Influence of Facilitating Condition, School ICT Leadership and Computer Self Efficacy on Students' ICT Engagement for Learning Mathematics among Secondary Mathematics Students in Iran-Zanjan

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***Abstract*- The aim of the study is to determine the relationship between facilitating conditions, school leadership and students' computer self- efficacy with students' ICT engagement. This is a quantitative research with questionnaire as the sole source of data. The samples are 390 randomly selected students from Zanjan Province Secondary School, in Iran. Data analysis is by multiple linear regression. The results show that all the independent variables are significant on students' ICT engagement, but they are of different degree. The school ICT leadership, computer self –efficacy and facilitating condition are 4.91, 3.89 and 2.31 Beta value respectively. This means school ICT leadership has strong influence, followed by computer self-efficacy and facilitating condition in ensuring the success of computer engagement program in secondary school mathematics classroom.**

***Keywords*: Students' ICT engagement, Computer self-efficacy, School ICT leadership and Facilitating condition.**

I. INTRODUCTION

Students' ICT engagement refers to the extent to which students perceive the extent of their involvement in the school ICT implementation processes (Gebre, Saroyan, & Bracewell, 2014). Students' engagement in ICT mirrors how the implementation involved students in terms of school ICT implementation decisions and processes that are geared towards enhancing the students' learning capacity by helping them to accomplish mathematics tasks better (Park View Primary School, 2013). In other word, engagement can also be regarded as the association of deep and significant learning where educators perform to fulfil students' need and expectation (Çakıroğlu, Başıbüyük, Güler, Atabay, and Memiş. (2017). To ensure ICT implementation attained the expected goal, various factors that could influence the process should be fully understood.

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Facilitating Conditions

Facilitating conditions refer to the degree to which an individual believes that organisational and technical resources exist to support the use of a system (Venkatesh *et al.*, 2003). Facilitating conditions are theorised in Decomposed Theory of Planned Behaviour (DTPB) as one of the antecedents to perceive behavioural control. DTPB proposes that ICT resource facilities are part of the elements of perceived behavioural control that influences individuals' use of technology or intention of using technology. This especially so because significant relationships have been proven between facilitating conditions and individuals' use of technology (Cox, Cox, & Preston, 2000; Gill & Dalgarno, 2008). In terms of mathematics learning, it was reported that Iranian pupils who use school computers to supplement their learning have an average academic accomplishment marks that are 14% higher in Mathematics than students with no school-based computers (UNESCO, 2014). On top of that, a study conducted in Lebanon and another in England indicated that facilitating conditions are necessary for learning and have significant influence on students' use of technology in teaching and learning (Tarhini, Hone, & Liu, 2015). This is further strengthened by a study on the use of social media for delivering preparatory information for in-lecture discussions on 1,200 students. The results suggested that the availability of technology has high impact on students' engagement in ICT for learning (Dyson, Vickers, Turtle, Cowan, & Tassone, 2015). In addition, Pegrum, Oakley, and Faulkner (2013) reported that the availability of technology like I-Pads in the after-school programme in mathematics homework and other digital media projects increase students' engagement.

School ICT Leadership

School ICT leadership in this context can be described as the extent to which school leadership expect their members to use ICT in the classrooms (Venkatesh et al., 2003). It has

been proven that school ICT leadership has been positively associated with students' engagement in ICT (Park View Primary School, 2013). Consequently, the success of the ICT program depends on the role and attitude of school ICT leadership. If the school have positive and committed leadership the chance for the program to succeed is greater. And students will have the chance to learn mathematics like their peers in other developed countries. Otherwise, the students will be deprived of the opportunity to learn mathematics in a much better environment. However, the school leadership needs the support of the district leadership because this collaboration is an essential strategy in ensuring the success of ICT program implementation (Herman, 2017). Besides, positive school ICT leadership generally improves principal-teachers relationship in secondary school. This indirectly eradicate management issues and improve the climate of the school. In short, principals who advocate ICT leadership gain a deeper understanding of their staff and find quicker solutions to complex situations, while using available information to resolve problems in the school (Adeyanju, 2015).

Computer Self-Efficacy

Computer self-efficacy is defined as the degree to which an individual believes that he/she has the ability to perform a specific task/job using the computer (Compeau & Higgins, 1995). Consistent with the findings of prior research, judgements of computer self-efficacy has continued to serve as key antecedents associated with students' ICT engagement, hence students' computer self-efficacy has been implied to influence their ICT engagement (Agarwal, Sambamurty and Stair, 2000). In a study conducted on the use of social media in Singapore, students' use of computers was reported to have been significantly influenced by their computer self-efficacy (Alenezi, Karim, & Veloo, 2010; Wang, Xu, & Chan, 2015). As such, this factor deserves a deeper understanding with regard to students' ICT engagement.

