Information Technology Knowledge among Physics Students in Dhahira Distric, Oman

Noura Said Al-Hinaai[1], Zaidatun Tasir[2*]
[1]Universiti Teknologi Malaysia, 81310 UTM Johor Baharu, Johor
*p-zaida@utm.my

Received: 5 September 2019
Revised: 1 October 2019
Accepted: 20 October 2019
Published Online: 3 November 2019

ABSTRACT

The purpose of this study is to determine the level of Information Technology (IT) knowledge among Physics students in Dhahira District in Oman based on student's performance in Physics and their learning style which is Multiple Intelligences. A quantitative survey research design was used in this study. The research samples consisted of 344 Physics students from 9 schools in Dhahira District. Data were gathered using two questionnaires: IT questionnaire and Multiple Intelligences survey. Descriptive statistics which are mean and standard deviation indicated that the IT level among students is moderate (mean= 3.95). ANOVA testing revealed that there is a significant difference at $\alpha = 0.05$ ($p= 0.000$) in IT knowledge among students from different levels of Physics performance at $\alpha= 0.01$ ($r= 0.480$). There is a significant moderate relationship between IT knowledge and Physics performance. Majority of Physics students in the district have a high level of Naturalist, Existential, Kinesthetic, Intrapersonal, and Visual intelligences compared to the other intelligences. For the rest of the intelligences the level is moderate. The study also indicated that most students have a high level of IT knowledge with the high level of multiple intelligences.

Keywords
Information technology; quantitative research; multiple intelligences

Introduction

Information technologies are part of how people learn, how they interact with each other and information, and how they represent and understand their world. Attaining a basic understanding of these technologies and mastery of essential technical skills is a requirement for anyone to benefit from innovation in the modern world. The basic premise of IT; that physical media and systems can be used to acquire, encode, store, transmit, distribute and display information in a way that solves problems for people; is complex and inspires life-long learning (Alford et al., 2004). It is important for students and teachers to learn about, experience, and use information technologies within the context of school curriculum in Science, Mathematics, and other subjects. Since the development of the computer and the evolution of the Internet, Information Technology (IT) has had a positive impact on education systems worldwide, particularly in the areas of Science.

ICT adds value to the processes of learning, and in the organization and management of learning institutions. The use of ICT cuts across all aspects of economic and social life. Technological developments in ICT are very rapid. Technology quickly becomes obsolete requiring new skills and knowledge to be mastered frequently. Adaptation is only possible when based on a sound understanding of the principles and concepts of ICT. These rapid developments in ICT are difficult to manage for Ministries of Education, educational managers, and schools. Circumstances vary between countries and between schools within a country, and implementation factors have therefore to be taken into account when designing ICT curricula (UNESCO, 2002).

All countries, both developed and developing, aim to access to the best educational facilities necessary to prepare young people to play full roles in modern society and to contribute to a knowledge nation. All governments aim to provide the most comprehensive education possible for their citizens within the constraints of available finance. Because of the pivotal position of ICT in modern societies, its introduction into secondary schools will be high on any political agenda (UNESCO, 2002).

The application of ICT tools can be integrated for working within specific subject areas such as Languages, Natural Sciences, Mathematics, Social Sciences, and Art. An ICT curriculum may include measurement, modeling and simulation, robots and feedback devices, statistics, creating graphics, spreadsheet design, and database design (UNESCO, 2002).

However, the knowledge about IT among students especially school students in Oman is in its early stages. In Oman, Ministry of Education's (MOE) vision is to introduce children to technology by integrating it with all areas of learning to help them hone essential 21st century skills through optimum use of technology .His Excellency Yahya Bin Saud, Minister of Education, Oman, said,

'The Ministry of Education has been committed to introducing innovative education techniques across schools in the country, with an aim to create a whole new learning experience for students while diverging from the norms of traditional classroom education... as it accommodates a child- centered teaching mode that allows students to use creativity for enhancing knowledge… and we look forward to bring in more and more schools under the wings of technology.'

In a study on the use of Information Technology in Oman, Jabur and Hamyer (2003) found that 92% of teachers felt the need for continuing education in the area of information technology, while 87% indicated a shortage in their knowledge and training in the field. Based on these findings, the researchers recommended the training of teachers in Information Technology for the success of basic education in the country (Jabur and Hamyer, 2003).

Generally, among Science subjects such as Chemistry, Biology and Physics, it was found that students who learn Physics are related more to IT. According to BECTa (2004), ICT is an essential part of teaching and helps improve pupils' understanding of Physics. The starter activity uses a short PowerPoint presentation to introduce the lesson and gain the students' attention. The great advantage of using ICT is that it allows simulating the experiment and enables the students to visualize what is happening, providing an excellent tool for explaining the processes involved. ICT enables teaches and students to simulate experiments in Optics, Electricity, Force and Motion, Work and Energy, Oscillations and Sound. Experience shows that students find this very valuable during lessons but with the advantage that the work can be readily referred to at a later time, or for catching up after absence.

