The Comparison of ICT' Literacy between Teachers and Students and Presenting a Model for Development of ICT in Schools

Saeid MORADI-REKABDARKOLAEI[1]

[1] Payam Noor University, Department of Educational Sciences, Tehran-IRAN

ABSTRACT

The major goal of the research is "the comparison of ICT' literacy between teachers and students in Iran's schools and presenting a model for development of information and communication technology literacy in schools". A group sample of teachers, 367 and a group sample of students, 384 were selected through simple random sampling method. Method of the research is survey and for study and analyzing of particular goals of the research, Using of two questionnaires and interview that are prepared for measurement and comparison ICT literacy. For analyzing the description and inferences statistics, we used chi-square tests have been used by exploiting of two-dimensional tables. Deductive analysis of the data shows that in all five factors, there is a meaningful difference between ICT literacy of teachers and students'. General result of the research shows that ICT literacy of students in all factors higher and greater than teachers'.

Keywords: Information and Communication Technology; Technology in Education; ICT Literacy Skills; Country-Specific Developments.

INTRODUCTION

Discussions of Information Technology in education typically emphasize the Technology rather than the information. Widespread technology has meant that people encounter more information, in a greater variety of formats, than ever before. Technology is the portal through which we interact with information, but people's ability to handle information-to solve problems and think critically about information-tells us more about their future success than their knowledge of specific hardware or software. These skills-known as Information and Communications Technology (ICT) Literacy-comprise a 21st century form of literacy, in which researching and communicating information via digital environments are as

important as reading and writing were in earlier centuries. ICT literate students master content faster, are better problem-solvers, become more self-directed, and assume greater control over teach (Katz, 2005). Beyond the classroom, ICT literacy is essential for being productive citizens in a knowledge-driven society and employers want their employees to have these skills (Herman, 2000). As a result, schools and university administrators are beginning to require them as competencies for graduation. To improve students' ICT literacy, however, there are several challenges to designing and implementing effective ICT literacy instruction. First, students often believe themselves to b e competent users of information resources because of their daily interactions with the Internet. This can lead to disinterest in learning skills to improve their use of search engines and electronic research databases. Second, the ease of transferring between social and school environments, using the same technology, can cause disruptions in classroom activity. For example, anecdotal evidence suggests that students receiving ICT literacy instruction in a computer lab frequently disengage and go off-task by reading their email and instant messaging their friends, playing games, or searching something of interest to them. These behaviors indicate that current instruction strategies are inefficient in meeting students' perceived needs and equally lacking in an engaging delivery method. Finally, without effective assessment it is difficult to know if instructional programs are paying off-are students' ICT literacy skills improving. Educators who accept the challenge of teaching ICT literacy skills must be prepared to:

• Find a strategy to reach the user who believes she is already proficient

• Make the learning relevant to the user's needs, including using the technologies the student already knows, to anchor the learning in something familiar

• Create active learning opportunities to keep the students on the task.

• Assess the impact of instruction on student-learning outcomes (Katz, 2005).

This research describes the ICT Literacy Assessment, developed by Educational Testing Service (ETS), an Internet-based assessment of ICT literacy skills. The assessment was designed to support instructional efforts in ICT literacy by providing data on students' skills that can help inform decisions for instituting and evaluating information literacy programs. Therefore, this research wants to evaluation teachers and students knowledge about of ICT. So, this research is after following goals:

1. Determination and comparison of secondary schools teachers and students' literacy for information accessed (data retrieved).

2. Determination and comparison of secondary schools teachers and students' literacy for information managed (information application and classification).

3. Determination and comparison of secondary schools teachers and students literacy for integrating information (interpretation, information representation, and summarization and information exchange).

4. Determination and comparison of secondary schools teachers and students literacy for evaluation of information (judgment about the quality, efficiency of information).

5. Determination and comparison of secondary schools teachers and students literacy for producing information (designing, Innovating and creating information).