Students' ICT Engagement

From the general educational perspective, the term students' engagement has often been used in various ways to match the circumstances of its use (Forehand, 2014). Students' engagement in school learning is perceived as a sign of effective classroom instruction and also a consequence of the school activities to improve learning (Kubiatko & Haláková, 2009). As a result, students who are fully engaged in schools tend to achieve higher levels of academic success than those who are not engaged (Vazirabadi, 2010). Kubiatko and Haláková (2009) observed that although students' engagement had been used as a construct in several studies to reconnect bored and disengaged students with the desire to learn, most researchers used the term differently. However, students' engagement in classroom and school is an important determinant of their learning outcomes and achievement, which is also associated with their engagement in technology in recent times (Duffy, 2008).

Students' engagement in ICT suggests their involvement in ICT implementation decisions and processes for schools in relation to how the decisions and processes affect the students in their studies and help them in accomplishing their tasks (Park View Primary School, 2013). On a broader dimension, students' ICT engagement includes a process by which ICT facilities and training programs are integrated into the students' learning curriculum to enable them to effectively access and use technologies for learning purposes (Tacchi & Watkins, 2007). This is in line with the Engagement Theory that specifically deals with technology-based teaching and learning that provides a conceptual framework that encourages collaboration and students' engagement by using technology tools and systems (Kearsley & Schneiderman, 1999). In the end, it supports students' liberal relationships with the school's ICT system in a way that enables them to use ICT tools creatively, while relating and sharing their learning experiences with the others.

This study has operationally defined students' ICT engagement as a multi-dimensional construct that comprised of three important learning domains, namely affective, cognitive and social or behavioural engagement in technology-rich classrooms. In order to effectively engage students in ICT, they need to be mindfully engaged in intellectual activities that support collaboration and working with ICT tools, along with other students (Chen, Lambert, & Guidry, 2010; Denner, Werner, Bean, & Campe, 2005; Richardson & Newby, 2006).

II. RESEARCH OBJECTIVE

The purpose of this study were to determine the relationship between facilitating condition, school ICT leadership and students computer self- efficacy with students ICT engagement in mathematics classrom. Specifically, the study aims to answer 'What are the relationships between facilitating condition, school ICT leadership and students computer self- efficacy with students ICT engagement in Mathematics classrom?

III. RESEARCH METHODOLOGY

This study was conducted in several Iranian secondary school on mathematics subject. A stratified random sampling was applied for this study. From a total of 1502 respondents, 390 respondents were selected. A set of questionnaires was prepared to gather information on facilitating condition, school leadership, computer self-efficacy and students' ICT engagement. There are X items in the questionnaire.There were 16 items for students' ICT engagement, 8 items for facilitating conditions adopted 8 items from Venkatesh (2003), Teo (2008) and Thompson (1991), school ICT leadership 6 adopted from Venkatesh et al. (2003), and students' computer self-efficacy 8 Venkatesh, Morris, Davis, and Davis (2003), whereas items 7 and 8 were adopted from (Hakkarainen et al., 2000) . The instruments used a 5-point Likert-scale with specific representation: 1(strongly disagree), 2(disagree), 3(slightly agree), 4(agree), and 5(strongly agree). Permission to use, modify, and translate the items have been obtained from the authors. A pilot study was conducted on 42 secondary mathematics students before actual data collection measure the reliability of the instrument. The reliability of the instrument to measure the students' ICT engagement and students ' use of ICT in learning Mathematics were 0.930 and 0.831, were acceptable for the actual study.

IV. FINDINGS

Objective of this study determined the effect of facilitating condition, school ICT leadership and computer self- efficacy on students' ICT engagement for learning mathematics. The first table shows a correlation between endogenous variables and exogenous variables. According to the result of Table I there is a positive correlation.

TABLE I: CORRELATIONS

		FC_M	SL_M	CSE_M	SIE_M
FC_M	Pearson Correlation	1	.306**	.187**	.256**
	Sig. (2-tailed)		.000	.000	.000
	N	390	390	390	390
SIL_M	Pearson Correlation	.306**	1	.203**	.365**
	Sig. (2-tailed)	.000		.000	.000
	N	390	390	390	390
CSE_M	Pearson Correlation	.187**	.203**	1	.406**
	Sig. (2-tailed)	.000	.000		.000
	N	390	390	390	390
SIE_M	Pearson Correlation	.256**	.365**	.406**	1
	Sig. (2-tailed)	.000	.000	.000	
	N	390	390	390	390

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

The next part of data presentation deals with the regression coefficient between facilitating condition, school ICT leadership and computer self-efficacy on students ICT engagement in learning Mathematics. Table 2 presented the regression coefficient between endogenous variable and exogenous variables. According to table 2 there is a positive significant relationship between facilitating condition and students' ICT engagement in learning Mathematics ($\beta = .238, p < 0.05, \mathrm{t} = 2.857$). In addition, there is a positive significant relationship between school ICT leadership and students' ICT engagement in learning Mathematics ($\beta = .491, p < 0.00, \mathrm{t} = 9.471$) And also a positive significant connection exist between students' computer self- efficacy and students' ICT engagement in learning Mathematics ($\beta = .389, p < 0.0, \mathrm{t} = 6.952$). Consequently, facilitating condition, school ICT leadership and computer self-efficacy are the predictors of students' ICT engagement for learning Mathematics among secondary school students in Iran.