The choice of Physics has not been fortuitous. According to Inyang and Josiah (2016), Physics is recognized as relevant to all Science but it is perceived by most students as conceptually difficult. Moreover, Physics teaching is increasingly being blamed to be inefficient. Physics as a discipline requires learners to employ a variety of methods of understanding and to translate from one to the other - words, tables of numbers, graphs, equations, diagrams, maps. Multimedia are particularly suitable for this role. Physics requires the ability to use Algebra and Geometry and to switch from the specific to the general and back. This makes learning Physics particularly difficult for many students.

It is however clear that some unique capabilities of computers can be used to implement better instructional strategies: the graphic capabilities of computers almost demand to be exploited to present powerful symbolic representations, including dynamic representations of time dependent processes and to enhance spatial thinking. With careful design, computers can provide powerful environments where students can explore new concepts actively on their own (Inyang and Josiah, 2016).

A comparatively recent development in research has explored possible links between the use of ICT in schools and the standards achieved by students in national tests and examinations. Recent studies by the British Educational Communications and Technology agency (BECTa) (2001a; 2001b) have sought to compare the performance of students in schools well-resourced for ICT with those less well- resourced. The studies indicated that students at schools with 'good' ICT resources achieved significantly better results in national tests in English, Mathematics and Science at age 11 and 14 and in national examinations at 16+ than students at schools with 'poor' ICT resources. Achievement was higher in schools where ICT was used routinely in Maths and Science lessons, and the best results were seen in schools where ICT was used across the whole curriculum. Moreover, many powerful ICT applications in Science subjects are produced by high-performance students (Hogarth et al., 2005).

According to Harrison et al. (2007), a recent independent research report on the Impact of ICT on Pupils Learning and Attainment project (ImpaCT2) showed that ICT can help raise standards. It looked at the relationship between pupils' use of ICT and their performance in exams. High ICT users performed better than low ICT users. Researchers also noted than high ICT use leads to a change in learners learning style. They were able to study better by themselves and were more independent, not so reliant on a teacher to give them all the answers.

James and Gardner (1995), define learning style as the “complex manner in which, and conditions under which, learners most efficiently and most effectively perceive, process, store, and recall what they are attempting to learn”. Swanson (1995) presents Keefe’s definition of learning style as “the cognitive, affective, and physiological factors that serve as relatively stable indicators of how learners perceive, interact with, and respond to the learning environment”. Litzinger & Osif (1993) describe learning styles as "the different ways in which children and adults think and learn." They see that each of us develops a preferred and consistent set of behaviors or approaches to learning.These definitions have understandable variations as they tend to reflect the perspectives of different learning styles inventories.

Kolb (1984) showed that learning styles could be seen on a continuum running from:

i. Concrete experience: being involved in a new experience
ii. Reflective observation: watching others or developing observations about own experience
iii. Abstract conceptualization: creating theories to explain observations
iv. Active experimentation: using theories to solve problems, make decisions

Different people do seem to learn more effectively in different ways. For some the concept of learning by activity (activist) is by far the most attractive, while others are much more reflective (reflectors) by nature and prefer to be given information and allowed time to think about it before doing anything. Others like to analyze, think and theorize (theorists) and may well wish to carry out research before changing their behavior, while still others (pragmatists) find learning fairly difficult if they cannot see the relevance to their jobs (Grace, 2001). Research concerned with identifying the relationship between academic achievement and individual learning style has provided consistent support for the following: a) students do learn differently from each other; b) student performance in different subject areas is related to how individuals learn; c) when students are taught with approaches and resources that complement their unique learning styles, their achievement is significantly increased (DeBello, 1985). One of learning styles that most related to school students is Multiple Intelligences theory by Gardner (1983). Howard Gardner named eight kinds of intelligences: linguistic, logical-mathematical, spatial, musical, bodily-kinesthetic, interpersonal, intrapersonal, and naturalists. Intelligence is a combination of the ability to learn, to pose problems and to solve problems (Moursund, 2002).

Therefore, it is appropriate to conduct a research on identifying the level of IT knowledge among Physics students in Omani schools. The study should also focus on identifying the differences in IT knowledge among students from different Physics performance. Besides that, the relationship between students' performance in Physics, IT knowledge, and students' learning styles should also be studied.

In this research, the level of IT knowledge among Physics students will be tested to determine the differences in IT knowledge compared to their performance Physics. It will also include identification of the learning styles of students based on the theory of multiple intelligences. Therefore, this study aims:

i. To determine the level of knowledge about IT among Dhahira district Physics students.
ii. To explore the difference, if any, in knowledge about IT among students from different Physics performance.
iii. To find the relationship between students' performance in Physics and their knowledge about IT.
iv. To determine the learning style of the students based on multiple intelligences theory.
v. To determine the level of IT knowledge based on the learning style/ multiple intelligence of the students.

Literature Review

According to Park et al. (2005), the recent development of information and communications technologies (ICT) stimulates the change in science education. The ICT is now becoming an essential tool for teaching-learning process in science education. Most of school access to Information and Communications Technologies (ICT) pose tremendous challenges to Physics teaching and learning. Physics is one of the first areas where the possibilities that computers may offer for the employment of new teaching methods have been and are still explored. Most of the students today are found to be lacking in creativity, analytical and critical thinking, as the traditional approaches do not encourage students for analytical and critical thinking. Evidence from a number of disciplines suggests that oral presentations to large groups of passive students contribute very little to real learning. In Physics, standard lectures do not help most students to develop conceptual understanding of fundamental processes such as electromagnetism, mechanics, etc (Kakroo, 2007).

