A Strategy to Improve The Usage of ICT in The Kingdom of Saudi Arabia Primary School

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Abstract—Integration ICT in education is complex ideas which should be interpreted practically to get significant outcomes. As developing country, the Kingdom of Saudi Arabia (the KSA) does not have a proper technological infrastructure as developed countries. Therefore, efficient strategies are required to improve the usage of ICT in the KSA primary schools effectively. Improving the usage of ICT in the KSA primary schools may be achieved by integrating ICT into classroom. However, some barriers which prevent a successful ICT implementation in the primary school have been identified. This paper proposes several strategies to overcome the problems. Several recommendations for ICT integration in primary school which may be adopted in the KSA are also proposed. These strategies should be done at school and national scale.

Keywords-ICT, primary school, barrier, strategy

I. INTRODUCTION

Information and communication technologies (ICT) are considered as an important tool for any organization to stay competitive and play their role efficiently and effectively. A significance gain will be achieved by organizations which adopt and implement successfully ICT [1]. In education sector, ICT is also considered as a potential tool to deliver a high quality of education and prepare the students for the information era [2]. When computer as part of ICT introduced to the educational system, several expectations will arise such as computer will reduce teachers' effort to deliver knowledge, computer give a better visualization, and computer will encourage students' motivation [Marcuse-Hass and Kromenholtz cited in 3].However, integration ICT in education is complex ideas which should be interpreted practically to get significant outcomes [4].

As other developing countries, the Kingdom of Saudi Arabia (the KSA) does not have a proper technological infrastructure similar to developed countries. Therefore, efficient strategies are required to improve the usage of ICT in the KSA primary schools effectively. Improving the usage of ICT in the KSA primary schools may be achieved by integrating ICT into classroom. However, some barriers which prevent a successful ICT implementation in the primary school have been identified on several studies. An analysis to understand how teachers and students utilize ICT and what the impacts for teaching and learning process in the classrooms is very important to construct strategies to overcome the problems. An intensive review of the ICT usage in the schools is undertaken. It aims to identify and categorize useful strategies which appropriate and could work in the KSA.

The aim of the study is to develop a set of strategies to improve the usage of information and communication technologies (ICT) in the Kingdom of Saudi Arabia primary school. The categories of the usage of ICT are 'supportive ICT use' and 'classroom ICT use'. Supportive ICT use refers to the use of ICT for practical educational support such as school administration, teaching management and administration and preparing worksheets for student assignment. Classroom ICT use is defined as the use of ICT in teaching and learning process in classroom and science labs such as using computers for demonstration and visualization, drill and practice activities [Tondeur et al. cited in 5].

II. REVIEW TECHNOLOGICAL USAGES IN PRIMARY SCHOOL

A. Types of Educational Computer Use

Most of ICT research explores the conditions that can sustain the integration of ICT into schools. In this context, many researchers presented frameworks or models demonstrating conditions that can have an influence on ICT integration into teaching and learning methods. These frameworks are mostly based on two basic methods: 'qualitative research methods' [e.g. 6] and 'quantitative research methods' [e.g. 7]. All the aforesaid frameworks have one thing in common that ICT integration is described from a holistic point of view influenced by conditions situated on different levels (pupils, teachers, schools, policy makers etc) [7].

On the basis of an empirical study involving a large segment of teachers, Tondeur et al. [cited in 5] has described two main categories of ICT use by teachers: supportive ICT use and classroom ICT use. Supportive ICT refers to the use of ICT for practical as well as organizational teaching responsibilities such as, student administration, teaching management and administration, preparing worksheets, developing evaluation activities presuming students' learning progress in a given situation, etc. The next category, 'classroom ICT use' focuses to support and heighten the actual teaching and learning process, for instance, how the computers can be used for demonstration purposes, drill and practice activities, representation of intricate knowledge elements, deliberations, cooperation, and project work, etc. Furthermore, Wozneyet et

al. [cited in 5] found that supportive use of ICT was the most decisive factor to appraise the classroom use of ICT.

