The Effects of Gender Differences in Ict Application: Bridging the Gap of Knowledge and Skills among Teachers

M. Nur Mustafa

Faculty of Education, University of Riau, Pekanbaru, Indonesia

**ABSTRACT**

This study aims to examine gender differences in term of ICT usage, knowledge, skills and application among teachers. The study also examines the extent of the knowledge and skills in bridging genders gap particularly of the ICT usage among teachers. The study also identifies the relationship of gender with ICT application, knowledge and skills among teachers. The samples consisted of 847 male and female high school teachers. Questionnaires were used to obtain information from the respondents. The instrument showed high level of validity and reliability value. MANOVA analysis was conducted to determine gender differences for each variable. Pearson correlations and inferential analysis were conducted to determine the relationship among the variables. Analysis of structural equation modeling (SEM) was conducted to identify the roles of knowledge and skills as mediators for gender and ICT application. The results showed significant gender differences in term of ICT application, knowledge and skills. ICT knowledge and skills were found to be able in bridging the relationship of gender and ICT applications. The findings reinforce the theory of the role and contribution of knowledge and skills in enhancing ICT application among teachers. Practically, it can be implicated that teachers’ ICT knowledge and skills need to be increased and promoted for an optimal application of ICT in teaching and learning in schools.

**INTRODUCTION**

Information and communication technology (ICT) is currently an integral part in many aspects of human life. Over the years, education is also an aspect of life which gains massive benefits from the utilization of technology. Smart innovations have been applied to aid learning and teaching activities, such as the radios, tape-recorders, films, television, direct broadcast satellites, videos and computer. The use of computers has rapidly phenomenon in the development of new technologies, especially the internet and multimedia which provide extensive opportunities for teachers and students, and shine a new light of meaning in learning. With ICT, borderless information is rapidly transmits, which very much needed in the present education system, and thus it is the best tool to assist current teaching and learning (Drier, 2001). This rapid change is fundamental, hence, adaptation is needed in the way of teaching, the manner of students learning, and the way school should be managed. The present of ICT has indeed changed teachers’ roles, as they are no longer merely providing knowledge, but are now facilitators and even friends for the students. In order to develop the ICT culture, several things need to be adjusted particularly in term of technical preparation, training and overcoming adjustment challenges.

Facilities and trainings will definitely strengthen the sense of ownership and will help teachers in changing their work patterns. Teachers are always keen to embrace new technology in the hope that technology can overcome the problems they encountered in teaching and learning (Norton & Willburg 2003). Teaching with the help of information and communication technology (ICT) such as the use of blogs, videos, websites, and email, will reflect teachers’ level of maturity and this in return improve students’ appreciation and respect as teachers are viewed as visionaries, advanced and up-to-date (Owen et al. 2000). Commonly, ICT is used by teachers as it helps in delivering the lesson, accelerating the process of storage and processing of information among students and of course it is unique and effective. In fact, teachers who regularly use technology will have extensive knowledge beyond the subject content and also on the information and communication technology itself.

Information and Communication Technology is also known as Information Communication Technology (ICT) is a powerful influence and leaves profound impact on human civilization. The Indonesian Ministry of
Education has provided a clear platform and direction on the usage and comprehensive integration of ICT in all public schools. This policy focuses on students to acquire ICT skills, the use of ICT in the curriculum and teaching and learning and also to empower ICT-based management. In line with the policy, all schools are provided in stages with various technologies such as infrastructure, hard ware and software, including ICT training courses for teachers and students. The goal of the policy is to create a culture of ICT in teaching and learning and in the long run, to produce competent, competitive and technology-literate society.

A study conducted by Marwan and Sweeney (2010) found that the use of latest technology equipment together with technical support will encourage teachers to fully integrate technology in education. Among the factors to be categorized as a condition of support are easy access to resources, support, the desire for change, school practices, the emergence of external influence and forces, as well as the teachers’ commitment towards innovation. These are the pre-conditions which identified as the main influences to integrate ICT in teaching and learning (Wan Zah Wan Ali et al., 2009). According to Abdullah (2006) the implementation of ICT in schools is inseparable from the concept of culturing the school and intelligent sharing with other related parties will be the critical turning point in the integration of ICT. The positive increment in the use and integration of Information and Communication Technology (ICT) has a significant impact on people’s lives and their daily activities. Thus, it is possible and safe to say that we are also experiencing an increase of interest, focus and great investments invested for the integration of ICT in education around the world (Yuen, Law & Wong, 2003).

