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PRESENTING A PRACTICAL FRAMEWORK FOR ASSESSING AND COMPARING THE ICT LITERACY OF PRINCIPALS AND TEACHERS IN IRAN'S SCHOOLS

Saeid Moradi, Ali Fallah and Saheb Ahmadi

Department of Primary Education (M.A), Iran, Islamic Azad University of
Savadkooch

isi@nwdic.com

Abstract – *The major goal of this research is to present a practical assessment and comparison of the ICT literacy of principals and teachers in Iran's schools. A group sample of principals, 361 persons, and a group sample of teachers, 367 persons, was selected through a taxonomic random sampling method. The research method was a survey in which questionnaires and interviews were used. To determine the questionnaires' reliability, SPSS software was used. Cronbach's alpha was more than 80% for the skill level measurement concepts. For an analysis of the data, the Chi-square test was used by exploiting two-dimensional tables. An analysis of the data shows that for all five factors, there is a meaningful difference between the ICT literacy of principals and teachers. The general result of the research shows that the principals' ICT literacy for all factors is higher and greater than the teachers'.*

Key words: *information and communication technology, technology in education, information literacy, ICT literacy skills, country-specific developments.*

1. Introduction

Information and communication technology (ICT) has become a key tool in the 21st century and has had a revolutionary impact on how we see the world and how we live in it. This phenomenon has given rise to advances in our way of life. ICT has also had a revolutionary impact on educational methodology globally. However, this revolution is not widespread and needs to be strengthened to reach a large percentage of the population. In a complex society like Iran's, many factors affect ICT use and integration, so an interdis-

plinary and integrated approach is necessary to ensure the successful development of Iran's education and its society as a whole.

ICT is indispensable and has been accepted as part of the contemporary world, especially in industrialised societies. In fact, cultures and societies have adjusted to meet the challenges of the knowledge age. So, the pervasiveness of ICT has brought about rapid technological, social, political, and global economic transformation. The field of education has also not been unaffected by the penetrating influence of ICT. Unquestionably, ICT has had an impact on the quality and quantity of teaching, learning, and research in teachers' and principals' education. Indeed, ICT provides opportunities for principals, teachers and principals to communicate with one another more effectively during formal and informal teaching and learning (Yusuf, 2005). In the same vein, teachers and principals need training not only in computer literacy but also in the application of various kinds of educational software in teaching and learning (Ololube, 2006). Furthermore, they need to learn how to integrate ICT into their classroom activities and school structure. Therefore, teacher and principal training is crucial for the use of ICT, because ICT is a tool that on the one hand can facilitate teacher training and on the other hand can help teachers take full advantage of the potential of technology to enhance student learning (UNESCO, 2003). In this way, ICT has brought in a new era in traditional methods of teaching and offers new teaching and learning experiences to principals, teachers and students. Hence, the education environment should take advantage of this capability to provide easy access to information, since technologies enable the visualisation of educational materials in an innovative and realistic manner (UNESCO, 2002).

In her recent article in *Change* magazine, Patricia Senn Breivik, a noted author on the subject of information literacy, argues that even with a wealth of information available to them, today's graduates are not more adept in information skills or more informed than their less information-rich predecessors: "What is growing ever more obvious is that today's undergraduates are generally far less prepared to do research than were students of earlier generations, despite their familiarity with powerful new information-gathering tools" (Breivik, 2005).