Evidence from surveys undertaken by Poole (2000) suggested that the problems in science lessons arose from a mix of educational and practical reasons. Though many of these were not unique to science, they were, arguably, brought more sharply into focus in science lessons because these subject areas initially appeared the more natural 'home' for many ICT applications, and expectations were therefore higher.

Technology has considerable potential for increasing interest in, and improving the quality of, learning in science and mathematics classrooms. However, effective use of instructional technology is possible only if sufficient attention is given to the following (Valdez, 2005):

i. Curriculum uses.
ii. Instructional pedagogy used.
iii. Assessments used.
iv. Sufficiency of technology and access to the Internet.
v. Ability of the teacher, especially, to model uses of technology.

Physics can be more innovative using multimedia as well as real life problems. Physics is a highly visual subject, and many concepts of Physics can be best covered graphically. For example, in Physics certain microscopic phenomenon such as double slit experiment for interference in which due to variation in wavelength the fringe width also varies, physically, it doesn't seem feasible to represent this process in the class room but multimedia based teaching can show it more effectively. Multimedia based Physics teaching develops the interest of the students in the subject and help them to imagine a world governed by the fundamental laws of Physics. Einstein has mentioned, "Imagination is more important than the knowledge" (Kakroo, 2007).

According to Park et al. (2005), learning Physics is often considered by teachers and students to be a difficult pursuit. Over the last two decades a great deal of educational research has been directed towards the exploration of students' ideas and difficulties on physical concepts and processes. Today numerous ICT applications are available, aiming to stimulate students' active engagement and offering the opportunity to work under conditions such as extremely difficult to get precise results, too much time-consuming which cannot be fit in the classroom, etc. The use of such ICT applications has developed a new research field in Physics education, since it radically changed the framework under which Physics teaching is being understood and implemented.

Most of schools access to Information and Communications Technologies (ICT) pose tremendous challenges to Physics teaching and learning. A variety of computer applications have been developed and used in teaching Physics, such as spreadsheets, computer-based laboratories, multimedia, simulations, exploratory environments, and intelligent tutors.

IT in Omani Schools

The computer is one of the most prominent results of the contemporary technological growth. Therefore, educators have to invest this technique in the educational field. For that reason, the Sultanate of Oman is always striving for the development of education to keep pace with the information era. Since the application of Basic Education for classes from 1-4 in the academic year 98/1999 in Omani schools, educators note that the system seeks to create a student that able to deal with contemporary technology.

The results of a survey by Bouazza & Al-Mufaraji (2005) showed that the utilization of school libraries by students in Oman was not encouraging. School libraries were generally poorly resourced and they especially lacked Av/Media and journals as well as electronic resources such as CD-ROM and access to the Internet. Library services were also poorly developed and tended to be "traditional" in character. Information technology was not available and information skills programs were not offered. The researchers concluded that there was much scope for development.

However, the situation has been changing in the last few years. The Ministry of Education has been making noticeable efforts in providing school libraries with personal computers, CD-ROMs and Internet connection. The same ministry has been organizing workshops on the use of information technology for the benefit of teachers (Bouazza & Al-Mufaraji, 2005).

Methods

The research design for this study is quantitative; a survey questionnaire. The research is conducted in 4 steps. Firstly, the instrument was adapted and translated form English to Arabic to be suitable for the respondents who are secondary school students. This ensures the best understanding of the questionnaire items. Secondly, the instrument was distributed to the chosen schools and delivered to students by their Physics teachers. Questionnaires are then collected and the ones which have not been answered were discarded from each school's questionnaire bundle. Thirdly, data gathered from instrument were analyzed using SPSS following the steps of keying in the data, applying appropriate statistical measurements and finding relationships Finally, results and findings were obtained, organized and discussed.

The sampling frame of this study is secondary school Physics students (Grade 12) from Dhahira district in Oman. A total of 344 students were selected randomly based on cluster random sampling technique according to their schools as the sample of this study. The population of this research is 2986 secondary Physics students in Dhahira district. The sample size is determined using the Table for Determining Sample Size from a Given Population by Robert V. Krejcie and Daryyle W. Morgan (Krejcie & Morgan, 1970). According to Krejcie and Morgan (1970), the minimum number of sample should be selected from a population of 2986 students is 341.

The age of the sample is between 17 to 19 year old. This sample is chosen due to the fact that all the students were introduced to "Information Technology" subject which was first introduced in the academic year 2004/2005 as a result of the changes made by the government on secondary education i.e. Grades 11 and 12. It worth to note that the introduction of that subject in Basic Education i.e. Grades 1- 10 started from the academic year 98/1999.

The schools of the respondents were chosen from both rural and urban places. A total of 9 schools were chosen via clustered random sampling technique. Questionnaires were distributed to the students by their Physics teachers. A total of 400 questionnaires were sent and 344 were received.