**Problem Statement:**

According to Abdullah (2006) the implementation of ICT in schools is actually setting up a new technological culture in the schools and commitment with others will make the setting up a critical turning point in the fully integration of ICT. It seems, the present problem is that the use of ICT is not properly applied among teachers. Chalk and talk method of teaching looks dull and bland. Based on this, the researchers argue that this study should be done on the teachers. This is due to the fact that teachers have been trained in the use of ICT facilities together with multimedia utilities, however the effectiveness of teaching and learning by using information technology depends on teachers’ capacity and capability. Therefore, a study should be conducted to determine the level of teachers’ acceptance and other influential factors. The factors studied in this study are ICT knowledge, skills and facilities and also gender.

The ICT skills that students should be exposed to must be able to prepare them for the future job market (Norizan et al., 2004). To serve this purpose, teachers should have sufficient ICT skills to meet the students’ learning needs. Teachers should be able to use ICT in school, as well as to utilize it in helping and guiding students to be competent users. However, studies on the use of ICT among teachers in schools showed a shocking low level (Ashinida et al., 2004; Nor Azilah & Mona, 2004). Indeed, the greatest challenge is to ensure that all teachers use instructional technology effectively in their daily teaching (Lee & Winzenreid, 2009). Thus, the question arises on the extent of teachers’ ICT knowledge and skills and to what extent ICT has been utilized and applied in their classroom teaching?

The extent to which teachers are willing and ready to use ICT in their teaching practice is also relies heavily on their prior knowledge and skills. According to Abd. Rahman (2000) teachers rarely use technology in the classroom due to lack of knowledge and skills in utilizing it in the classroom. Teachers are experiencing various difficulties in learning and applying ICT, ranging from the technical aspects such as computer owning, readiness, the availability of projectors, to handling the attacking of threatening virus which of course would downgrade the effectiveness of their teaching (Sumimoto et al. 2012). Due to the nation development, the teaching profession is getting challenging. Teachers are expected to meet the challenges as they are shouldering huge responsibility to implement and execute the national education plan particularly in producing skillful students especially in technology as in 2020 National Vision. Tajul Ariffin (1997), found that in many cases it could be observed that many educators are still having a sense of ‘phobia ‘ or fear and negative on the idea of using computer in teaching and learning.

A research conducted by Morahan-Martin (1998) found that Internet users are dominated by men since it was introduced. Even though the number of women users is increasing worldwide, but the use of the Internet in many ways is still lower than men. Consequently, women miss the opportunity to access information and experience a variety of online services, and this situation somehow has certain unfavourable effects on the economy and education. The negative attitude of women towards new technology was reported causing a low level of computer skills, low levels of computer competency and a bit negative toward computers in comparison with men.

**The importance of the study:**

Teachers desperately need to grasp information technology skills and knowledge, especially in the era of information explosion. This is due to fact that internet provides massive information related to the current technology and teachers should be able to acquire valuable information via the internet. Teachers who are able to master the use of ICT, will gain huge benefits and of course will develop their interest in technological
advances. School is a place for a quest of knowledge and thus, expected to be taking huge steps to welcome the country's mission in preparing and arming the younger generation to move towards knowledge generation by the year 2020. Effective use of technology in daily work and in the classroom is phenomenal and this will allow teachers to be more successful in helping students to learn and effectively assist the students to be effective citizens. Therefore, this study is very important and it is appropriate to examine gender factor in ICT application and the influence of teachers' knowledge and skills in bridging the relationship of those variables.

Research Objectives:
This study aims to examine gender differences in the extent of ICT application among teachers, it also determines the influence of ICT knowledge and skills in facilitating the application of ICT. The first objective is to identify whether there are differences in term of knowledge, skills and application of ICT between male and female teachers. The second objective is to identify the influence of knowledge and skills in mediating ICT applications. This article focuses on the dimension of knowledge and ICT skills between male and female teachers, as to explain its relationship with ICT applications for the purpose of future strategic planning to overcome the shortcomings of teachers in technology application.