One study was conducted in 1998 to determine teachers' special needs for the effective use of information and to participate in information resource based learning in New Zealand. The results showed that although training in information skills in schools is very necessary, it is not appropriately included in the curriculum, and even though trainers value information skills, they do not have sufficient knowledge of it. Given this, it can be said that ICT literacy is not supported in schools. Studies show that although with the present policies literacy education is necessary in schools, its execution is very difficult without an appropriate programme for teachers' professional progress and

collaboration with other people like primary school librarians (Moore, 2000). Yangen et al. (2003) conducted a case study in primary schools in Hong Kong under the title “The effect and role of information technology” to show how economic and social changes and information and communication technology pressures affect the daily practice of Hong Kong schools and their students. They found that teachers and principals should be familiar with the application and development concepts of ICT in the classroom. They emphasised the need for further research to prove the successful effects of information technology educational programmes on teachers, pupils, graduates and staff professional promotion in Hong Kong. Another study named “Investigating desirable patterns of teachers’ computer literacy in Iran’s guidance schools” was conducted by Fathian and Noroozy (2004) at a science and industry university. They analysed the results of a teachers’ survey to suggest a suitable pattern to teach information technology skills and develop teachers’ computer literacy in guidance schools. Therefore, they first investigated computer literacy in education and training, especially teachers’ computer literacy in guidance schools, and then they presented the results obtained from a teachers’ survey and field research on skills actually acquired and the skills that they should develop. The results showed that teachers are very weak in computer literacy and skills, so that education and the training ministry should help remedy teachers’ weakness in this field. Larose et al. (1999) further pointed out that many of the educated, no matter to what level of education, have minimal computer literacy but do not use it in their pedagogy out of fear that the rapidity of the obsolescence of the hardware and software would make their task more complex and interminable. They further asserted that other writers explain this trend by pointing to the low level of computer literacy of student teachers at the time of their entry in pre-service education.

Therefore, the objectives of the current research are to attempt to develop this technology among teachers and principals by providing a suitable model of ICT literacy skills. Thus, efforts are made to develop the awareness and knowledge of teachers and principals about information and communication technology in representing digital knowledge. So, the main goals of this research are to:

1. Determine and compare principals’ and teachers’ literacy in accessing information (collecting and/or retrieving data);
2. Determine and compare principals’ and teachers’ literacy in information management (application and classification of information);
3. Determine and compare principals’ and teachers’ literacy in incorporating and integrating information (interpretation, information representation, and summarisation and information exchange);

4. Determine and compare principals' and teachers' literacy in evaluating information (judgments about the quality and efficiency of information);
5. Determine and compare principals' and teachers' literacy in producing information (designing, innovating and creating information).

2. Practical framework of ICT literacy

Discussions about information and communication technology literacy should begin with the concept of information literacy. 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. The American Library Association defines ICT literacy as follows: individuals should recognise the necessary information and have the ability to evaluate and use information (American Library Association, 1989). In addition, information literacy consists of many skills related to directing and seeking information and communication. So, ICT literacy is a part of the specialisation of information literacy that concentrates on the explanation of information merit via technology (Diane Lee, 2002). ICT literacy includes information storage, regulation, publishing and other developments in recent years. So, we should define literacy as changes that include recent knowledge and skills related to the recent world. Therefore, ICT literacy consists of the ability to use technological tools such as: information and communication searching and sorting, and accessing a digitised context and using data (ETS, 2003). ICT literacy also includes using digital technology, communicative tools and accessing communicative and informative networks, information management, data incorporation and integration, data evaluation and creation in order to exploit a cognitive function in society. Based on this definition, five components of ICT literacy are categorised. In these five parts, a set of skills and knowledge is represented that has increasing cognitive complexity. These five components are as follows:

1. Data accessing: knowing how to collect and retrieve data;
2. Data management: applying an existing organisational or classification scheme;
3. Data integration: interpreting and representing information. This involves summarising, comparing and contrasting;
4. Data evaluation: making judgments on the quality, relevance, usefulness, or efficiency of information;
5. Data creation: data production by data invention, establishment and design in a digital environment.

Table 1. Framework 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 organisational or classification scheme for information
Integrate	Interpreting and representing information, such as by using ICT tools to synthesise, summarise, 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

3. Research Method

3.1. Statistical population, sample and sampling method

Data collection in this research is limited to factors that affect guidance schools of Mazandaran, a province of Iran, consisting of principals and teachers (male and female) of guidance schools in the academic year of 2006-2007. Sampling was done in two stages. Stage one was performed via taxonomic random sampling and in stage two the Kergsy and Morgan tables were used for selecting a statistical sample.