Instruments

The instrument used in this study was two questionnaires. They are "Knowledge about Information Technology (IT) Questionnaire" and "Multiple Intelligences Survey". These questionnaires include information about respondents (age, gender and Physics performance). Both questionnaires were translated by the researcher from English to Arabic language; which is the official language in Oman, to be well understood by the students.

The Knowledge about Information Technology- (IT) Questionnaire

The IT Questionnaire was adapted from Aris (1999). Some of the questions were omitted because they are inapplicable for the level of IT knowledge provided for students in that grade. This questionnaire uses a Likert Scale of 1 to 5 from very low to very high.

The Multiple Intelligences Survey

The Multiple Intelligences Survey was adapted from McKenzie (1999) questionnaire. It originally consists of 90 questions (10 questions for each of 9 sections). However, only 45 questions (5 from each section) were used so as to be suitable for secondary school students. Tasir (2002) also had used less than 10 questions (6 questions) in her study among secondary school students (age of 14). The nine sections of this questionnaire reflects Naturalist, Musical, Logical, Existential, Interpersonal, Kinesthetic, Verbal, Intrapersonal, and visual strengths. Examples of Multiple Intelligences Survey statements are presented in Table 1.

Table 1. Examples of Multiple Intelligences Survey statements

Survey Section	Statements Examples
Naturalist	Ecological issues are important to me Hiking and camping are enjoyable activities
Musical	I focus in on noise and sounds I remember things by putting them in a rhyme
Logical	Solving problems comes easily to me I can complete calculations quickly in my head
Existential	I enjoy discussing questions about life Relaxation and meditation exercises are rewarding
Interpersonal	Study groups are very productive for me Clubs and extracurricular activities are fun
Kinesthetic	Sitting still for long periods of time is difficult for me A fit body is important for a fit mind
Verbal	I enjoy reading all kinds of materials It is easy for me to explain my ideas to others
Intrapersonal	Social justice issues concern me I am willing to protest or sign a petition to right a wrong
Visual	I can imagine ideas in my mind I can recall things in mental pictures

Results

Results acquired from the survey of IT knowledge would be discussed based on the level of IT knowledge on a) Basic IT skills, b) Awareness on the existence of IT c) Knowledge of IT and its application in education, and d) The general IT knowledge. This would be followed by the analysis of the IT knowledge according to different Physics performance. The results on the relationship between students' performance in Physics and their IT knowledge would be also highlighted. Lastly, results on the students learning style acquired from the Multiple Intelligences survey and results on IT knowledge based on Multiple Intelligences would be presented.

Demographic Data

The demographic data in this study are age and gender. Those are obtained from the questionnaires distributed to the students. The ages of the sample range between 17 to 19 years old (Grade 12) where 125 students of age 17, 201 students of age 17, and 18 students of age 19. The sample consisted of 344 male and female students where males= 124 and females= 220. The research did not address gender or age differences when obtaining findings.

Level of IT Knowledge

The mean score and standard deviation of each item in the sections of Basic IT Skills, Awareness on the existence of IT, and Knowledge of IT and its applications in education in the IT questionnaire are tabulated in Tables 2, 3 and 4 respectively.

Table 2. Basic IT skills

Question	VL (%)	L (%)	M (%)	H (%)	VH (%)	Mean	SD
1. Keyboard	0	3.5	15.4	32.3	48.8	4.26	0.85
2. Mouse	0	1.7	6.7	25.0	66.6	4.56	0.70
3. Scanner	6.7	10.2	31.1	2.4	29.7	3.58	1.20
4. Monitor	1.2	4.1	11.9	27.0	55.8	4.32	0.92
5. Printer	2.6	7.0	16.3	23.3	50.9	4.13	1.08
6. Floppy disk	4.4	5.8	13.1	26.7	50.0	4.12	1.12
7. Hard-disk	5.8	4.4	21.2	29.4	39.2	3.92	1.14
8. CD-ROM	7.0	9.6	20.9	27.3	35.2	3.74	1.23
9. Microsoft Word	5.5	8.7	16.3	22.1	47.4	3.97	1.22
10. Microsoft Excel	9.0	19.8	29.1	23.3	18.9	3.23	1.22
11. PowerPoint	6.1	10.5	16.3	29.7	37.5	3.82	1.22
12. World Wide Web	11.6	12.2	16.3	25.9	34.0	3.58	1.37
13. Electronic mail	20.3	16.9	25.0	17.7	20.1	3.00	1.40
Overall mean						3.86	0.83

*Notes – VL = Very Low, L = Low, M = Moderate, H = High, VH = Very High

Table 3. Knowledge of IT and its applications in education

Question	VL (%)	L (%)	M (%)	H (%)	VH (%)	Mean	SD
1. I am aware that IT is a technology that supports creation, storage and delivery of information.	0.9	4.4	16.3	34.3	44.2	4.17	0.91
2. I am aware that computers play an important role in IT.	0.6	1.7	4.9	21.2	71.5	4.61	0.72