B. Characteristics of ICT Usage

Tondeu, Valcke & van Braak [8] explore the individual characteristics of teachers and school environment that are related to various types of computer usage by primary school teachers. In this perspective a survey was conducted in Flanders primary schools whereby a questionnaire was directed to (ICT) coordinators from the same schools to collect auxiliary information as to the cultural and contextual school characteristics. Hence, strenuous efforts were made to find out a collective impact of both teacher and school characteristics during a multifarious level of investigation. As the study reveals that cultural school characteristics i.e., the schools' readiness to change as well as the availability of an ICT based school policy plan, are intrinsically linked to the use of computers as an educational instrument on one hand and the implementation of ICT considering the basic computer skills on the other. On the contrary, no cultural school characteristic is likely to be associated solely, with the use of computers as an information instrument. Nevertheless, as stated above that a multi-dimensional approach can bring a more conductive and meaningful insight into the characteristics affecting the use of computers.

III. Analysis

The Ministry of Education, the Ministry of Higher Education and the General Organization for Technical Education and Vocational Training have joint responsibility to manage and operate the education system in the KSA. Kindergarten is provided for children aged 3–5 years but it is not a prerequisite for enrollment of primary education. The first grade of primary education is provided for children aged six years. They must pass the final examination at the end of Grade 6 and obtain the Elementary Education Certificate as requirement to move to intermediate education. The students study at intermediate education for three years. They also must study for three years at secondary education and this is the final stage of general education. Student can go to higher education after finishing secondary education [9]. The number of students and teachers at each level in 2007 [10] is shown in Table 1.

TABLE I. Number of Students and Teachers in 2007

Education Level	Students		Teachers	
	Male	Female	Male	Female
Primary	1,255,117	1,187,365	107,227	110,328
Intermediate	609,300	535,248	54,034	54,031
Secondary	541,849	471,225	41,108	46,715

ICT have a potential to change the ways of teaching. However, some barriers must be considered to achieve good results. Balanskat, Blamire and Kefala [cited in 11] state that although teachers acknowledge the importance of ICT to improve learning process, some problems continue arise during the process of adopting these technologies. This section describes several problems on the implementation of ICT in several countries which may be happened in the KSA.

An analysis is undertaken to understand how teachers and students utilize ICT and what the impacts for teaching and learning process in the classrooms. Researchers have been used several category to classify barriers of the implementation of ICT on school. Hew & Brush [6] identified the barriers into several groups, namely: (a) resources, (b) institution, (c) subject culture, (d) attitudes and beliefs, (e) knowledge and skills, and (f) assessment. Bingimlas [11] divided the barriers into (a) teacher level and (b) school level. Mohamed, Abuzaid & Benladen [12] regarded the barriers as cultural and technical constraints. This analysis focuses on teacher factor, school/institution factor and extrinsic factor.

A. Teacher Factor

Amongst the other factors, teacher-related variables are the most powerful predictors of technology integration. Teachers are critical key to successful adoption of ICT and 'teacher professional development needs to focus on both technology skills and support for pedagogical change to embed ICT' [13]. Therefore, teachers should be at the center of ICT integration projects. Marcinkiewicz [cited in 5] stressed that the full integration of the use of computers in education will remain a remote target to achieve unless the gap between teachers perceived impediments and the use of computers is filled with caution. This study divide some barriers associated with teachers into the following categories:

1) Lack of teacher confidence.

Several references reported that lack of teacher confidence prevent them to use ICT on class. Becta [cited in 11] found that teachers were afraid to use ICT in the classroom as they feel having limited knowledge in the area of ICT. Lack of confidence will also reduce the teachers' motivation to use ICT as useful tool in teaching process [11]. A study conducted in 2005 by Jamieson-Proctor et al. [14] indicate that 73% of female teacher in Queensland state are less confident to use ICT for teaching and learning process in classrooms. This number was significantly greater than their male counterparts.