The principals' statistical sample contains 361 persons, 136 of whom were female (37.7%) and 225 male (62.3%). Of 361 principals, 5 persons (1.4%) had a degree, 31 persons (8.9%) had the highest degree, and 186 persons (51.2%) had a graduate degree. 132 persons (36.6%) had an MA degree or above. 7 people (1.9%) gave no response. In addition, 179 principals (48.8%) had more than 15 years of service. The lowest record was 5 years, served by 11 principals (3%). 36 principals (10.4%) had 5 to 10 years of service. 120 principals (33.2%) had 10 to 15 years of service. 15 principals (4.6%) did not provide their years of service. Of 361 principals, 63 persons (17.5%) were 20 to 30 years old and 203 persons (56.2%) were from 30 to 40 years old and 95 principals (26.3%) were older than 40 years.

The teachers statistical sample consists of 367 persons, of whom 175 were female (47.7%) and 192 were male (52.3%). Of the 367 teachers, 11 persons (3%) had the highest degree, and 312 persons (85%) had a graduate degree. 37 persons (10.1%) had an MA. 7 people (1.9%) gave no response. 177 teachers (48.2%) out of 367 had more than 15 years of service. The lowest years of service were 5 years served by 16 teachers (4.3%). 42 teachers

(11.5%) had 5 to 10 years of service and 118 teachers (32.2%) had 10 to 15 years of service. 14 teachers (3.8%) did not report their years of service. Out of 367 teachers, 54 persons (14.7%) were 20 to 30 years old and 215 people (58.6%) were from 30 to 40 years old and 98 teachers (26.7%) were older than 40 years.

3.2. Research procedure and data measurement tools

A questionnaire and interview were used in this research for data collection. A questionnaire was compiled from different studies for data collection, and was distributed among the samples of principals and teachers. Then, each subject was asked to explain his/her answers to assure answer correctness. In this way, there was a kind of interview, following which the questionnaires were collected and analysed. The questionnaire had 3 parts. Part one consisted of an introduction on how to answer the questions. Part two related to personal information consisting of data on gender, academic background, age and record of service. Part three was related to questions with a two-option answer (Yes-No). Therefore, a self-constructed questionnaire with 27 questions was the main tool for data measurement and collection. Questions 1-6 related to aim 1 of research; questions 7-14 targeted aim 2 of the research; questions 15-19 focused on aim 3 of the research; questions 20-23 related to aim 4 of the research; and questions 24-27 covered aim 5 of research.

A pre-test method was used to remove the questionnaires' defects and ambiguities. Before the questionnaire's final adjustment and replication, two ICT experts were asked to study the questionnaire to comment on how well the questions fitted the research objectives. Their comments were collected and the questions accepted by them were selected. Then, the questionnaire was tested on 70 persons that constituted 10% of the sample population of principals and teachers. Their comments on the questionnaire were also collected. In the final stage after complete affirmation, the questionnaire was executed on all subjects from the research population.

To determine the questionnaire's reliability using SPSS software, the Cronbach Alpha was obtained for skill level measurement options. The Cronbach Alpha was more than 80% for the skill level measurement concepts.

3.3. Data analysis

Descriptive statistics were used for data analysis that covered the respondent's profusion and percentage distribution and then deductive statistics (Chi-square test) were used. The research variables were measured at a nominal level of measurement. The Chi-square test and 2x2 tables are the most appropriate tests for these data.