3. I am aware that the Internet is an information highway system.	0.9	1.7	5.2	19.5	72.7	4.61	0.74
4. I am aware that IT has a great influence on individuals, organizations and the society.	2.0	3.2	7.8	25.6	61.3	4.41	0.92
Overall mean						4.45	0.61

*Notes – VL = Very Low, L = Low, M = Moderate, H = High, VH = Very High

Table 4. Knowledge of IT and its applications in education

Question	VL (%)	L (%)	M (%)	H (%)	VH (%)	Mean	SD
1. I can give a definition of IT.	5.8	6.7	38.7	31.1	17.7	3.48	1.04
2. I have knowledge about the benefits of IT to Individuals and organizations	3.5	7.0	20.6	36.9	32.0	3.87	1.05
3. I have knowledge about the Omani government initiatives to bring its people into the information era.	3.2	13.4	23.3	32.3	27.9	3.68	1.11
4. I have knowledge about history and development of computers.	8.1	21.2	32.0	22.7	16.0	3.17	1.17
5. I have knowledge about the main component of a computer system.	4.9	13.4	32.6	28.2	20.9	3.47	1.11
6. I have knowledge about purchasing a computer based on several characteristics	11.3	17.2	34.9	20.6	16.0	3.13	1.21
7. I have knowledge about system and application software, and examples of each type used in everyday situations.	5.5	18.3	32.6	26.2	17.4	3.32	1.13
8. I have knowledge about evaluating both the application and educational software based on a several	7.6	24.4	38.4	20.3	9.3	2.99	1.06
9. I have knowledge about the Internet such as, its concept, hardware requirements, and the Internet services.	4.4	12.8	22.4	37.8	22.7	3.62	1.10
10. I have knowledge about the development of the Internet and its application in the Omani educational system.	4.1	10.8	31.4	30.8	22.7	3.57	1.08
11. I have knowledge about the role of computers and IT in education.	2.0	6.1	17.2	35.8	39.0	4.03	1.00
12. I have knowledge about the application of IT in teaching and learning in schools.	2.3	6.7	23.3	40.1	27.6	3.84	0.98

13. I have knowledge about the effectiveness of computer-based learning in improving students' knowledge and attitudes.	3.2	6.1	18.0	33.1	39.5	4.00	1.05
14. I have knowledge about the application of IT in school administration.	4.1	15.4	30.5	29.4	20.6	3.47	1.10
Overall mean						3.54	0.68

*Notes – VL = Very Low, L = Low, M = Moderate, H = High, VH = Very High

Table 5 presents the overall mean and standard deviation for each of the three sections of the IT questionnaire and the overall mean and standard deviation of the general IT knowledge.

Table 5. IT knowledge

Section	Mean	SD
Basic IT skills	3.86	0.83
Awareness on the existence of IT	4.45	0.61
Knowledge of IT and its applications in education	3.54	0.68
Overall	3.95	0.59

IT Knowledge for Different Physics Performance

The IT knowledge for different Physics performance is presented in Table 6. ANOVA analysis is presented in Table 7 where p is the significance at α= 0.05.

Table 6. IT knowledge according to Physics performance

Physics Grade	N	Mean
F	8	3.51
D	71	3.49
C	94	3.88
B	112	4.18
A	59	4.28

Table 7. ANOVA

	F	p
Basic IT skills	26.556	0.000

Awareness on the existence of IT	37.133	0.000
Knowledge of IT and its applications in education	5.870	0.000
IT knowledge	14.319	0.000

* $\alpha = 0.05$

Tukey HSD Post Hoc Tests are tabulated in Table 8 (significant). Pairs that are not significant are F & D, F & C, and B & A.

Table 8. Tukey HSD Post Hoc Tests (significant)

Pair (grades)	p
F & B	0.000
F & A	0.000
D & C	0.000
D & B	0.000
D & A	0.000
C & B	0.000
C & A	0.000

Relationship between IT Knowledge and Physics Performance

Spearman's rho correlation is used to find the relationship between IT knowledge and Physics performance. Table 9 shows the correlation coefficient for the relationship between Physics performance and Basic IT skills, Awareness on the existence of IT, Knowledge of IT and its application in education, and the general IT knowledge.

Table 9. Spearman's rho correlation between IT knowledge and Physics performance

	Correlation
Basic IT skills	0.534**
Awareness on the existence of IT	0.233**
Knowledge of IT and its applications in education	0.358**
IT knowledge	0.480**

** Correlation is significant at α= 0.01 level (2-tailed).

Students' Learning Style/ Multiple Intelligences

The Multiple Intelligences survey was analyzed by finding out the frequencies of each statement of the questionnaire. This was done for each intelligence section to find out what intelligence exists most among students. Number of statements chosen by each student in each intelligence section represents how strong that intelligence is for that student. Frequencies of the nine intelligences are presented in Table 10.

