COMPARISON OF PERCEPTION TOWARD THE ADOPTION AND INTENTION TO USE SMART EDUCATION BETWEEN ELEMENTARY AND SECONDARY SCHOOL TEACHERS

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ABSTRACT
The purposes of this study are to investigate the attitudes and perceptions of teachers toward the adoption of and intention to use Smart Education, to examine empirically the relationship between intention to use Smart Education and the consequential effect factors, and to obtain measures for revitalizing Smart Education. In order to accomplish all these, we suggested an expanded model based on a model for the theory of reasoned action. The results of the study are as follows. Firstly, attitude, subjective norms, teacher efficacy, resistance to class, and organizational citizenship behavior, respectively, affect intention for using Smart Education. Also, educational value and teacher efficacy have an impact on the attitude; furthermore, the burden for class and organization citizenship behavior affected the teacher efficacy. Secondly, the following were seen to have a high path coefficient: the elementary school teachers in H1 (Attitude → Intention to use), H3 (Teacher efficacy → Intention to use), H4 (Resistance to class → Intention to use), H6 (Educational value → Attitude), H8 (Teacher efficacy → Resistance to class); and the secondary school teachers in H2 (Subjective norms → Intention to use), H5 (Organization citizenship behavior → Intention to use), H7 (Teacher efficacy → Attitude), and H9 (Teacher efficacy → Organization citizenship behavior). And through these results, the factors for introducing and promoting Smart Education and its invigoration measures were presented.
Keywords: Smart Education, Theory of Reasoned Action, Innovation Resistance, Teacher Efficacy, Organization Citizenship Behavior

INTRODUCTION

According to the Korea Communications Commission and the IT industry, smart phone users have surpassed 26 million 720 thousand as of May 11th, 2012 (Hur, 2012). Also, as SNS and cloud computing services have become more and more mainstream, it is not an exaggeration to say that our society has hailed in a so called 'Smart phone era'. In 2011, based on these trends, the Ministry of Education, Science and Technology launched the 'Smart Education' executive planning and related government programs and an executive strategy roadmap. Starting in 2012, Education Offices in the cities and regions of Korea began planning and quickly executing detailed strategic plans for individual schools within their region to this effect. Furthermore, in the academic field, many researchers have been publishing research on utilizing social network services (Brady et al., 2010) or smart phone based services (Lee & Jung, 2010; Cho, 2009) etc., for education, which show the synergy effects of SNS-type social media with education and have also shown to have a positive effect on providing the student with a more inviting and voluntary study environment.

However, even though we have set up a very high standard of education policies through the private sector and in households, due to cursory implementation, effective methods and strategies were not set in place making it not uncommon to see the proposed education methods disappear from the site of education or the impact of education unable to be maximized. Understanding how a new education method like Smart Education spreads and how it affects education begins with understanding the educational organization, which design the smart learning programs (Kim & Han, 2006), and in order for an innovative education method to be successful, efforts must be made to convince as many early adopters as possible in the early stages and also sources of dissatisfaction must be determined from the feedback quickly.

There is a string of research regarding the specific characteristics of the professors supporting this new method of education, the style of the innovation, development of prediction models for new technology development, professors' study strategies, and introductory timing related to introducing this new method of education. However, because the focus of previous research was on implementing and successfully launching a new education method, there is a lack of opinions from professors' that evaluate the likelihood of Smart Education being adopted and going main stream. And up to this point, since most empirical research regarding implementing new education methods focused on a narrow aspect, there is a limitation on citing the research as a result of in-depth and multilateral analysis. Continuing this logic, we are attempting to validate and analyze the

best way to introduce smart learning, through a survey inquiry determining what elements in the research affect the motivations for applying smart learning and also what factors affect the attitude and actual usage motivation for the professors that manage the realistic capacity and conclusions of the education.