On this base, one study was conducted in 1998 for determining teacher's special needs from students' preparation point of view for effective using of information and participation to facilitate information resource based learning in New Zealand. Results showed that although training information skills in schools is very necessary, but it is not included in curriculum appropriately, and even though trainers' value information skills, but they haven't enough knowledge about it and ICT literacy is not supported in schools. Studies show that although with present policies, literacy education is necessary in schools, but its execution is very

difficult without the appropriate program for teacher's professional progress and collaborating with other people like primary schools' librarians (Moore, 2000).

In the study, Yangen and et al. (2003) have conducted a case study in primary schools of Hong Kong in an article named "The effect and role of information technology" to show that how economic and social changes and information and too many nouns usage affect on Hong Kong schools and their students daily practice. They found that teachers and principals should be familiar with ICT application and development concept nature in the classroom. They emphasized on the necessity of further researches and studies for proving successful effects of information technology educational programs on teachers, pupils, graduated and staff professional promotions in Hong Kong. Furthermore, in the study named "Investigating the desirable pattern of teachers' computer literacy in Iran's guidance school" that conducted by Fathian and Noroozy (2004) in science and industry university. They tried to study the results of teachers' polling to suggest a suitable pattern for teaching information technology skills and teachers' computer literacy in guidance schools. Therefore, they first investigate computer literacy position in education and training ministry, especially teachers' computer literacy in guidance school, and then results were presented that obtained from teachers' polling and field research about skills that have learnt and skills that they should learn. Results showed that teachers are very weak in computer literacy and skills, too many usages of that education and training ministry should resolve teachers, weakness in this field.

Larose and et al. (1999) further pointed out that many of the educated no matter the level of education, have minimal computer literacy but do not use in their pedagogy because of the fear that the rapidity of obsolescence of the hardware and of the software will make their task more complex and interminable. They supplementary asserted that other writers explain this trend by pointing to the low level of computer literacy of students and teachers at the time of their insertion in pre-service education.

Based on performed studies in Singapore that related to processes that staff applied for data accessing and using information to perform their responsibilities, this research showed that ICT literacy is not a regular and systematic process, but is a personal and innovative process and is not identical for all people, so it should be flexible, innovative and reactive. Based on a study, eight inspectors from different companies were interviewed for their inspection tasks. This interview showed that people have different manners of information acquisition in work place that is not systematic. ICT literacy in work place is useful and effective whereas it would be innovative, dynamic and based on critical thinking and cooperation. Information acquisition manner should be integrated in all thinking processes and people should develop their information acquisition behaviors. ICT literacy is developed in work place whereas companies pay attention to promoting good communication, participation in information acquisition manner, technology as a tool not an aim and staff flexibility (Cheuk, 2000).

Define and explain the model of ICT literacy

In January 2001, ETS convened an International ICT Literacy Panel to study the growing importance of existing and emerging information and communication technologies and their relationship to literacy. The members agreed that little was being done to address critical ICT literacy skills in higher education. In response, a consortium of experts in ICT literacy assembled to advise ETS test developers as in the design of an Internet-delivered assessment that measures students' abilities to research, organize, and communicate on information using technology (Katz and et al., 2004).

The assessment focuses on the cognitive problem solving and critical thinking skills associated with using technology to handle information. As such, scoring algorithms target cognitive decision-making, rather than technical competencies (Katz, 2005). The assessment

measures ICT literacy through five performance areas, which represent important problem-solving and critical thinking aspects of ICT literacy skill (Table 1).