Methodology:
This study used a survey method to collect data by using 5-point scale questionnaires to examine ICT knowledge, skills and application. Respondents were selected from a population of secondary school teachers of three states of Indonesia, Bandung, Yogyakarta and Pekanbaru. The sampling was done by using simple random sampling method. A total of 847 teachers were involved in the study. A pilot study was conducted involving a total of 200 secondary school teachers to test the validity and reliability of the research instrument. The value of Cronbach alpha for each dimension of ICT applications (0943), knowledge of ICT (0968) ICT, (0970). Every aspect had high reliability and fit to be used in the actual study. Structural Equation Modeling analysis (SEM) with AMOS 18.0 software were used to test the research hypotheses. A more detailed analysis was used in this research to meet the research objectives.

Descriptive analysis involving the mean and standard deviation was conducted to examine whether males and females differ in the application of ICT in schools and whether they have different perceptions of ICT knowledge, skills and application. The effect size of the difference between both genders of the variables was also performed. SEM analysis was used to determine gender differences in term of ICT knowledge, skills and application. Mediation analysis was conducted to examine the impact of ICT knowledge and skills in mediating the gender gap on ICT applications. The index matching measure was also used as a benchmark in determining the comparative fix of a model, including the root mean-square error of approximation (RMSEA), comparative fit index (CFI) and the normed chi-square ($\chi^2$/df) (Hair et al., 2006).

Findings:
Gender differences in term of ICT knowledge, skills, and applications:
MANOVA analysis showed that male teachers had significantly higher knowledge, skills, and ICT applications when compared to females’ teachers. Pearson correlation analysis showed the relationship of each variable showed that male and female teachers had a moderate to strong relationship with each of the variables studied. This shows that the teachers’ knowledge, skills and ICT applications are mutually influence each other.

| Table 1: Mean and Correlation among the Variables for Male and Female Teachers. |
|-----------------|-----------------|-----------------|-----------------|
|                  | L (n=1170) Mean (std) | P (n=1189) Mean (std) | Sig. | Knowledge | Skills | Application |
| 1. Knowledge     | 3.98 (0.51)       | 3.65 (0.77)       | 0.00 | 1          | 0.830  | 0.380       |
| 2. Skills        | 3.89 (0.89)       | 3.53 (0.72)       | 0.00 | 0.830      | 1      | 0.583       |
| 3. Application   | 3.51 (0.84)       | 3.29 (0.82)       | 0.00 | 0.662      | 0.681  | 1           |

Note: The coefficient value of correlation on diagonal lines are for males, while the below corner line is the value for females. ** P <.01, * p <.05

ICT application has the highest correlation with ICT skills for both male and female teachers. This suggests that both male and female teachers need appropriate skills to apply ICT in teaching and learning. However, the results showed that more female teachers need ICT skills and knowledge in the application of ICT as compared to male teachers.
The Role of Readiness in bridging the Gender gap in ICT application:

Mediation analysis by using SEM was performed to identify the role of knowledge and skills for both genders in term of ICT applications. The results of the path analysis model equations indicate the SEM measurements as Chi Square / df = 0.00, Root Mean Square Error Approximation (RMSEA) = 0.04, Goodness of Fit Index (GFI) = 1.00 Comparative Fit Index (CFI) = 1.00. All of the measures used to show that the data used in this study proved to have reasonable accommodation for the proposed model (Byrne, 2010).

![Diagram](image1.png)

**Fig. 1:** Readiness Moderating effects in Relevance.

To Gender and ICT Applications:

To examine the mediatory effect, the Sobel test results showed that the effect of knowledge was a significant mediator, z = 6.60 (p < 0.05). Sobel test results confirmed that ICT knowledge was a mediator between gender and ICT application. The direct effect of gender on the application of ICT was not significant (Ed = 0.005, p > 0.05). However, indirectly, the effect of gender on the application of ICT through ICT knowledge as a mediator was not large, but significant (Ei = -0.23, p < 0.05). On the other hand, indirect effect of the impact of

![Diagram](image2.png)

**Fig. 2:** Mediationary Effects of teachers’ Knowledge and ICT Skills towards.

Gender and ICT Application:

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gender on the application of ICT through the mediator of ICT skills was not large, but significant (Ei = -0.0286, p <0.05).

