as the ability to understand the information which is presented using a combination of different forms of media such as audio, images, and videos. Multimedia literate students are both involved in creating and consuming multimedia documents challengingly [36]. Table 1 displays various views on multimedia by Mayer [35].

According to Ware [37], multimedia literacy motivates students much more than mere print-based literacy. It can afford language learners alternative visual and verbal ways to create texts.

He states that technology should be integrated in both in-school and after school learning activities.

Regarding the above-mentioned studies, literacy in its new definition which includes computer literacy, information literacy, and multimedia literacy has been considered a great help in the process of language teaching and learning and teachers play an essential role in employing their multi-dimensional literacy for language teaching and conveying it to their students. So, as it was mentioned, teachers should be trained in this regard and be prepared for the use of the modern technology effectively. Although many studies have investigated the computer literacy of language teachers, few studies have been done in Iran. In addition, the scales they used in their studies were not comprehensive, so this study is intended to provide a more comprehensive picture of teachers' literacy by using three separate scales that were designed to determine the computer, information, and multimedia literacy of language teachers.

Method

Participants

The participants of the present study were 255 male and female English language teachers teaching at English institutes in the academic year 2016. Their age ranged from 22 to 40 and they were chosen randomly from language institutes in Kerman, Shiraz, and Rafsanjan cities in Iran.

Instrument: CIM-LQ for EFL Teachers

To meet the requirements of the present study, the Computer, Information, and Multimedia Literacy Questionnaire (CIM-LQ for EFL Teachers) was constructed by the researchers with three subscales (each containing 25 items) including computer literacy, information literacy, and multimedia literacy (see Appendix A). A five-point Likert scale was used to rank the responses from "*never or almost never true of me*" =1 to "*always or almost always true of me*" =5. The scale showed a high reliability (r= .88). To validate the questionnaire, a sample of 200 EFL teachers responded to its three subscales and their responses were used for performing Principle Component Analysis (PCA). At first, the correlation matrix, Kaiser-Meyer-Olkin (KMO) value and Bartelet's Test of Sphericity were examined to ascertain the suitability of data for PCA. The output revealed the presence of coefficients of .3 and above and a KMO value of .70. Moreover, Bartelet's Test of Sphericity showed statistical significance at (.000). The mentioned information is summarized in Table 2.

According to the PCA outputs, three factors were detected with Eigen values more than one which explained 13.4%, 5.7%, and 5% of the variance respectively. The first factor consisted of 20 items, the second factor, 22 items, and the third factor 12 items. As Table 3 displays, 21 out of 75 items were deleted.

After excluding the above-mentioned items, the analysis was done once again. The results showed reliability .92, KMO = .83 and total variance of the three factors = 38%. Then, the

factors emerged from PCA were analyzed by converting the data to AMOS program for Confirmatory Factor Analysis (CFA). The multiple goodness-of-fit indexes were considered to assure an acceptable fit value. Normed Fit Index (NFI), Comparative Fit Index (CFI), and Root Mean Square Error Approximation (RMSEA) indicated acceptable fit values of .81, .86, and .04 respectively. As Table 4 shows, the factor loadings of 47 items were higher than .3 which is an acceptable amount; however, 7 items (3, 24, 28, 30, 52, 53, and 54) were removed due to their low factor loadings.

Considering the results of CFA, reliability analysis for each factor was performed. Reliability coefficient of the three factors (computer literacy, information literacy, and multimedia literacy) were found to be .84, .84, .82 respectively. Also, the whole scale showed a high reliability (.92). Table 5 summarizes each factor's reliability information.

Data Collection Procedure

The 255 EFL language teachers in the study were asked to complete the three subscales of the newly developed questionnaire, namely CIM_LQ for EFL Teachers (see Appendix A). Due to the time needed for completing the questionnaire, some teachers answered it at home. Also, 21 teachers received and completed the questionnaire through email. The participants were informed that the information about their literacy level would be kept confidential.