Table 1. *Show Components of ICT literacy in the 21ˢᵗ century*

Skills	Explanation
Access	Collecting and/or retrieving information in digital environments
Manage	Using ICT tools to apply an existing organizational or classification scheme for information
Integrate	Interpreting and representing information, such as by using ICT tools to synthesize, summarize, compare and contrast information from multiple sources
Evaluate	Judging the degree to which information satisfies the needs of the task in ICT environments, including determining authority, bias and timeliness of materials
Create	Adapting, applying, designing or inventing information in ICT environments

Discussions about ICT literacy should be begun by information literacy concept. The term "information literacy" was coined in the 1970s by library and information professionals; librarians readily chose "information literacy" over "library literacy". With the emergence of information technologies in the 1980s, it became an acceptable education term. American libraries association defines ICT literacy as following: individual should recognize necessary information and have ability to evaluate information and using them (American libraries association, 1989). Also, information literacy consists of many skills related to directing and seeking information and communication. So, ICT literacy is a part of specialization of information literacy that concentrates on information merit explanation via technology (Diane Lee, 2002). ICT literacy contains information like storage, regulation, publishing and other outstanding changes in recent years. So, we should define literacy with changes that contain recent knowledge and skills related to recent world. Therefore ICT literacy consists of the ability of using technology tools like: information and communication search and sorting and accessing to Digitalized context and using data. Also, ICT literacy includes using digital technology, communicative tools and access to communicative and informative networks, information management, data incorporation and integration, data evaluation and creation for accessing cognitive function in society. In this definition, five components of ICT literacy are categorized. In these five parts, a set of skills and knowledge is represented that has an increased cognitive complexity. These five components are as following:

- Data accessing: knowing how to collect and retrieve data.
- Data manage: applying an existing organizational or classification scheme.
- Data integration: interpreting and representing information. It involves summarizing, comparing and contrasting.
- Data evaluation: making judgments about the quality, relevance, usefulness, or efficiency of information.
- Data creation: data production by data invention, establishment and design in digital environment.

METHODOLOGY

a) Participants

Data collection in this research is limited to factors that affect on secondary schools of Mazandaran, a province of Iran, that consist of teachers (male and female) and students (boy and girl) of grades 1, 2, and 3 of daily secondary schools in academic year of 2008-2009.

Sampling was done in this research in two stages. The stage one was performed via randomized sampling and in stage two Kergsy and Morgan tables were used for selecting statistical sample. Teachers statistic sample contains 367 persons that 175 out of them were female (47.7) and 192 out of them were male (52.3). From 367 teachers, 11 persons (3%) had supreme diploma, and 312 persons (85%) had graduate degree. 37 persons (10.1) did masters of Arts. 7 people (1.9) had not responded. Also, 177 teachers (48.2) out of 367 had more than 15 years record of services. The least record of services was 5 years that 16 teachers had (4.3). 42 teachers (11.5) had 5 to 10 years record of services. 118 teachers (32.2) had 10-15 years record of services. 14 teachers (3.8) didn't show their record of services. Also, from 367 teachers, 54 persons (14.7) were 20 to 30 years old and 215 people (58.6) were 30-40 years old and 98 teachers (26.7) were of higher than 40 years old. Students statistic sample were 384 that 183 persons were girls (47.7) and 201 persons (52.3) were boys. 128 students (33.3) were in grade of one that were 15 years old. 112 students (29.2) were in grade of 2 that were 16 years old and 144 students (37.5) were in grade of 3 that were 17 years old.

b) Research procedure and data measurement tools

The questionnaire was used in this research for data collection. A questionnaire was provided for data collection by different studies, and then it was distributed among the samples of teachers and students. The questionnaire had 3 parts. Part one was introduction on how to answer the questions. Part two related to personal information that consists of data of sex, academic, age and teachers' record of services and students grades and sex. Part three is related to questionnaire questions that have been regulated as two-option answer (Yes-No).

Pretest method was used for removing questionnaires' defects and ambiguities. Before questionnaires' final adjustment and replication, two ICT experts were asked to study questionnaire to comment on question fitness with research objectives. Their comments were collected and the questions were accepted by them were selected. Then the questionnaire was tested between 75 persons that were 10% of sample population of teachers and students. Also, their comments on questionnaires were collected. Then in final stage after complete affirmation, it was executed on all subjects from research population.