On the other hand, school organizations are quite different from other organizations and even more so depending on the educational quality of the school (Oh & Jung, 2006). Elementary and secondary schools have a separate set of educational goals, environments and are operated by a different type of teaching staff structure. Therefore, it is expected that teachers that wish to apply a new educational method to their classrooms will have differing perspectives so the need for basic research such as comparing and analyzing the reason that elementary school and secondary school teachers are implementing Smart Education exists. This study is based on the perspectives of the teachers regarding the implementation and application of Smart Education and empirically investigates the relationship between the intent to apply smart learning and the elements that affect this intent while also analyzing the difference of the intent for applying Smart Education by the quality of the school in order to discover a method to propagate the adoption of Smart Education.

THEORETICAL BACKGROUND AND RESEARCH HYPOTHESIS

Selecting and organizing teachers' knowledge and experience, the paradigm from the past that teachers' language was centralized in the role of knowledge messenger is being developed to the educational paradigm that is anchored in various students utilizing ICT. Likewise, the content of education with the changes of learning, educational methods, educational environments are being changed, and Smart Education is receiving a great deal of attention recently. Though Smart Education is defined variously by many scholars (Noh et al., 2011; Jo & Lim, 2012; Kim & Kim, 2012), when we synthesize those definitions, it is chiefly concerned with learners' differing learning styles and capabilities, and it focuses on increasing development in learners' thinking skills, communication skills, problem solving skills etc, and providing chances for cooperation learning and individual learning, Smart Education makes learning more enjoyable and can be explained as intelligence tailored learning based on ICT or smart devices.

When we look at these Smart Education related research works, firstly there are research works which surveyed positive educational effects utilizing various methods (Greenhow & Robelia, 2009; Yue et al., 2009; Thomas, 2010; Cochrane & Bateman, 2010) and secondly, there is research which shows Smart Education in a negative light (Lee, 2012; Kim & Kim, 2011; Lee, 2010). Also, we look that the research, which suggests directions for policy, method, system for Smart Education (Kim & Son, 2011; Lee, 2010; Lim, 2011) largely deals with the factors that are necessary for the implementation of Smart Education techniques and systems.

In this context, working to improve Smart Education's strengths and finding ways to mitigate its negative aspects, Smart Education is necessary as a new learning method for teachers on the front lines of education in order to train effective and skillful people in the 21st century. For the necessity of Smart Education and spreading sympathy, it may be important to understand teachers' thoughts and experiences regarding the introduction and utilization of Smart Education.

The adoption and use of ICT in educational sites is in fact not so much influenced by the Education Administration Authority, but in fact by the real teachers and students themselves. Without the support for change by these individuals, it is difficult to affectively apply a new education method (Pelgrum, 2001). Bullock (2004) announced research results stating that the ultimate decision for adopting and applying new technologies into the classroom was done by the teachers and, Kersaint et al (2003) also stated that teachers comfortable with new technology also had a tendency to be comfortable using ICT as a real educational tool. This is due to the fact teachers are introspective action takers and not passive people who just take and execute orders (Schon, 1987). Marcinkiewicz and Regstad (1996) reported that the biggest influence on computer use was how the teachers felt about using personal computers for education purposes. Expression of subjective norms can be suppressed socially or politically. Subjective norms that are shown in planned behavioral theory usually manifest themselves based on how the individual perceives the opinion of the group / society on the specific behavior (Fishbein & Ajzen, 1975). In other words, when defining subjective norms as a manifestation of how an individual perceives the expectations of a behavior by a group / society, it can be said that the important variables determining the subjective norms in the educational scene are the individual expectations on Smart Education regarding the students, parents, and education associates, principal and vice principal, etc. When explaining the intent for adopting new technologies, the subjective norm factor is often brought up as a variable (Kim et al., 2009; Davis & Wong, 2007; Park, 2009; Teo, 2010). In this study, Theory of Reasoned Action (TRA) and Theory of Planned Behavior (TPB) are analyzed and based on the research results above, by determining that the attitude of teachers toward Smart Education has an effect on the intent to apply smart learning, we hypothesize the following:

H1: Attitude towards Smart Education will have a positive effect on the intention to use.
H2: Subjective norms towards Smart Education will have a positive effect on the intention to use.