Table 10. Frequencies of the intelligences

Leve l	1	2	3	4	5	6	7	8	9
	f	*f*	*f*	*f*	*f*	*f*	*f*	*f*	*f*
Low	24	103	56	12	60	27	51	24	36
Moderate	81	128	125	38	97	82	102	49	81
High	238	111	162	293	186	234	188	271	227

1= Naturalist, 2= Musical, 3= Logical, 4= Existential, 5= Interpersonal,
6= Kinesthetic, 7= Verbal, 8= Intrapersonal, 9= Visual

IT Knowledge based on Multiple Intelligences

For analyzing IT knowledge based on Multiple Intelligences, each of the nine intelligences was categorized into 3 levels i.e. Low, Moderate, and High. For each intelligence, frequency and mean was calculated in relation to IT knowledge. Results are presented on Table 4.10 below.

Level	1		2		3		4		5		6		7		8		9	
	f	μ	*f*	μ	*f*	μ	*f*	μ	*f*	μ	*f*	μ	*f*	μ	*f*	μ	*f*	μ
A	24	3.76	103	3.81	56	3.70	12	3.59	60	3.88	27	3.76	51	3.77	24	3.88	36	3.79
B	81	3.86	128	3.97	125	3.95	38	3.79	97	3.96	82	3.98	102	3.94	49	3.79	81	3.77
C	238	4.00	111	4.07	162	4.03	293	3.98	186	3.97	234	3.96	188	4.01	271	3.98	227	4.04

1= Naturalist, 2= Musical, 3= Logical, 4= Existential, 5= Interpersonal, 6= Kinesthetic, 7= Verbal, 8= Intrapersonal, 9= Visual A= Low, B= Moderate, C= High

Discussions

The findings related to level of IT knowledge among the students show that they have a moderate level in the Basic IT Skills with mean=3.86. The data analysis indicates that although the overall level of this section is moderate, students have high level in using computer hardware e.g. Keyboard, Mouse, Monitor, and Printer with mean higher than 4.00. On the other hand, findings indicate that students have moderate level in using Scanner with mean=3.58. This could be explained through the availability of these equipment in district schools.

For the computer software e.g. World Wide Web, Electronic Mail, and Microsoft Excel, the level is moderate with the lowest mean=3.00 for the use of Electronic Mail and mean=3.23 for the use of Microsoft Excel. The first case could be explained through the availability of Internet service in schools which is still not available in most of them and the second case through the number of classes allocated for the IT subject during the academic year.

Findings also show a high level in the Awareness on the Existence of IT section with mean=4.45. This gives a good impression on the positive attitude of students toward technology and their perception of its relevance for the individual and society.

For the Knowledge of IT and its Applications in Education section the level is moderate with mean=3.54. The lowest mean in this section is 2.99 for the "evaluating application and educational software". This can be attributed to the shortage of applications and educational software provided to the students.

The high means of questions 11 and 13 indicate that students value the role of computers and IT in education, and also the effectiveness of computer-based learning in improving students' knowledge and attitudes. The means of questions 2, 3, 9, 10, and 12 are moderate. This can be explained through the shortage of internet service in many schools in the district. In addition, students are not introduced fairly to the different applications of IT and to the government's efforts in that area. The low means of questions 1, 4, 5, 6, 7, 8, and 14 indicate that students do not have sufficient information on characteristics, applications, and history of computers and IT in general. Those should be included broadly in IT subject.

It is important to consider the different types of technology which can be used to support learning and make them available to the students. According to Becker (1994), various technologies deliver different kinds of content and serve different purposes in the classroom. For example, word processing and e-mail promote communication skills; database and spreadsheet programs promote organizational skills; and modeling software promotes the understanding of science and math concepts.

In general, the level of IT knowledge among Dhahira District Physics students is moderate with overall mean= 3.95. This indicates that the IT subject is effective and achieving the desired objectives although there is a need for a detailed analysis of the contents of the books, the material available and the time allocated to it. Marshall (2002) suggests "there's an unprecedented need to understand the recipe for success, which involves the learner, the teacher, the content, and the environment in which technology is used."

Knowledge of IT Based on Physics Performance

Student with high Physics performance (Grades A and B) have also high level of IT knowledge (mean = 4.28 and 4.18 respectively). Results also showed that students of moderate Physics level (Grade C) have a moderate level of IT knowledge (mean = 3.88). For students with low Physics performance (Grades D and F), the level of IT knowledge is low (mean = 3.49 and 3.51 respectively). In general, from Table 4.5, the means of the 5 levels of Physics grades increase as the Grade moves from F to A.

Table 7 shows that there is a significant difference at $\alpha = 0.05$ in IT knowledge among students from different Physics performance. This means that students with different Physics performance have different levels of IT knowledge where students with high grades in Physics have high levels of IT knowledge. This is aligned with Hogarth et al. (2005) in that IT has opened up a whole range of potential applications in Science. Those applications help students to find more information about their school subjects and to gain better understanding of science.

Pairs of grades those are significant are presented in Table 8. There are seven significant pairs which are F and B, F and A, D and C, D and B, D and A, C and B, and C and A. On the other hand, there is no significant difference between F and D, F and C, and B and A. From these findings, it can be stated that students with low level of Physics performance (Grades D and F) have a significant difference in the level of IT knowledge with students who have moderate and high level of Physics performance (Grades C, B, and A).