2) Lack of teacher competence

Lack of teacher competence is a barrier which directly related with teacher confidence. William et. al. [cited in 6] found that more than 10% of elementary school teachers in Scottish school have not enough skills on databases and spreadsheet. In Australia, Newhouse [cited in 11] found that many teachers were not enthusiastic to integrate ICT with teaching activities as they have not enough knowledge and skill about this technology. In United States, Snoeyink and Ertmer [6] also found that lack of computer skill was becoming a barrier for teachers to integrate ICT into teaching process on the classrooms. In Malaysia, lack of teacher expertise on ICT was reported as the main constraint of promoting ICT in schools [15]. A study by Cavas et al. [16] in Turkey found that Turkish primary science teachers' positive attitudes toward ICT was influenced by their computer ownership at home and their computer experience.

3) Negative attitudes

Teachers' participation influence the successful of ICT implementation in the schools [7]. Schoepp [cited in 11] states that although some teachers have enough knowledge and skill on ICT, they did not intend to use ICT as they believe there are

not appropriate rewards for using it. Furthermore, some teachers believed that there is no relationship between ICT and an effective teaching [6]. For example, a study in Australia revealed that most of teachers believed a better learning cannot be achieved by using computer [Newhouse cited in 6]. In addition, Jamieson-Proctor et al. [14] found that there are significant resistance from teachers in Queensland state to use ICT as required by curriculum.

Those teachers who have an obsession and sheer commitment to boost their learning processes can more likely incorporate technology in their teaching. This view is also consistent with findings by Sang et al. [5] that amongst the internal teacher variables, ICT motivation appears to be the strongest predictor of ICT classroom use. In addition, teachers' attitudes towards ICT use in education are strongly related to their ICT motivation being a predictor of ICT classroom use.

B. School/Institution Factor

1) Lack of time.

Using ICT on the classrooms needs a good preparation which may be time consuming. Teachers need many hours to search suitable resources on the Web, prepare photos and videos for multimedia presentation. If the schools do not reduce teachers' teaching time as compensation, it is difficult to expect the teachers to use ICT on their classroom [6]. Furthermore, an availability of computers in laboratories was not guarantee the teachers to access it if they should compete with the other teachers for laboratory time [Zhao, Pugh, Sheldon,and Byers cited in 6]. In Saudi Arabia, Al-Alwani [cited in 11] found that teachers do not want to use ICT as they have busy schedule.

2) Lack of effective training.

Lack of teacher competence and skill is regarded as main barrier of ICT integration in the class room. A good training for teacher may be solution for the problem. Therefore, lack of effective training for teacher is significant barrier for the implementation of ICT on classroom [19]. Gomes [cited in 11] states that insufficient training in digital literacy, pedagogic and didactic training become barriers for teachers to use ICT in the classrooms.

3) Lack of local technical support.

Neyland [18] states that 'provision of ICT and technical support are first order factors affecting technology integration'. It is common that the teachers face technical problem when working in technology-integrated-classroom. On this classroom, there are various kinds of technological resources such as computers, LCD projector, printers, CD-ROMs, whiteboard and other multimedia device. It is hard to encourage teachers to use ICT without immediate support from skilled staffs when the teachers have difficulties to operate these technological resources [Lim et al. cited in 6]. Indeed, lack of technical assistance is considered as significant constraints for using ICT [Pelgrum cited in 11]. In New Zealand, a study by New Zealand Education Review Office revealed that technical support was considered as a significant factor for successful use of schools' e-learning packages [18]. In Saudi Arabia, teachers did not want using ICT if there was no technical support [Almohaissin cited in 11].

4) Leadership barrier

A good example from the leaders (school principal) is significant factor for successful integration ICT in school. Stuart et al. [20] state that 'the leadership behaviors of senior management plays an important role in determining the success or failure of an ICT implementation'. Fox and Henri [cited in 6] reported that most of teachers in Hong Kong was not interested to use ICT in the classroom as they felt that there no support from the principal whose did not understand ICT. In Victoria, Australia, the successful implementation of ICT into the curriculum was depend on commitment of school leaders to arrange a suitable training for the teachers [21].

C. Extrinsic Factor

1) Local culture

One of the advantages of using ICT is possibility to deliver information over the internet which performs e-learning. However, unsuccessful adoption of e-learning in developing countries was resulted from direct copy from developed countries whose have significant different cultures [Wurm 2008 cited in 12].