4. Results

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

4.1. Comparison of principals' and teachers' literacy based on the level of skill in data retrieval

The results obtained from a comparison of the principals' and teachers' literacy based on the skill level of data retrieval show that out of 728 respondents, 495 persons (68.0%) on this basis had skills and 233 persons (32%) were not skilful. If we break down these figures, we find that 214 teachers (43.2%) and 281 principals (56.8%) had skills in data retrieval and 144 teachers (61.9%) and 89 principals (38.1%) were not skilled in this area. For an evaluation of the differences in skill levels between principals and teachers in data retrieval, a Chi-square test was used and its results are shown in Table 2. Based on this table, we can say that with a degree of freedom of 1 and a confidence interval of 99.9 there is a meaningful difference between the skill level of principals and teachers in data retrieval.

Table 2. Chi-square Tests for meaningfulness of first goal

	Value	Df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	28.289	1	.000		
Continuity correction(a)	29.332	1	.000		
Likelihood ratio	30.450	1	.000		
Fisher's exact test				.000	.000
Linear-by-linear association	29.329	1	.000		
N of Valid Cases	728				

a Computed only for a 2x2 table

4.2. Comparison of principals' and teachers' literacy based on skill level in data application and classification

The results obtained from a comparison of principals' and teachers' literacy based on the skill level of data retrieval shows that out of 728 respondents, 499 persons (68.5%) were skilled on this basis and 229 persons (31.5%) were not skilful. Breaking down these figures, 210 teachers (42%) and 289

principals (58%) had skills in data retrieval, and 144 teachers (62.9%) and 85 principals (37.1%) were not skilful in this area.

For a difference evaluation of the skill level of principals and teachers in data application and classification, a Chi-square test was used and the results are shown in Table 3. Based on this test, there is a meaningful difference between the skill level of principals and teachers with a 99.9% confidence interval. The skill level of principals and teachers is different in this area.

Table 3. Chi-square Tests for meaningfulness of second goal

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	31.003(b)	1	.000		
Continuity Correction(a)	29.118	1	.000		
Likelihood ratio	35.273	1	.000		
Linear-by-linear Association	28.826	1	.000		
N of Valid Cases	728				

a Computed only for a 2x2 table

b 0 cells (.0%) have expected counts less than 5. The minimum expected count is 123.14.

4.3. Comparison of principals' and teachers' literacy based on skill level in data interpretation and representation

The results obtained from a comparison of principals' and teachers' literacy based on the skill level of data retrieval shows that out of 728 respondents, 373 persons (51.2%) had skills in this area and 355 persons (48.8%) were not skilful. Breaking down these figures, 125 teachers (33.5%) and 248 principals (66.5%) had skills in data retrieval, and 220 teachers (62%) and 135 principals (38%) were not skilful on this basis. For a difference evaluation of the skill level between principals and teachers for data interpretation and classification, a Chi-square test was used. This test shows that there is a meaningful difference between the skill level of principals and teachers at a 99.9% confidence interval in data interpretation and representation, as shown in Table 4.

Table 4. Chi-square test for meaningfulness of the third goal of the research

	Value	Df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)

Pearson Chi-Square	41.079	1	.000		
Continuity Correction(a)	42.128	1	.000		
Likelihood ratio	39.566	1	.000		
Linear-by-linear association	43.029	1	.000		
N of Valid Cases	728				

a Computed only for a 2x2 table

b 0 cells (.0%) have expected counts less than 5. The minimum expected count is 178.89

4.4. Comparison of principals' and teachers' literacy based on data quality and utility judgment

The results obtained from a comparison of principals' and teachers' literacy based on the skill level in data retrieval shows that out of 728 respondents, 388 persons (53.3%) had skills in this area, and 340 persons (46.7%) were not skilful. If we break down these figures, we find that 170 teachers (43.8%) and 218 principals (56.2%) had skills in data retrieval, and 195 teachers (57.3%) and 145 principals (42.7%) were not skilful in this area. To evaluate the difference between principals and teachers in the skill level for data quality and utility judgment, a Chi-square test was used. The test shows that there is a meaningful difference between the skill level of principals and teachers at a 99.9% confidence interval in data quality and utility judgment, as shown in Table 5.