Furthermore, using "B" as the non-standardized coefficients from table 2 a regression equation was found. The equation consisted of the constant and endogenous variables. Normally, the model of prediction for students' in learning Mathematics using independent variables (FC, SIL and CSE) as predictor were achieved as follows:
FC: Facilitating condition
SIL: School ICT leadership
CSE: computer self-efficacy

$$\check{y} = 1.146 + 134FC + .180SIL + .153CSE + e$$

Where:

$\check{y}$ $= predicted\ utilisation\ of\ students' ICT\ engagement\ in\ learning\ Mathematics$

$e = Residua$

According to Table II the statistics analysis showed that school ICT leadership had strong contribution on students'

use of ICT in learning Mathematics with a beta value of 0.491. And statistically significant at the level of 0.00.

TABLE II: COEFFICIENT MULTIPLE LINEAR REGRESSION FOR STUDENTS' USE OF ICT IN LEARNING MATHEMATICS

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	1.146	.182		10.708	.000
	FC_M	.134	.047	.238	2.857	.005
	SIL_M	.180	.033	.491	9.478	.000
	CSE_M	.153	.039	.389	6.951	.000

a. Dependent Variable: SIE_M

Additionally, multiple linear regression was accordingly performed to predict factor (students' ICT engagement in learning Mathematics) by influencing of Facilitating condition, School ICT leadership and students' computer self- efficacy. The following model summary in Table III shows that the multiple correlation coefficient (R) obtained was 0.435 using the predictor simultaneously and the R^2 value obtained was 0.399 The R^2 value indicates how far a variable is able to explain the variation of a dependent variable. The coefficient of determination is 39.9% (almost 40%) which is the extent of variation in the dependent variable that is influence on students' use of ICT in learning Mathematics.

TABLE III: MODEL SUMMARY

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.435[a]	.399	.283	.60227

a. Predictors: (Constant), SIC_M, FC_M, SL_M

Table IV shows the ANOVA analysis results for the Multiple Linear Regression model. ANOVA, F (3, 386) obtained was 30.025 (p = 0.000) with the p-value smaller than 0.01 was obtained, indicating that the predictors (facilitating condition, school ICT leadership and computer self- efficacy) are significantly predict the dependent variable (Students' ICT engagement in learning Mathematics). As a decision, predictors factors make a significant unique contribution to the prediction of students' ICT engagement in learning Mathematics [F（3, 386 = 30.025, p = 0.000, R^2 = 0.399].

TABLE IV: ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	32.673	3	10.891	30.025	.000[b]
	Residual	140.014	386	.363		
	Total	172.687	389			

a. Dependent Variable: SIE_M

b. Predictors: (Constant), SIC_M, FC_M, SL_M

V. DISCUSSION

This study examined the relation between facilitating condition, school ICT leadership computer self-efficacy. Result in this study shows school ICT leadership has higher significant impact on students' students' ICT engagement in learning Mathematics. This means school leadership has a crucial role to play to ensure school management's commitment to give direction towards ICT implementation among their students (Palomba & Banta, 1999).This is in line with Parkview (2013) who reports that involving students in ICT implementations has significant effects on the students' use of ICT. This is so because ICT engagement particularly deals with involvement and participation in using ICTs (Zylka, Christoph, Kroehne, Hartig, & Goldhammer, 2015). This could only be achieved through strong support and directive from the school leadership. Students' computer self-efficacy is also significant in promoting positive relationship with students' ICT engagement in learning Mathematics. This finding is similar to a number of studies (Greene et al., 2004(Orvis, Horn, & Belanich, 2008; Pavlas, Heyne, & Bedwell, 2010). Hence, students' ability to use the computer as well as other ICT tools helped them to be involved and engaged in ICT in learning Mathematics.

Findings from this study shows that students are not quite satisfied with the ICT facilitation provided by the teachers. The government should carry out more training to upgrade the knowledge, skills and disposition of teachers (Burden and Byrd, 2007) so that they could facilitate students' learning meaningfully. It would be even better if schools could be provided with enough computers for mathematics learning activities (Dyson, 2015).

VI. CONCLUSION

Overall, students' engagement in ICTs is crucial factor in learning mathematics. This study has shown that school leadership, computer self-efficacy and facilitating condition contribute in their own way in enhancing positive learning environment. Since ICT application for education has rapidly developed in recent years, all students should be given the opportunity to develop their mathematics capacity with the assistance of ICT.

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