For determining questionnaires' reliability by SPSS software, Cronbach Alpha was obtained for skill level measurement options. The result was very desirable. Cronbach Alpha was more than 0, 85 for skill level measurement concepts that was acceptable.

c) Data analysis

Descriptive statistics were used for data analysis that was the respondent's profusion and percentage distribution and then deductive statistics (Chi-square test) was used, because research variables were measured in nominal level measurement, Chi-square test is the most appropriate test for these data and 2×2 tables.

FINDINGS

In this section, all research objectives in sample population and results and findings obtained from skill measurement in LCT literacy between teachers, and students are investigated for data analysis by using the indicators of descriptive and deductive statistics.

i) Goal of number 1 was related to determination and comparison of teachers and students' competencies based on the level of skill in data retrieval.
 - Sample population distribution based on the level of skill in respect of data retrival:

Table 2. *Distribution of Respondents Based on Skill Level of Skill in Respect of Data Retrival*

Accessing information	Teachers		Students		Total sample	
	n	%	n	%	n	%
Data retrieval	214	41,9	297	58,1	511	68
Not skillful	142	59,1	98	40,9	240	32
Total	356	47,4	395	52,6	751	100

Results obtained from the comparison of teachers and students' competencies based on the skill level of data retrieval in the Table 2 shows that out of 751 respondents' 511 persons (68.0%) in this basis had the skill and 240 persons (32.0%) were not skillful. Therefore, 214 teachers (41.9%) and 297 students (58.1%) had skill in data retrieval. However 142 teachers (59.1%) and 98 students (40.9%) were not in this basis not skillful.

For evaluation, the difference between the skill level of teachers and students, in respect of data retrieval, chi-square meaningful test has been used which its result has been presented in table 3. Based on this table, it can be said that: In freedom degree 1 and with a 99.9 percent confidence distance, there is a meaningful difference between skill level of teachers and students in respect of data retrieval.

Table 3. *Chi-Square Tests for Meaningfulness of First Goal*

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	29.181	1	.000
Likelihood Ratio	31.442	1	.000
Linear-by-Linear Association	30.169	1	.000
N of Valid Cases	751		

A Computed only for a 2x2 table

ii) Goal of number 2 was related to determination and comparison of teachers and students literacy based on skill level in data application and classification.

- Sample population distribution based on skill level in application and classification of information:

Table 4. *Distribution of respondents based on skill level in application and classification of information*

Accessing information	Teachers		Students		Total sample	
	n	%	n	%	n	%
Data retrieval	217	41,5	306	58,5	523	69,6
Not skillful	144	63,2	84	36,8	228	30,4
Total	361	48	390	52	751	100

Results obtained from the comparison of teachers and students' competencies based on the skill level of data retrieval in the Table 4 shows that out of 751 respondents' 523 persons (69.6%) in this basis had skill and 228 persons (30.4%) were not skillful. Therefore, 217 teachers (41.5%) and 306 students (58.5%) had skill in data retrieval. However 144 teachers (63.2%) and 84 students (36.8%) were not in this basis not skillful.

For difference evaluation of skill level of teachers and students for data application and classification, Chi-square test was used that its result has been shown in Table 5. Based on this test, there is a meaningful difference between the skill level of teachers and students in

confidence distance of 99.9. On the other hand, the skill level of teachers and students is different in this area.

Table 5. *Chi-square Tests For Meaningfulness of Second Goal*

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	32.101(b)	1	.000
Likelihood Ratio	34.268	1	.000
Linear-by-Linear Association	31.866	1	.000
N of Valid Cases	751		

a Computed only for a 2x2 table
b 0 cells (.0%) have expected counts less than 5. The minimum expected count is 123.14.

iii) Goal of number 3 was related to determination and comparison of teachers and students' competencies based on the level of skill in data interpretation and representation.
- Sample population distribution based on skill in respect of information interpretation:

Table 6. Distribution of Respondents Based on Skill Level in Information Interpretation