Table 5. Chi-square test for meaningfulness of fourth goal

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	43.678	1	.000		
Continuity Correction(a)	44.787	1	.000		
Likelihood ratio	45.114	1	.000		
Linear-by-linear Association	43.611	1	.000		
N of Valid Cases	728				

a Computed only for a 2x2 table

b 0 cells (.0%) have expected counts less than 5. The minimum expected count is 170.65.

4.5. Comparison of principals' and teachers' literacy based on the skill level of data design and creation

The results obtained from a comparison of principals' and teachers' literacy based on the skill level of data retrieval shows that out of 728 respondents, 308 persons (42.3%) had skills in this area, and 420 persons (57.7%) were not skilful. Breaking down these figures, 110 teachers (35.7%) and 198 principals (64.3%) had skills in data retrieval, and 233 teachers (55.5%) and 187 principals (44.5%) were not skilled in this domain. A Chi-square test was used to evaluate the difference between principals' and teachers' level of skill in data design and creation. This test shows that there is a meaningful difference between the principals' and teachers' level of skills in data design and creation at a confidence interval of 99.9%. This test is shown in Table 6.

Table 6. Chi-square test for meaningfulness of fifth goal

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	49.936(b)	1	.000		
Continuity Correction(a)	49.912	1	.000		
Likelihood ratio	48.736	1	.000		
Linear-by-linear association	50.881	1	.000		
N of valid cases	728				

a Computed only for a 2x2 table

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

5. Discussion and conclusion

The present research has attempted to evaluate and compare ICT literacy among principals and teachers of guidance schools and consequently to provide a suitable model of ICT literacy skills for the development of schools. Correspondingly, five components are provided in this research for the development of ICT literacy of principals and teachers. These five components were set and analysed as the main aims of this research. The results of this research are as follows:

Objective one: out of 728 respondents, 495 persons (68%) stated that they were skilled in data retrieval. This rate was 43.2% for teachers and 56.8% for principals, which shows that principals are more proficient than teachers.

The Chi-square test shows this difference meaningful at a confidence interval of 99.9%.

Objective two: out of 728 respondents, 499 persons (68.5%) were skilled in data application and classification. This rate was 42% for teachers and 58% for principals, which shows a higher level of skills among principals than among teachers. The Chi square test shows a meaningful difference.

Objective three: out of 728 respondents, 373 persons (51.2%) were skilled in data interpretation and representation. This total was made up of 33.5% teachers and 66.5% principals. This shows that the principals had a higher level of skills than teachers and the Chi-square test shows a meaningful difference.

Objective four: out of 728 respondents, 388 persons (53.3%) were skilled in judging data quality and utility. This total was made up of 43.8% teachers and 56.2% principals. This shows that principals had a higher level of skills than teachers and the Chi-square test shows a meaningful difference.

Objective five: out of 728 respondents, 308 persons (42.3%) were skilled in data design and creation. This total was made up of 35.7% teachers and 64.3% principals and shows that principals have a higher level of skills in this area than teachers. The Chi-square test shows a meaningful difference between the skill level of teachers and principals.