Results and discussion

Considering the importance of teachers' competence in terms of using technology and guiding language learners for its use, this study aimed to measure the level of computer literacy, information literacy, and multimedia literacy among Iranian EFL teachers. The results showed that EFL teachers were not highly competent regarding multimedia and information literacy. As Table 6 shows, the participants' mean for computer literacy, information literacy, and multimedia literacy was 4.0, 3.4, and 2.9 out of 5 respectively.

This finding is in line with previous literature. For example, Dashtestani [24] found that the levels of EFL teachers' computer literacy were not adequate for the implementation of CALL. The same result was achieved by Son and Robb [23] who confirmed the low level of computer literacy among in-service EFL teachers. Moreover, Strudler, Mckinney, and Jones's [38] indicated that beginner teachers were not adequately prepared for applying technology in teaching. Considering the findings of the previous research and the present study which revealed a low to moderate level of literacy among language teachers for multimedia and information literacy, training teachers appropriately and practically appears obligatory.

Zamani [39] believes that one obstacle for using technologies by teachers may be the lack of appropriate and useful training courses. Also, Dashtestani [24] stated that one obstacle to training teachers adequately is institutions' policies which impose limitations on the trainers. So, improving teachers' computer literacy requires flexibility of the institutions and employing

changes recommended by teacher trainers. Moreover, Ozsevgec [7] emphasized on improving the quality of computer courses for teachers and stated that the lack of such courses caused no improvement in pre-service teachers over time. These findings and statements lend support to Jahromi and Salimi [20] who claimed a need for further teacher training on computer and its applications.

Li [40] also concluded that technology competence and confidence is one of the four major factors that affect teachers' application of technology in the classroom. Therefore, many researchers placed great emphasize upon training teachers for appropriate use of technology [41, 42, 20, 38, and 39].

Although teachers are provided with training courses and workshops for making them technologically competent, the training is usually carried out in a theory-oriented rather than practice-oriented way and do not make teachers technologically competent in practice. Moreover, the training programs do not consider real EFL teaching contexts; consequently, teachers usually confront with difficulties for integrating technology into real language teaching practice [43]. Therefore, as Debski [44] stated, teachers should be provided with a context to use technology practically.

Conclusion

Some authors [45] have studied the achievements of distance learning programs in terms of computer and online technologies. In addition, Simon et al. [46] provide educators with practical skills and information they need to function in a distance learning environment. Technology provides numeral opportunities for language learning such as interacting with native speakers and accessing authentic materials for language learning and these language learning potentials necessitates enhancing language instruction in the classroom [47]. So, teachers should be technologically knowledgeable enough to implement appropriate technological tools for instruction. Moreover, teachers' technological literacy is essential for guiding language learners on how to use technological resources for learning. Since language learners usually spend a short time in language classrooms in EFL contexts and have no access to native speakers, teachers are recommended to help and guide language learners to use technology outside the classroom [48]. Accordingly, teachers themselves should be competent enough for applying technology in instruction and guiding learners.

Limitations and further research

The results of the present study were based on a questionnaire designed by the researchers. In spite of showing good validity and reliability, it might have underestimated or overestimated the level of teachers' literacy due to the probability of choosing options by chance or the ones that show them more literate than the reality. So, to improve the results, further studies can examine teachers' literacy in practice. Also, comparing the effect of training teachers on their level of

literacy practically and theoretically can be explored in the future. Moreover, further studies can explore the effect of teachers' experience, age, gender, and other variables on their level of computer literacy.