Relationship between IT Knowledge and Physics Performance

There is a significant relationship between IT knowledge and Physics performance. Table 9 shows the Spearman's rho correlation coefficient between Physics performance and IT knowledge r= 0.480 which is significant at the 0.01 level (2-tailed). For the 3 sections of the IT Questionnaire, the relationship is significant with r= 0.534, 0.233, and 0.358 for Basic IT Skills, Awareness on the Existence of IT, and Knowledge of IT and its Application in Education respectively.

This result is parallel with Laird & Kuh (2004). They found that there is a positive relationship between students' academic uses of information technology and multiple aspects of student engagement. They also indicate that using information technology is associated with desirable outcomes.

Although the relationship between IT knowledge and Physics performance is significant in this study, it is considered as a moderate relationship (r = 0.480). According to Guilford (1956), the moderate correlation occurs between 0.4 – 0.7. Therefore, more IT applications should be integrated in learning Physics to help raising students' Physics performance.

According to Means and Olson (1997), the technology supports student performance of complex tasks that are similar to those performed by adult professionals and/or fill a genuine need of the student. This supports the finding of this study in which students with high level of IT knowledge are also with good Physics performance.

Learning Style of the Students Based on Multiple Intelligences Theory

Majority of students have a high level of Naturalist, Existential, Kinesthetic, Intrapersonal, and Visual intelligences compared to the other intelligences. More than 200 students have a high level of those five intelligences. Data from Table 10 also show that 162 students have high level of Logical intelligence, 186 students have high level of Interpersonal intelligence, and 188 students have high level of Verbal intelligence. For the Musical intelligence, data from Table 4.9 show that the majority of students have a moderate level of that intelligence.

These findings are parallel with O'Connor (2003) where the investigation of the multiple intelligences profiles of a group of high school students found that intrapersonal, kinesthetic, existential intelligences scored highest and verbal linguistic ability, and musical intelligence scored lowest across the nine areas identified by Gardner in his Multiple Intelligences Theory.

Findings are also aligned with Neville (2000) where the investigation of the multiple intelligences among 3rd, 7th, and 11th-grade students in South Dakota indicated that the respondents perceived naturalist and visual-spatial intelligences to be their most predominant intelligences and musical-rhythmic intelligence to be their least predominant intelligence.

Level of IT Knowledge Based in Multiple Intelligences

Data from Table 11 show that most students have a high level of IT knowledge with the high level of Naturalist, Logical, Verbal, and Visual intelligences where number of students is 238, 162, 188, and 227 respectively. For the other five intelligences, the IT level among students is moderate. These findings can be explained through the findings of Valdes et al. (1999) in that technology has been proved to accommodate learning styles and to be an effective motivator for students with specific learning needs.

For the Naturalist, Musical, Logical, Existential, Interpersonal, Verbal, and Visual intelligences, it can be concluded that as the intelligence moves from low to moderate to high level the mean of the level of IT knowledge increases. For the Kinesthetic intelligence, the IT knowledge for the high level (mean= 3.96) is slightly lower than the moderate level (mean= 3.98). The IT knowledge for the low intelligence level is higher than that of the moderate level of the Intrapersonal intelligence.

However, based on the findings, it can be concluded that the IT knowledge among student with high level of intelligences is high. Therefore, technology can be used in classrooms to enhance students' intelligences. Savini (1995) believe that the use of technology can provide different ways for learning and can be used to build upon a students' strength and extend their knowledge and abilities.

Conclusion

The findings of this study showed the level of IT knowledge among Dhahira District Physics students is moderate (mean = 3.95). It also indicated that students with different Physics performance have different levels of IT knowledge where students with higher grade in Physics have higher IT level.

Results revealed a moderate relationship between IT knowledge and Physics performance (r= 0.480). According to Multiple Intelligences Survey results, majority of Physics students in the district have a high level of Naturalist, Existential, Kinesthetic, Intrapersonal, and Visual intelligences compared to the other intelligences in which majority of students have a moderate level. Findings also indicated that students with high level of IT knowledge have also a high level of multiple intelligences.

Limitations and Future Studies

The research study showed that the level of IT knowledge among Dhahira district Physics students is moderate. The level of IT knowledge among students from different Districts and subjects is not determined yet. It is therefore suggested that the research study is expanded to involve all Omani students from different grades and different subjects. This would help to stand on the level of students in information technology, thus raising the efficiency of education in the Sultanate.

The research also determined the learning style of the students based on multiple intelligences theory. A wider research in that area is recommended because it would help in determining students' interests and developmental needs. This will guide the direction of the educational system program which will adapt to students rather than expecting students to adapt to it. According to Campbell (1991), teaching and learning through the multiple intelligences helps solve many common school problems and optimizes the learning experience for students and teachers alike. Furthermore, evidence indicates that an individual can learn better, smarter, faster and retain more information when material is presented in one's preferred learning style/multiple intelligence (Lane, 2000).

References

Alford, K. et al. (2004). A Curriculum Framework for Evolving an Information Technology Program. 34th ASEE/IEEE Frontiers in Education Conference, Savannah, GA

Aris, B. (1999). The Use of Information Technology in Education: Using an Interactive Multimedia Courseware Package to Upgrade Teachers' Knowledge and Change Their Attitudes. An Interactive Multimedia Doctoral Thesis Produced in the CD-ROM Format.