Accessing information	Teachers		Students		Total sample	
	n	%	n	%	n	%
Data retrieval	131	33,3	262	66,7	393	52,3
Not skillful	216	60,3	142	39,7	358	47,7
Total	347	46,2	404	53,8	751	100

Results obtained from the comparison of teachers and students' competencies based on the skill level of data retrieval in the Table 6 shows that out of 751 respondents' 393 persons (52.3%) in this basis had skill and 358 persons (47.7%) were not skillful. Therefore, 131 teachers (33.3%) and 262 students (66.7%) had skill in data retrieval. However 216 teachers (60.3%) and 142 students (39.7%) were not in this basis not skillful.

For difference evaluation of skill level between teachers and students for data interpretation and classification, Chi-square test was used. This test has shown that there is a meaningful difference between the skill level of teachers and students in confidence distance of 99.9 in data interpretation and representation that was shown in Table 7.

Table 7. *Chi-square Test for Meaningfulness of Third Goal of the Research*

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	38.009(b)	1	.000
Likelihood Ratio	39.233	1	.000
Linear-by-Linear Association	37.108	1	.000
N of Valid Cases	751		

a Computed only for a 2x2 table
b 0 cells (.0%) have expected counts less than 5. The minimum expected count is 178.89

iv) Goal of number 4 was related to determination and comparison of teachers and students competencies based on data quality and utility judgment.

- Sample population distribution based on skill level in respect of judgment about the quality and efficiency of information:

Table 8. *Respondent's distribution based on the skill respect of judgment about the quality and efficiency of information*

Accessing information	Teachers		Students		Total sample	
	n	%	n	%	n	%
Data retrieval	153	36,4	267	63,6	420	56
Not skillful	193	58,3	138	41,7	331	44
Total	346	46	405	54	751	100

Results obtained from the comparison of teachers and students' competencies based on the skill level of data retrieval in the Table 8 shows that out of 751 respondents' 420 persons (56.0%) in this basis had skill and 331 persons (44.0%) were not skillful. Therefore, 153 teachers (36.4%) and 267 students (63.6%) had skill in data retrieval. However 193 teachers (58.3%) and 138 students (41.7%) were not in this basis not skillful.

For evaluation the difference between teachers and students, the skill level in data quality and utility judgment Chi-square test was used that has shown there is a meaningful difference between teachers and students level of skill in data quality and utility judgment in confidence distance of 99.9 from statistic point of view. This test was shown in Table 9.

Table 9. *Chi-square test for meaningfulness of fourth goal*

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	39.331(b)	1	.000
Likelihood Ratio	40.211	1	.000
Linear-by-Linear Association	39.506	1	.000
N of Valid Cases	751		

a Computed only for a 2x2 table
b 0 cells (.0%) have expected counts less than 5. The minimum expected count is 170.65.

v) Goal of number 5 was related to determination and comparison of teachers and student's competencies based on the skill level of data designing and creation.

- Sample population distribution based on the skill in respect of designing and creation of information:

Table 10. *Respondent's distribution based on the skill in designing and creation of information*

Accessing information	Teachers		Students		Total sample	
	n	%	n	%	n	%
Data retrieval	111	34,8	208	65,2	319	42,5
Not skillful	257	59,5	175	40,5	432	57,5
Total	368	49	383	51	751	100

Results obtained from the comparison of teachers and students' competencies based on the skill level of data retrieval in the Table 10 shows that out of 751 respondents' 319 persons (42.5%) in this basis had skill and 432 persons (57.5%) were not skillful. Therefore, 111 teachers (34.8%) and 208 students (65.2%) had skill in data retrieval. However 257 teachers (59.5%) and 175 students (40.5%) were not in this basis not skillful.

Chi-square test was used to evaluate the difference between teachers and students' level of skill in data designing and creation. This test shows that there is a meaningful difference between teachers and students' level of skill in data designing and creating in confidence distance of 99.9. This test was shown in Table 11.