A few more studies have explored that how these factors influence in a direct and/or indirect way the levels of ICT integration in classrooms. Although the question about ICT integration in education is the one having global significance yet, the cultural variables have to be taken into account as well. For instance, cultural differences have been identified when comparing Chinese and Flemish teacher perspectives in the use of ICT in teaching and learning methodologies [Zhu et al. cited in 5]. According to their findings, Chinese teachers, in particular, express more doubts about the constructivist principles underlying many ICT applications including but not limited to collaboration, independent learning, and self-directed learning. These differences are identified in ideas of Chinese teachers as compared with Flemish teachers as regards to teacher–student and student–student interactions. This is linked to disparity in the cultural dimensions of both societies e.g., power distance, collaboration, and competition. Chinese teachers nevertheless put a larger emphasis on those nuances.

Implementation of ICT generally will be continued by providing access to the Internet. There are many negative views about contents of the Internet such as extreme political beliefs, pornography, and strange religions [Postrel cited in 22]. Although all of these factors may be not considered 'ethically abhorrent' in some western societies, it cannot be accepted in the KSA culture which based on Islamic religion [22]. Indeed, after a long national debate about the social risks of the Internet, the internet was introduced in the KSA in 1999 to support e-learning [Wurm 2008 cited in 12]. To sum up, modification of examples strategies from other countries is required for ICT adoption in the KSA.

2) Lack of funding support.

Integrating ICT into school require a high cost for supplying and maintaining this technology [23]. A sufficient fund is regarded as one of the key of successful implementation of ICT in the schools [15]. Without sufficient fund, the schools cannot provide software and hardware such as computers and its peripherals. Hew & Brush [6] state that without adequate these technological resources, it was difficult to encourage the teachers to use ICT in the classrooms. Indeed, a sufficient fund

is one of important factor to ensure sustainability ICT integration in the primary school.

3) Lack of appropriate planning.

A successful ICT integration requires a good planning. Technology alone was not sufficient to integrate ICT in the classrooms. A comprehensive plan for introducing ICT in society was also required [Mool cited in 23]. Somekh [13] states that 'the complexities of educational innovations require a holistic strategy capable of building change in social practices informed by the practical power of theoretical knowledge'. A good comprehensive planning is essential to solve simultaneously other problems such as lack of appropriate planning, lack of funding support, coping different local culture and lack of effective training.

IV. Discussion and Initiatives

Several references propose a various solution for implementation of ICT in the schools. This section examines these solutions which may be adopted in the KSA.

A. Personal Development for Teachers

Some recent researches reveal that irrespective of teachers' earnest inclination and profound interest in knowing about the potential of ICT, their practical use of ICT is comparatively low and it generally focused on a limited range of applications. On the other hand, yet another international survey on teachers' perceived impediments in using ICT unfolds three main factors i.e. their lack of resources, their lack of knowledge and skillfulness and instructive complexities to incorporate technology in instruction. However, the competency and compatibilities of teachers' self-assurance in their expertise is a key to understand their eagerness to integrate technology in their instruction. Zhao and Cziko [cited in 25] explore three conditions that can help motivate teachers in using ICT to carry out their pedagogical responsibilities e.g., (1) teachers should have faith that the use of technology would enhance the effectiveness of their goals which cannot be achieved through ordinary means, (2) they should also believe that the use of technology would not hamper the other high-level goals they want to accomplish and (3) they should believe that they have full command on invariably available resources and have enough potential for effectively utilizing ICT. Moreover, Cox [cited in 26] state that positive perceptions of students and teachers to the value of ICT will encourage them to use ICT. Therefore, understanding the teachers' perception toward ICT will help the decision maker (government or school principal) to make plan about how the teachers will adopt ICT in their teaching activities.

