



Antecedents of technology integration into science teaching: Examining the aggregate role of principal and teacher related variables in the context of Iranian schools

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Antecedents of technology integration into science teaching: Examining the aggregate role of principal and teacher related variables in the context of Iranian schools

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Abstract

In order to improve students learning outcomes in science classrooms, integrating technology tools into science teaching by teachers is instrumental. Despite of this importance, some teachers use technology tools without any believing and use them to support their existing practices rather than to engage students in learning. Although many previous studies have found some well defined factors influencing actual use of technologies in teaching, this study highlights the aggregate role of some scarce considered variables including principal and teacher related variables in a hypothesized model. 300 science teachers of secondary schools in Tehran city were randomly selected and completed valid and reliable questionnaires. The obtained data were analyzed using structural equation modeling. The results demonstrated that hypothesized model has a good fit to data. In this model, principal's technology leadership has a significant indirect effect on science teachers' actual use of technology through mediating role of their sense of technology efficacy and technology acceptance constructs. Since most previous studies are limited to popular and individually considered variables, this study extends this line of inquiry surrounding aggregate role of some less considered variables. It also contributes to science and technology education literature by providing empirical evidence concerning the indirect role of principals in technology integration into science teaching. Future studies surrounding science education in schools should consider technology leadership competencies of principals as an indispensable factor.

Keywords: Technology, Science, Teacher, Principal, Leadership

Theoretical framework and problem

Science teaching is a difficult and dynamic profession that it is not easy for teachers to enhance students learning. They have to integrate different technology tools into their instruction (Russell *et al.*, 2003). Some student learning outcomes, such as "science concept understanding" and "scientific reasoning skills" were considered as positive outcomes of technology integration (Schroeder *et al.*, 2007). Despite of this importance, some teachers use technology tools without any believing and acceptance (Wozney *et al.*, 2006). For this reason many studies have conducted to found factors influencing actual and true use of technologies in teaching. While technology integration is a long-term process requiring teachers' proficiency and commitment, very scarce studies highlight the important role of principal and teacher related variables (Teo, 2009; Hughes & Zachariah, 2001). Among principal related variables, some evidences revealed that adequate beliefs and competencies of principals (Table 1) in managing technology in their schools have positive impact on actual utilization of technology in classrooms (Zeinabadi & Mohammadvand, 2015). The importance of these activities has attracted the attention of researchers when they studied them as a "principal technology leadership". This new field of leadership advocates that principals should provide sufficient technology leadership to motivate technology integration by teachers (Hughes & Zachariah, 2001).

Table 1: Principal's technology leadership beliefs and competencies

Believing	Principal's belief to employ technology in school
Illustrating	Illustrating technology objectives and expectations for teachers
Planning	Low, mid and long term planning for technology
Establishing	Establishing a culture of utilizing technology
Empowering	Empowering teachers to utilize technology
Encouraging	Encouraging teachers to employ technology
Evaluating	Evaluating teachers' technology performance,
Increasing	Increasing the sharing of technology knowledge
Supporting	Supporting and preparing adequate and new technology tools

Beside on principal's technology leadership, two important teacher related variables including "teacher sense of technology efficacy" and "technology acceptance" were influential. Weak sense of efficacy will be discourages teachers ability to use technology and decreases their technology acceptance (Teo, 2009). According to Davis (1989), technology acceptance is a model which has five constructs. In this model, "actual use of technology" by teachers is a direct function of their "behavioral intention", "perceived ease of use", "perceived usefulness", and "attitude toward use".

Grounding this model, it can be claimed that principal's technology leadership is an important external variable influencing science teacher's technology acceptance components. Although some evidences support this claim (Zeinabadi & Mohammadvand, 2015), but other existing literature (e.g. Teo, 2009) reports that sense of technology efficacy has positive impact on technology acceptance constructs especially on "perceived ease of use". On the other hand, through considering the results of previous studies which highlight the general role of principal's leadership behaviors in teacher's sense of efficacy (e.g. Wahlstrom & Louis, 2008), it can be also claimed that principal's technology leadership has direct role in teacher's sense of technology efficacy. In general following hypothesized model (Figure 1) can be used in order predicting science teacher's technology integration in science classrooms.

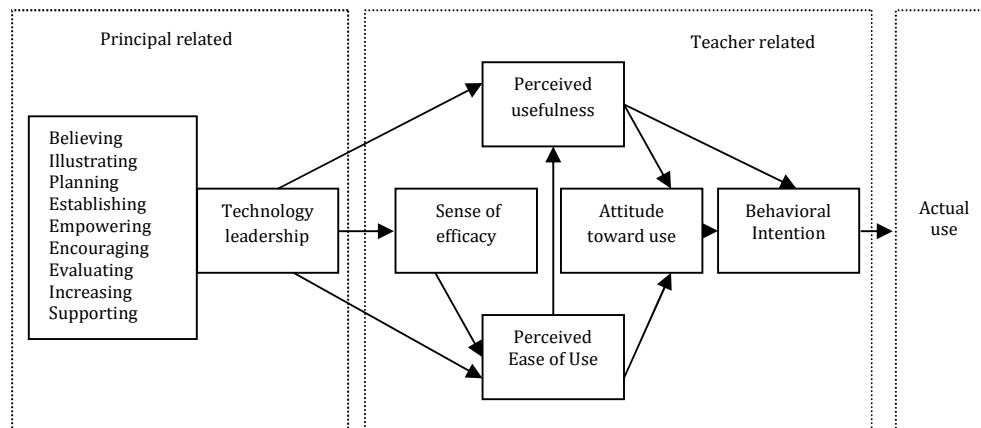


Figure 1. Hypothesized model of study

Aim of study

This study examines a hypothesized model with aim of encouraging technology use by science teachers and highlights the aggregate role of some very scarce considered variables in the context of Iranian schools.

Methods

The sample group consisted of 300 science teachers which were randomly selected from secondary schools of Tehran. In each school, data were collected during separate meetings with teachers. Four valid and reliable Persian questionnaires including principal's technology leadership (Zeinabadi & Mohammadvand, 2015), teacher sense of technology efficacy and acceptance (Teo, 2009) and technology use (Vannatta & Fordham, 2004) were considered for collecting data. Structural equation modeling was used to test hypothesized model.

Results

Standardized coefficients (β) and (t) values indicate that all direct effects in the model are positive and significant. In addition, results show that principal's technology leadership has significant indirect effect on science teacher's actual technology use through mediating role of sense of technology efficacy and technology acceptance constructs. Also adequate fit criteria were calculated for the hypothesized model.

Conclusions

Since most previous studies are limited to popular and individually considered variables, this study extends this line of inquiry surrounding aggregate role of some low considered variables. It also contributes to science and technology education literature by providing empirical evidence concerning the indirect role of principals in technology integration into science teaching. Future studies surrounding science teaching in schools should consider technology leadership competencies of principals as an indispensable and very important external factor.

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