The efficacy of teachers means the positive effect that a teacher can have on the performance of the students (Ashton, 1984). Bandura (1997) emphasized that teacher efficacy could be a self-evaluating belief system for teachers based on efficient student leading and efficient classroom time. When the efficacy of teachers is high, they try to steer the classroom activities and education in a desirable direction while also being more open to trying individually creative educational methods. On the other hand, teachers with a low efficacy are more likely to adopt a strict, uniform and more traditional education style (Tshannen-Moran et al., 1998). Based on research precedence, it is shown that elementary and secondary school teachers with high efficacy had a tendency to have an open attitude towards new ideas and wished to utilize various teaching tools in their curriculum (Potosky, 2002; Tondeur et al., 2008; Yang, 2012). Based on these research results, it was determined that teacher efficacy has a positive effect on the intent for teachers to apply Smart Education activities, and the following hypotheses were set:

H3: Teacher efficacy towards Smart Education will have a positive effect on the intention to use.

In general, the necessary adoption of innovation for changes to a school system occurs on a systematic and individual level (Ellsworth, 2000). Especially, regarding the level of execution as an adopter of an innovation, teachers show a variety of profiles. Some teachers contribute very actively while others are passive in their contributions to the process of school change. Also, some teachers resist school change. In the case of Ncube (1998), the resistance to change by the teachers was often a main obstacle for the school improvement program. As a result, because it is the teachers that spread the innovation and the innovative ideas with the school, resistance to change by the teachers is a very significant factor. In Greenberg and Baron (2008), the teachers rejected change in the name of keeping the school as-is creating an obstacle for changing the habits of the teachers. In the case of Zimmerman (2006), the reason for the reluctance to change stemmed from the fear of new changes. If a school had previously failed at implementing a change, this experience caused fear of new changes for the teachers. Along the same logic, because it is determined that in this study the resistance and pressure regarding Smart Education will weaken the intent for teachers to apply Smart Education, the following hypothesis is set:

H4: Resistance to classes utilizing Smart Education will have a negative effect on the intention to use.

Bateman and Organ (1983) described organizational citizenship behavior as a behavior that is not formally defined or guaranteed by contract, but a behavior that manifests not from reward but a voluntary behavior for the overall good of the organization. Organizational citizenship behavior does not occur because the participant is expecting pay or a raise, nor does it occur out of a sense of obligation. However, organizational citizenship behavior is essential for maintaining the robustness of an organization. It could be said that the organizational citizenship behavior requirements during the process of implementing a new education method has many differences in scope and intensity. However, considering the difficulties in the innovation process for introducing a new education method, it is easy to see the possibility that the personal preferences of the teachers can have an influence on the success of the education. Moreover, because the ultimate purpose of introducing Smart Education is not merely just to introduce a new education method, but to start an education revolution through Smart Education, it is determined that applying organizational citizenship behavior could have significant meaning, thus the following hypothesis is set:

H5: Teachers' organization citizenship behavior will have a positive effect on the intention to use.

The educational value of Smart Education is not only because of its efficiency, customizability and individualized nature in regards to the education method, but also the expectation that the traditional classroom experience can be enhanced as well. In general, when the educational value of a certain education method is high, it is reported as having a positive impact on the introduction intent (Kim, 1998; Choi et al., 1999; Kang & Kang, 2009; Yuan & Lee, 2012). For applying Smart Education, the value of the education can have a positive impact on the attitude towards Smart Education. Therefore, the following hypothesis is set:

H6: The educational value of Smart Education will have a positive effect on the attitude towards Smart Education.