Becker, H. J. (1994). Analysis and trends of school use of new information technologies. Irvine, CA: University of California, Irvine, Department of Education

Bouazza, A.; Al-Mufaraji, M. (2005) Use of School Libraries by Teachers: the Case of Oman. Libri

British Educational Communications and Technology agency [BECTa] (2001a)

Primary Schools of the Future: Achieving Today. Coventry: BECTa.

British Educational Communications and Technology agency [BECTa] (2001b) The Secondary School of the Future. Coventry: BECTa.

British Educational Communications and Technology agency BECTa (2004). Using ICT in physics to enhance teaching and learning. UK

Gardner, H. (1993). Multiple intelligences: The theory in practice. New York: Basic Books.

Gardner, H.. (1983). Frames of mind: The theory of multiple intelligences. New York: Basic Books.

Guilford, J.P. (1956). Fundamental Statistics in Psychology and Education. (p. 145) New York: McGraw Hill.

Harrison, C. et al. (2000), ImpaCT2 Project Preliminary Study 1 – Establishing the Relationship between Networked Technology and Attainment (Becta, Coventry).

Hogarth S., Bennet J., Lubben F., Campbell R., Robinson A. (2005) The effect of ICT teaching activities in science lessons on students' understanding of science ideas. Protocol. In: Research Evidence in Education Library. London: EPPI-Centre, Social Science Research Unit, Institute of Education, University of London.

Jabur, Naima H. and Hamyer Al –Mahrouki (2003). An Evaluation study of Omani experience in the use of information technology within the shift to basic education. In: Educational Technology Conference Proceedings, Sultan Qaboos University, 20–22 October 2003. (in Arabic).

James, W. B., and Gardner, D. L. "Learning Styles: Implications for Distance Learning." New Directions for Adult and Continuing Education no. 67 (Fall 1995):19-32.

Kakroo, R. Tryst with ICTs. Digital Learning Magazine. Vol.3 (2007). India

Kolb, D.A. 1984. Experiential learning: experience as the source of learning and development. Englewood Cliffs, New Jersey: Prentice-Hall.

Krejcie, R. V., & Morgan, D. W. (1970). Determining sample size for research activities. Educational and Psychological Measurement, 30, 607-610.

Laird, T., Kuh, G. (2004). Student Experiences with Information Technology and their Relationship to Other Aspects of Student Engagement. Paper presented at the Annual Meeting of the Association for Institutional Research. Boston

Lane, C. (2000). Implementing Multiple Intelligences and Learning Styles in Distributed Learning/IMS Projects. http://www.tecweb.org/styles/imslsindl.html

Inyang, U. M., & Josiah, M. M. (2016). Students' gender and perceived difficulty of concepts in secondary school physics in Jos Metropolis, Nigeria. *IOSR Journal of Research & Method in Education*, *6*(5), 1-5.

Litzinger, M. & Osif, B. (1993) Accommodating diverse learning styles: Designing instruction for electronic information sources. In Shirato, L. & Abor, (eds). What is good instruction now? Library instruction for the 90s. Pieran Press, Miami.

Marshall, J.M. (2002). Learning with technology: Evidence that technology can, and does, support learning. San Diego, CA: Cable in the Classroom.

McKenzie, Walter. 1999. Multiple intelligences survey. The One and Only Surfaquarium, http://surfaquarium.com/MI/inventory.htm

Means, B., Olson, K. (1997). Technology and education reform. Office of Educational Research and Improvement, Contract No. RP91-172010. Washington, DC: U.S. Department of Education.

Neville, Alan L. (2000). Native American Students' Self-Perceptions Regarding Gardner's Multiple Intelligences (Howard Gardner). Dissertation Abstracts International, Volume 61-03, Section A

O'Connor, J. (2003) Multiple Intelligence Theory and its possible link to academic results, BSc Thesis in Health, Fitness and Leisure, Institute of Technology, Tralee

Park, S. et al. (2005). Physics Inquiry Experiments Using Computer Interface Based Excel VBA. Recent Research Developments in Learning Technologies. Korea

Poole P (2000) Information and communications technology in science education: a long gestation. In: Sears J, Sorensen P (eds) Issues in science teaching. London: RoutledgeFalmer, pages 209-218.

Savini, M. et al. (1995). Computer Architectures for Machine Perception, CAMP'95 Proceedings, IEEE Computer Society Press, Los Alamitos, California.

Swanson, L. J. "Learning Styles: A Review of the Literature" July 1995. (ED 387067)

Tasir, Z (2002). Pembinaan dan Penilaian Keberkesanan Perisian Multimedia Interaktif Matematik Berasaskan Kecerdasan Pelbagai. Universiti Teknologi Malaysia: Ph.D Thesis.

UNESCO (2002). Information and Communication Technology in Education. Division of Higher Education, France

Valdez G. (2005) Critical Issue: Technology: A Catalyst for Teaching and Learning in the Classroom. NCEMSC, USA