Table 1. Three views of Multimedia (Meyer, 2009)

View	Definition	Example
Delivery media	Two or more delivery devices	Computer screen and amplified speakers; projector and lecturer's voice
Presentation mode	verbal and pictorial representations	on- screen texts and animation; printed texts and illustrations
Sensory modality	Auditory and visual senses	narration and animation; lecture and slides

Table 2. KMO and Bartlett's Tests

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.709
Bartlett's Test of Sphericity	Approx. Chi-Square	5728.102
	Df	2775
	Sig.	.000

Table 3. Deleted items from computer, information, and multimedia literacy

Computer literacy	6, 14 , 18
Information literacy	2, 10, 16, 17, 25
Multimedia literacy	1, 4, 5, 6, 8, 9, 10, 11, 12, 17, 18, 19, 24

Table 4. Confirmatory factor analysis

Factor 1		**Factor 2**		**Factor 3**	
items	**Factor loading**	**Items**	**Factor loading**	**Items**	**Factor loading**
1	۰/۳۹	23	۰/۳۲	43	۰/۷۵
2	۰/۳۵	25	۰/۵۱	44	۰/٤۱
4	۰/۳۰	26	۰/۳۱	45	۰/۷٤
5	۰/۳٦	27	۰/۵۰	46	۰/٦۵
6	۰/٤۵	29	۰/۳۷	47	۰/۷۱

7	٠/٣٨	31	٠/٣٢	48	٠/٦٨
8	٠/٤٨	32	٠/٣٣	49	٠/٥٤
9	٠/٤٢	33	٠/٥٤	50	٠/37
10	٠/٦٢	34	٠/٥٦	51	٠/٣3
11	٠/٥٣	35	٠/٥٥		
12	٠/٥٠	36	٠/٦٦		
13	٠/٥٥	37	٠/٦٦		
14	٠/٤٣	38	٠/51		
15	٠/٣٨	39	٠/٦١		
16	٠/٤٦	40	٠/٥٨		
17	٠/٤٦	41	٠/٥٣		
18	٠/٥٠	42	٠/٦٨		
19	٠/٥٣				
20	٠/٥٠				
21	٠/٤٩				
22	٠/٥٣				

(factor structures and loadings of 51 items)

Table 5. Reliability of each Factor

Factors	N of Items	Cronbach's Alpha
1(computer literacy)	21	.846
2(Information literacy)	17	.845
3 (Multimedia literacy)	9	.821
Whole scale	47	.92

Table 6. Descriptive Statistics

	N	Range	Min.	Max.	Sum	M		SD	Variance
A	255	1.27	3.45	4.73	1040.45	4.08	.013	.21	.04
B	255	2.70	1.95	4.65	873.85	3.42	.03	.49	.24
C	255	3.17	1.33	4.50	740.08	2.90	.06	1.09	1.19

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Appendix A
CIM-LQ for EFL Teacher
Dear English Teacher, this questionnaire has been prepared to determine your level of computer literacy, information literacy, and multimedia literacy. Please read the following items and mark the most suitable response.
Age….. Gender: male ☐female ☐