Table 11. *Chi-square test for meaningfulness of fifth goal*

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	41.955(b)	1	.000
Likelihood Ratio	41.634	1	.000
Linear-by-Linear Association	39.775	1	.000
N of Valid Cases	751		

a Computed only for a 2x2 table

b 0 cells (.0%) have expected counts less than 5. The minimum expected count is 157.08.

DISCUSSION AND CONCLUSION

The present research attempted to evaluate and compare ICT literacy between teachers and students of guidance schools. Therefore, provide a suitable model of ICT literacy skills to development of schools. Correspondingly, five components provided in this research to developed ICT literacy between teachers and students. These five components were set and analyzed as the main aims of this research.

Result of the research shows that students' ICT literacy is higher than teachers'. The teacher who is responsible for teaching and learning process and transferring knowledge to student lacking ICT literacy and skill as a main key of learning skill in the 21st century. So, is suggested that the schools try developing ICT literacy between teachers. Thus, education officials should try to provide suitable approaches for promoting teachers ICT literacy to develop teaching-learning process in schools especially between teachers and students. As we erstwhile said, Yangen and et al. (2003) concluded in their studies that teachers have lower level of ICT skill. They suggested that teachers should be familiar with this technology to be successful in learning-teaching process. The results of this research indicate this fact. Also, in a research conducted by Fathian and Noroozy (2004) results showed that teachers are weak in computer literacy and skills. They suggested that educational organization should try to remove this weakness. In the study, Tang and Ang (2002) the effects of communication in ICT literacy integration were studied. They suggested that teachers should not be considered as teaching receivers but they should be considered as participants in teaching and learning. Hence, in another study, Larose et al. (1999) argue that regardless of the quality of ICT equipment available to teachers and students in the school environment and independently of the quantities of courses which they have taken during their undergraduate studies, the level of transfer of acquired competencies and learning to practice is very weak. However, the major impact of education on the educated remains at the level of the "private" use of these technologies and not in their integration into daily teaching practices. Larose and colleagues further pointed out that many of the educated, no matter the level of education, have minimal computer literacy but do not use it in their pedagogy because of the fear that the rapidity of obsolescence of the hardware and of the software will make their task more complex and interminable. Hakimy (2004) in a study named "the study of effective factors in using ICT" concluded that teachers were not prepared for teaching by using ICT. This research shows the teachers weakness in ICT literacy skill. Also, the study from Dawson and Rakes (2003)

underpins the former: the more training teachers receive, the more ICT integration at school level is begin observed. Their findings suggest that without well-trained, ICT-capable teachers, the integration of ICT into school curricula will remain deficient.

Teachers report in this study that they have weakness in ICT literacy and limited effect on this level of ICT literacy skill and they can't use ICT skill in their curricula.

Another finding of this study is the meaningful difference between the skill level of teachers and students in all five components of this research. For justify these findings can say that all these five components are useful for helping teachers and students in teaching and learning process. These components are the main educational tools in teaching-learning process in the 21st century. Therefore, present research attempts to help teachers and students' to be proficient in ICT literacy and prepares them to create a desirable teaching-learning process and promotes them in schools. Also, some suggestions were presented about ICT literacy skills with respect to research results that were suitable approaches for developing ICT literacy. These suggestions are as following:

1. It is suggested to develop ICT literacy conception like general literacy in society especially in educational environments.

2. It is suggested to consider national and global researches and information and communication technology researches that were executed in different levels in educational organizations.

3. The officials of educational organization should prepare programs for teachers and students to use ICT in curricula and different scientific activities. Teachers' and students' activities should be evaluated.

4. It is suggested to compile national and global standards for developing ICT literacy in different levels, especially between teachers and students.

5. The officials of educational organization should support educational experts and researchers that execute new political and social researches in ICT literacy. Data obtained from these researches help politicians, educators and craftsmen to prepare a comprehensive program.

6. The officials of educational organization should evaluate ICT literacy based on global scales and evaluate international ICT literacy of teachers and students.

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