The main result of the research shows that principals' ICT literacy is higher than that of teachers. In other words, the teacher who is responsible for the teaching and learning process and for transferring knowledge to students lacks ICT literacy and skills which constitute a main key for learning in the 21st century. These findings, indicating that teachers have a lower level of skills in ICT, show the weakness of the education system in Iran. So, it is suggested that schools try to develop ICT literacy among teachers. Education officials should make efforts to provide suitable approaches for promoting teacher ICT literacy by developing a teaching-learning process in schools, especially among teachers. As mentioned above, Yangen et al. (2003) concluded in their studies that teachers have a lower level of ICT skills. They suggested that teachers should be familiar with this technology to be successful in the learning-teaching process. The results of this research support this view. Research conducted by Fathian and Noroozy (2004) also showed that teachers are weak in computer literacy and skills. They suggested that the educational organisation should try to remove this weakness. Tang and Ang (2002) studied the effect of communication in ICT literacy integration. They suggested that teachers should not be considered as teaching receivers, but should be considered as participants in teaching and learning. 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 et al. further pointed out that many of the educated, no matter what their level of education, have minimal computer literacy but do not use it in their pedagogy out of the fear that the rapidity of obsolescence of the hardware and software will make their task more complex and interminable. Hakimy (2004) concluded in the “Study of Effective Factors in Using ICT” that teachers were not prepared for using ICT technology in teaching. Teachers’ essential needs and services were limited, and teachers were not prepared for using computer hardware and software. Additionally, teachers’ responses to the questionnaire and an analysis of the data showed that using software and hardware is a big problem for teachers. This research highlights the teachers’ weakness in ICT literacy skill. The study of Dawson and Rakes (2003) indicates that the more training principals receive, the more ICT integration there is at school level. Their findings suggest that without well-trained, ICT-capable principals, the integration of ICT in school curricula will remain inadequate. In this study, teachers report that they have weaknesses in ICT literacy and due to the limited level of their skills they cannot use ICT skills in their curricula.

Another finding of the current study is the meaningful difference between the skill level of principals and teachers in all five components. It can be said that all five components are useful in helping principals and teachers in the teaching and learning process. Considering these findings, we may say that knowledge of the five components that comprise data retrieval, data application and classification, data representation and interpretation, data evaluation, and data design and creation and their correct application in the education system are effective in developing the teaching-learning process of principals, teachers and students and in promoting ICT in schools. These components are the main educational tools in the teaching-learning process in the 21st century. Therefore, the present research attempts to help principals, teachers and students to be proficient in ICT literacy and to prepare them to create a desirable teaching-learning process and to promote it in schools. The following suitable approaches for developing ICT literacy are also suggested:

1. Officials of the educational organisation should prepare programmes for principals, teachers and students to use ICT in the curricula and for different scientific activities;
2. National and global research and ICT educational research conducted at different levels in educational organisations should be considered;
3. Officials of the educational organisation should support educational experts and researchers that execute new political and social research.

ch in ICT literacy. Data obtained from such research may help politicians, educators and craftsmen in preparing a comprehensive programme;

4. Officials of the educational organisation should evaluate ICT literacy based on global scales and evaluate the international ICT literacy of principals, teachers and students;
5. National and global standards for developing ICT literacy should be compiled at different levels, especially among principals, teachers and students.

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PREDSTAVLJANJE PRAKTIČNOGA OKVIRA ZA OCJENJIVANJE I USPOREDBU INFORMATIČKE PISMENOSTI RAVNATELJA I NASTAVNIKA U IRANSKIM ŠKOLAMA

Saeid Moradi, Ali Fallah and Saheb Ahmadi

Sažetak – Glavni cilj ovoga istraživanja jest predstavljanje praktičnoga okvira za ocjenjivanje i usporedbu informatičke pismenosti ravnatelja i učitelja u iranskim školama. Skupni uzorak od 361 ravnatelja i skupni uzorak od 367 učitelja odabran je taksonomskom metodom slučajnog uzorkovanja. Za metodu istraživanja odabrana je anketa te su za posebne ciljeve istraživanja izrađeni upitnici i intervjui. Za određivanje pouzdanosti upitnika korišten je računalni program SPSS.

Koeficijent Cronbach Alpha je bio veći od 80% kod mjerenja razine vještine. Za analizu podataka korišten je hi-kvadrat test uz upotrebu dvodimenzionalnih tablica. Analiza podataka pokazala je da u svih pet ispitivanih kategorija postoje značajne razlike u informatičkoj pismenosti između ravnatelja i učitelja. Opći rezultat istraživanja pokazao je da je informatička pismenost ravnatelja u svim kategorijama bolja i veća od učiteljske.

Ključne riječi: *Informacijska i komunikacijska tehnologija, tehnologija u obrazovanju, informatička pismenosti, informatičke vještine, napredak specifičan za zemlju.*