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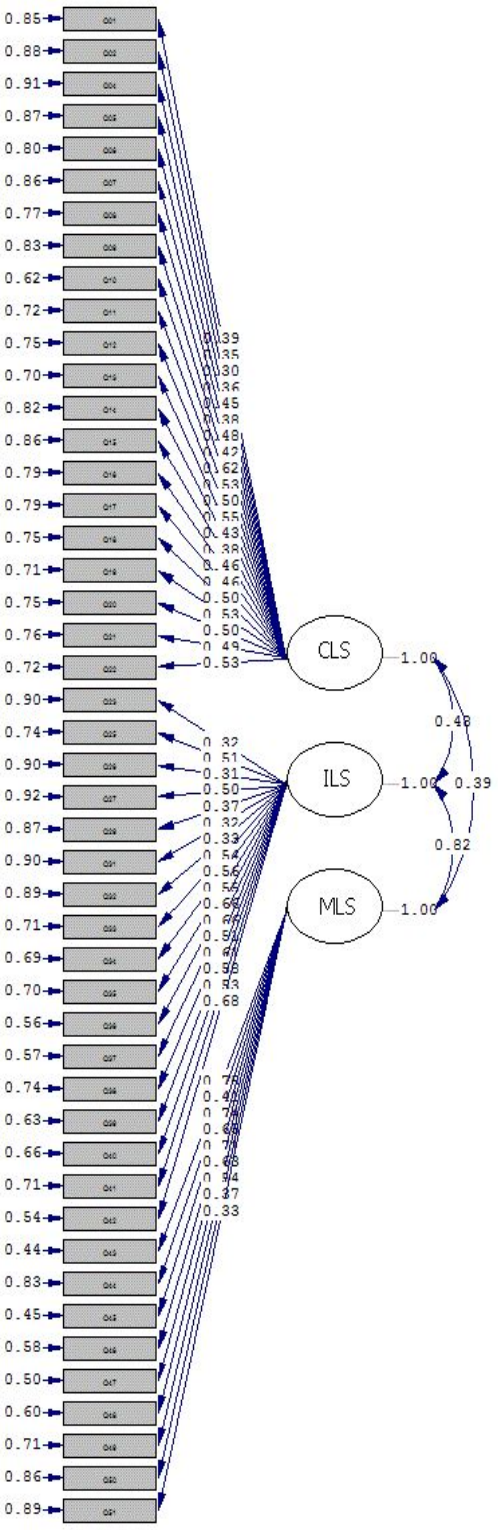
Computer literacy	Never or almost never true of me	Generally not true of me	Somewhat true of me	Generally true of me	Always or almost always true of me
1. I can use external hardware(e.g., printer, scanner, and projector) safely.					
2. I can use spreadsheet programs like Microsoft Excel to create a spreadsheet.					
3. I can recover the content of every deleted file easily.					
4. I can use editorial tools effectively to edit documents.					
5. I can use word processing software to create, edit, and print documents efficiently.					
6. I can find the right buttons on the keyboard for typing and punctuating a text easily.					
7. I can log into my home computer from another machine.					
8. I can recognize problems with network connection and troubleshoot them.					
9. I can create and manage files (e.g., apply modifications on different files such as deleting, and inserting).					
10. I can write all types of files onto CDs using different types of software.					
11. I can check a computer for viruses successfully.					
12. I can back up my computer files.					
13. I can manage my email account regarding all applications.					
14. I have no problem in keeping my antivirus updated.					
15. I can create a screenshot at different sizes focusing on any specific item.					
16. I can handle all the keyboard related functions acceptably.					
17. I know all units for measuring computer information such as megabyte, pixel, gigahertz, etc.					
18. I am familiar with basic computer and internet terms such as LAN, CPU, VoIP, RAM.					
19. I can upload different types of files.					
20. It is difficult for me to recognize the problem with my computer when it does not work appropriately.					
21. I can install different software (e.g. antivirus software, educational software)appropriately.					
Information literacy					
22. I can discern the necessity for obtaining specific information.					
23. I can identify the credibility of websites containing the needed information.					
24. I have no problem in locating the desired information on web pages.					
25. I can select the most appropriate					

information for my purpose.					
26. I am aware of searching techniques to retrieve information effectively.					
27. The existence of a variety www sources for the needed information makes me confused.					
28. I am able to effectively use the obtained information for the issue at hand.					
29. I can determine the reliability of the collected information.					
30. I evaluate and compare information from various sources in terms of accuracy.					
31. I am able to interpret the collected information.					
32. I can access the needed information through websites effectively.					
33. I can evaluate the source of information critically.					
34. I can distinguish plagiarized information from the original one.					
35. I can identify specialized information sources.					
36. I am aware of the internet copyright laws.					
37. I can use indexes to quickly locate data.					
38. I can use the internet to convey information to other people in different ways such as chat, social networking, VoIP, blogging.					
Multimedia literacy					
39. I can critically analyze and evaluate multimedia information.					
40. I can produce live and recorded multimedia.					
41. I can create interactive web pages.					
42. I examine the Multimedia information in terms of plagiarism.					
43. I feel confused in interpreting complex multimedia information.					
44. I can create and participate in virtual learning communities.					
45. I can use exercise creating programs such as Hot potatoes effectively.					
46. I know how to use e-tools such as podcast, vodcast, Audio blog for language teaching.					
47. I am able to interact with the multimedia content when it is live.					



Chi-Square=4006.66, df=1172, P-value=0.00000, RMSEA=0.041