Professional development for teachers was considered as a critical factor in the successful integration of ICT in the schools [Way & Webb cited in 18]. Teachers should have 'technology-supported-pedagogy knowledge' which is required when they plan to integrate ICT in the classrooms [Hughes cited in 6]. By this knowledge, the teachers may ask the students to write their assignments in a word processor document rather than submit a hand-written paper. The teachers may also give art assignments drawing on a graphic software or 2D/3D modeling software.

The teacher should be trained to be able teaching in 'student-centered way' and developing 'individual learning program' for their students. They should also encourage the students to work independently in their own computer [23]. One school in Sidney has conducted a regular workshop to increase teacher confidence with ICT. The workshop involved local experts and consultants to ensure a sustainable support [23]. Furthermore, Jones [cited in 26] states that the barriers which hamper the teacher to use ICT can be eliminated through two ways, namely, individual level enablers and whole school level enablers. At individual level, the teachers are given full access to personal pc or laptop with good quality of hardware and software, access to good educational resources, and appropriate trainings. At whole school level, adequate technical support, effective timetabling, support from senior staff or principal and adequate equipment such as whiteboards in classroom are regarded as key factors.

To sum up, a basic and general ICT training for all primary school teachers is required and should be carried out in national level by the government of the KSA. More advanced and specific ICT training could be carried out at school level and its subjects is determined by each school requirements.

B. Training for Students

Availability of ICT resources will not be useful if the students have no skill to use it in their learning process. Therefore, the school should provide basic training for the students. In Malaysia, there was program called 'Pintar' which delivered basic ICT training for students from low income families. The training had objective to increase the students motivation to learn [15]. Indeed, as training for teachers, suitable ICT training for students is also required.

C. Institution/School Support

Support from institution/school is required to perform 'supportive environment' which include encouragement to use ICT, training and providing technical support staffs [28]. All of ICT components, hardware and software, should be well maintained and technical support should be available when teachers have difficulties to operate it [23]. Hiring special staffs which have responsibility to support ICT implementation in the primary schools may be a good solution.

A good arranged timetable may provide the teachers more time to prepare teaching material which use ICT [28]. By reducing teachers' workload, they will have more time for developing learning program with colleagues, trying new method to teach in ICT environment, and thinking about better pedagogical practices [23]. The schools should also facilitate a work group which enables the teachers to work together producing learning materials. This effort will save teachers' time and also increase their productivity.

As a leader, the schools principals' commitment to actively improve the usage of ICT will support the successful integration ICT in the school. These supports can be in forms of improving curriculum and establishing technology committee, encouraging teachers to improve their technological skills, providing appropriate resources and continuous monitoring. The technology committee has main task developing a planning and strategy to ensure that ICT integration will work well [23]. Furthermore, from his questionnaires to teachers about online learning tool integration

in schools, Neyland [18] concluded that 'local leadership, including the level of school support and commitment to innovation, was seen to be more important than broader systemic level strategies'.

Schools' effort to integrate ICT into science labs will help students to get an interesting visualization of the nature process. This effort will encourage students to be familiar with ICT and also develop their learning skill [29].

D. Community and Government Support

Sustainability for ICT access will be guaranteed if the schools have sufficient money. Government funding is highly required to provide appropriate hardware and software for the schools. Supporting by money raised by parent association, the continuity of ICT access may be achieved [28].

Involvement of business company is also very important. In India, Pearson Education provided software which combines an eLearning tool, a homework management tool, teachers' resources management and administration tool. A pilot project has been run in 125 schools. These tools may help the schools to implement ICT and saving their valuable time [30].

1) Example of State / National Scale Project in Developed Countries

Technology alone was not sufficient to integrate ICT in the classrooms. A comprehensive plan for introducing ICT in society was also required [Mool cited in 23]. Government should develop an integrated planning and create ICT implementation framework on national scale.