**Discussion:**

The study found that there are gender differences in term of ICT knowledge, skills, and ICT applications. This is probably due to the fact that male teachers have a better attitude towards ICT than females. Past studies found that females have negative attitude towards the use of ICT causes gender differences in this case (Shofield 1995). This might be happened due to lack of effective use of ICT among female teachers which caused by work load and self-confidence in using ICT (Volman & Ekk, 2001). In contrast to males, their attitude and self-confidence in using ICT are stronger which in return help them in enhancing the ICT knowledge and skills to be more effective in applying ICT in teaching and learning process. An abroad study by Janssen Reinen and Plomp (1993) found that male teachers in secondary schools have higher self-confidence towards computers than females. In addition, the study also found that female teachers have lower knowledge and skills when compared to male teachers. Robertson et al. (1995) also found that male teachers consider themselves to be more efficient and have greater skills than their female counterparts. On the whole it can be concluded that the role of female teachers in the use of ICT will be lower because they have a lack of confidence in using ICT.

ICT skills among male and female teachers have a strong connection with the application of ICT. This study explains that ICT skills are the determinant factors for teachers to integrate ICT in their teaching and learning process. Thus, certain efforts particularly concerning teachers’ attitude need to be taken seriously in improving teachers’ ICT skills. According to Abdul Wahab (2006) there was a significant relationship between the use of information and communication technology with an attitude. The study suggested that attitude is a factor in influencing the use of information and communication technology in teaching and learning, thus it has phenomenal impact on ICT skills. However, this current study successfully revealed that ICT knowledge has an impact on the application of ICT. This is indicated by the significant positive relationship between teachers' knowledge and ICT applications. This finding is similar with an implication concluded by Mohd Anuar Ahmad (2011) who found that there is a positive relationship between technological knowledge with technology skills among teachers and at the same time brings positive impact on the attitude towards ICT. Thus, the relevant parties and authorities need to consider teachers’ attitude in planning and organising efforts to improve ICT knowledge, skills and application among teachers.

Knowledge and skills are significant gender mediators in the application of ICT in teaching and learning. This study successfully demonstrated that between male and female teachers, teachers' knowledge and skills are the key factors which can increase the application of ICT in teaching and learning. Although in terms of knowledge and skills, female are considered to have lower level than males, but the knowledge and skills among women are the most contributing factors to the application of ICT in teaching and learning. Thus, conclusive studies about gender differences in term of ICT knowledge, skills and its application should be carried out in the near future. This is due to the findings obtained using the same approach or different research methods are sometimes not consistent (Lagesen, 2005; Ng & Mitter, 2005; Mellström 2009).

**Conclusion:**

Female secondary school teachers were found to have lower ICT knowledge, skills and ICT applications when compared to male teachers. Due to that, further studies should be done by studying various backgrounds of respondents, as to see whether these differences are influenced by income, education level, and teaching experience. Hence, courses and in-service trainings are steps to be taken by the Ministry of Education in order to equalize the differences of ICT knowledge, skills and application between male and female teachers. Training can also serve as confidence booster for the teachers in using ICT. The study found that teachers' skills are the highest influential factor in the application of ICT in teaching and learning. Therefore, the main focus in improving the application of ICT among teachers should be by given them more opportunities to be able to explore various types of ICT facilities, this in the long run will definitely increase the skills. The contribution of this study is to confirm of the importance of ICT in teaching and learning. Teachers are the main players in the teaching and learning process, hence they are expected to acquire the skills necessary to apply ICT in the classroom. Extra focus should be given to the female teachers, as the findings of this study provide valuable insight especially for the school or the Ministry of Education to consider certain measures in improving the skills, which in the long run will bridge the gender gaps in term of knowledge, skills and ICT applications between the male and female teachers.

**REFERENCES**