In Australia, the NSW government undertook a project called 'Computer in School Plan' which involve updating computer hardware and software regularly, providing for using computer, and developing an enhance curriculum [23]. In UK, the government launched City Learning Centers (CLCs) to integrate ICT into schools. This program has increased the usage of ICT for lesson planning and teaching process as the teachers have more access to ICT. As part of the program, various trainings to operate computer and specific package software were provided. As the result, the teachers felt more confident to operate computer in the classroom [31]. Furthermore, on January 2002, the Welsh Assembly Government in UK spent £9.9 million grant to provide every primary school with one interactive whiteboard (IWB) whiteboard, computer and projector. The IWB can display a projected image and allows the users to control the connected PC by touching the board. Even though some teachers must be convinced about the usefulness of IWB, most of them believed that this tool is very important for their future teaching [Kennewell & Morgan cited in 17].

In South Korea, integration ICT in education was considered as main factor of rapid economic growth and development. Since 1970s, the government of South Korea provided a significant amount of fund to integrate ICT in education. By using ICT in education, South Korea prepared its population to adapt quickly with science and technology in labor market [Kim cited in 32]. In 1990s, the government of South Korea introduced eight-year plan to provide training in the use of ICT for teachers. This plan was part of the government master plan for education. The training was gaining a high success and becoming a basic pillar of integration of ICT in South Korea education system [32].

2) Example State / National Scale Project in Developing Countries

In Chile, there was a national program called Enlaces to implement ICT in schools and also integrating ICT with the curriculum. The program had objective to improve the quality of national education by providing suitable ICT infrastructure, providing training for teachers and implementing digital resources. In fact, the project was considered as the most successful and sustainable program which cope all areas such as rural and urban area [33].

To reduce the risk of ICT-marginalization in the Arab World, Dutta et al. [34] suggest 'devise a clear and comprehensive ICT development plan, supported by the highest political constituencies' and 'incorporate ICT skills and knowledge into the educational system'. The first example in Arab World is from Egypt where Ministry of Communications and Information Technology has focused their attention and energies on expanding and utilizing the human resources required for the development of telecommunications and IT sectors. The government has introduced an exclusive professional training program that will produce 5,000 trained professionals of IT per-annum. The ministry also plans to open a National Information Technology Institute (NITI) through which they endeavor to patronize all training programs necessary for the progression of IT skills across the country. The ministry also planes to set up more technical universities in the country and encourages sending young professionals abroad for training and takes necessary measures for the advancement of an ICT based curriculum in Egypt [34].

Likewise in Kuwait, the Ministry of Education has launched a recent plane for providing broadband internet access to approximately 300 government schools all over the country by issuing tenders to big companies to install basic infrastructure and connection facilities so on and so forth. In this way the private sector in the country gets fully involved in the process of implementation and expansion of governmental policies towards ICT by giving several discounts and concessions to private schools i.e., the reduction of monthly internet charges and leased connection to the American and English schools in Kuwait [34]. In the U.A.E., the Ministry of Education and Youth in collaboration with some foreign donors have launched the project of Smart Schools with the purpose to encourage and enhance the internet use in schools within a conducive learning atmosphere. This mega project takes many incentives including but not limited to the free installation in government and private schools as well as a discounted usage fees with the result hundreds of schools in the U.A.E. have subscribed to these services till to date [34].

E. Solving Cultural Problem

Unsuccessful adoption of ICT strategies may be resulted from direct copy from developed countries whose have significant different cultures with the KSA. For example, implementation of ICT generally will be continued by providing access to the Internet. To avoid cultural conflict regarding access to the Internet, Sait et al. [22] suggested that the government should have policy/legislation to control and

standardize the suitable contents. The government of the KSA also has done several efforts to block websites which provide unacceptable contents in the KSA such pornography materials, online gambling and dating. The use of central proxy server (software and hardware system) was proved effective and did not cause significant delay for the users [Al-Furaih cited in 22].

Education in the KSA applies a gender-segregation policy which prohibits interaction among men and women students [12]. Therefore, ICT implementation to support e-learning should be modified. Mohamed et al. [12] propose customized e-learning system which limit communication among students from different gender. Interaction only allowed between learners and tutors.

Using ICT in the classrooms is considered as adopting Western culture by most of teachers in the KSA [26]. Therefore, Oyaid (2009) suggested that the teachers should be ensured that using ICT is compatible with their values, faith, and beliefs. Moreover, acquiring this new technology will make them as a better teacher as well as a better Muslim. Indeed, this effort may change teacher's negative attitude into positive attitude regarding ICT integration in classrooms.

F. Recommendation for Implementation in the KSA

Based on several strategies that are adopted from the other countries, several recommendations are proposed to be implemented in the KSA.

1) Create a Suitable ICT Infrastructure Environment

An ICT system consist of hardware, software, people who use them and communications technology such as the Internet. Improving the usage of ICT in the KSA primary schools may be achieved by integrating ICT into classroom. Typical ICT projects involve upgrades of equipment (hardware and software) or new installations of the network. However, purchasing complete equipments to support ICT integration require a huge amount of money. Therefore, an integrated planning to gradually improve ICT infrastructure within medium-term period (3 to 5 years) at each primary school is required. The infrastructure can be used to enhance the internet access in schools and to perform eLearning. Moreover, part of the fund should be allocated to construct ICT labs in schools. This effort will help students to get an interesting visualization of the nature process and encourage them to be familiar with ICT and also develop their learning skill.

2) Training for Ministry of Education Staffs

The Ministry of Education should develop, manage and control project of ICT integration in schools. Therefore, the ministry should have competence staffs in this area to integrate sustainability concepts and policies into ICT planning and design projects. ICT trainings for the ministry staffs should be carried out as very important part of the project.

3) Developing ICT Training Program for Teachers in Schools

The ICT trainings should be provided as part of teacher career development. The training materials include 'technology-supported pedagogy knowledge' which is required when they plan to integrate ICT in the classrooms. By these training, the teachers will increase their confidence with ICT and enhance their ability to teach in 'student-centered way' and developing 'individual learning program' for their students. Specific ICT trainings for teachers are also required. The training subjects are chosen according each school requirements.

V. CONCLUSION

This study found several barriers of the implementation of ICT on school. These barriers are classified as teacher factor, school/institution factor and extrinsic factor. Several strategies for ICT integration in primary school which may be adopted in the KSA are proposed. At national scale, integrating ICT with the curriculum is carried out by introducing some subjects related with ICT to the primary schools. The government should make integrated planning to gradually improve ICT infrastructure at each primary school. Basic ICT trainings as part of teacher career development should be launched with materials include 'technology-supported-pedagogy knowledge' which is required when they plan to integrate ICT in the classrooms. Trainings for schools principal are also required to improve leadership capability and their commitment to successful integration ICT in the school. Finally, the government may support research to develop a low cost interactive whiteboard which is considered very important to improve students' learning abilities and encourage them to participate in learning process in the classroom.

At institution/school scale, the schools should provide specific ICT trainings for teachers and its subjects are chosen according to the school requirements. Hiring staff for ICT technical support will enable 'supportive environment' which encourage the teachers to use ICT and ensure all of ICT components, hardware and software, are well maintained. Facilitating discussion groups is important as medium to share ideas among teachers about integrating ICT into classes. Creating a good timetable and reducing teachers' workload may provide the teachers more time to prepare teaching material which use ICT, developing learning program with colleagues, trying new method to teach in ICT environment, and thinking about better pedagogical practices. Finally, integrating ICT into science labs effort will help students to get an interesting visualization of the nature process and encourage them to be familiar with ICT and also develop their learning skill.

Quantitative and qualitative studies to evaluate the effectiveness of each strategy are important to be carried out. The examples of the studies are the following:

- A study to evaluate suitable ICT training methods for teachers, school principals and Ministry of Education staffs which can be implemented in the KSA. The training should also encourage teachers to use ICT and becoming open minded to new technologies.
- A study to produce appropriate learning materials based on ICT which suitable with culture in Saudi Arabia.
- A study to produce an appropriate government policy which can be used to fasten ICT adoption in the KSA.

- A study to develop curriculum which involves ICT as important part. ICT material should be inserted in each school subject.
- A study to develop software in Arabic language as part of ICT integration in the classrooms. The software also could be used to support science labs.

The result of the studies can be used to develop more comprehensive and efficient framework for ICT integration in primary schools in the KSA.

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