On the one hand, the change in the beliefs and attitude of the teachers stems from the specific performance of

the students or education value but the teachers' efficacy is also a relevant parameter. Teachers' efficacy is defined by their own belief of how much the teachers affects the student's performance (Ashton, 1984), or also the teachers' confidence in their own ability to put into practice those education activities that are meaningful to the students (Gibson & Dembo, 1984). Since it is determined that a teachers' efficacy can be viewed as serving an important role in the ability to maintain a positive and innovative belief and attitude during the process of syllabus preparation, when actually teaching or confronted with unexpected problems such as device failure, the following hypothesis is set:

H7: Teacher efficacy towards Smart Education will have a positive effect on the attitude towards Smart Education.

The research of Hysong and Miguel (1998) demonstrated that a teachers efficacy has a positive effect on the innovation and performance of an individual in a new environment, and as the concept of self efficacy is introduced to the field of IT systems, self efficacy has been widely regarded in many studies as a main variable, which affects innovative performance or performance in general (Jang & Jo, 2002; Compeau & Higgins, 1995). Meanwhile, people with a low level of self efficacy minimize anxiety by choosing a method they are familiar with even if a better method exists. Therefore, it can be viewed that the resistance against innovation can be affected by a teachers' perceived efficacy. Thus, based on previous research, this study determines that the degree of resistance against the introduction of Smart Education differs depending on the teachers' efficacy and assumes that an analogy can be drawn from the concept of innovation resistance, which is mainly used in the IT field and applied as education pressure in the education field, the following hypothesis is set:

H8: Teacher efficacy towards Smart Education will have a negative effect on the resistance to class of Smart Education.

Ashton (1984), Gibson and Dembo (1984) stated that teachers with a high efficacy regarded performance expectations from students and responsibilities towards their students' studies very highly and wished for their students to improve academically, and if the students failed, rather than thinking that it was the student's fault or inability, the teachers thought that there was a problem with their own teaching method and immersed themselves even further in their teaching. From this perspective, teachers that believe their teaching techniques can change their students showed not only a high level of organizational citizenship behavior while teaching in the classroom, but also amongst colleagues in the school. During teaching, this high level of organizational citizenship behavior in turn translated into the student's confidence in succeeding academically, and through determining that this behavior could increase the application of Smart Education, the following hypothesis is set:

H9: Teacher efficacy towards Smart Education will have a positive effect on organization citizenship behavior.

Based on previous research above that is related to Smart Education, to analyze the effects of 6 selected research parameters (Attitude, Subjective norms, Resistance to class, Organizational citizenship behavior, Educational value and Teachers efficacy) and their effects on behavioral theory model, the following structural equation is set (shown in Figure 1) and the causal relationship between the factors are verified.

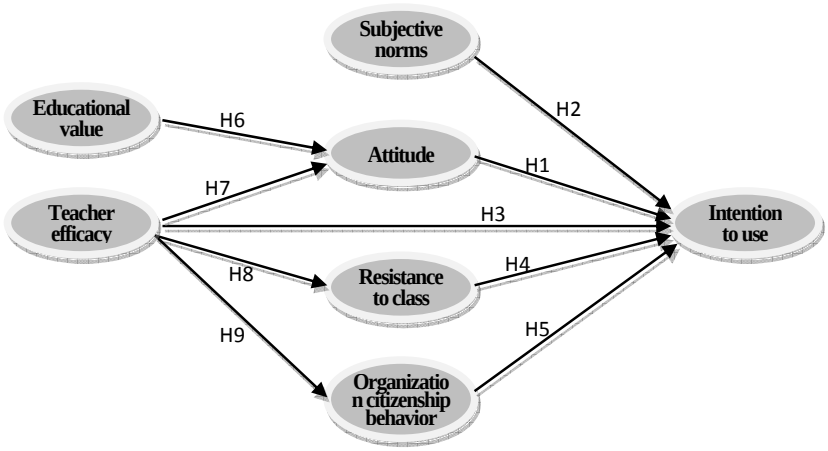

Figure 1: Summary of research hypothesis

RESEARCH HYPOTHESIS PROOF ANALYSIS AND RESULTS

Summary of choosing research subject and analysis

Proof and analysis for the research was conducted with teachers in the elementary and secondary schools of the Gyeonggi region as the research subjects. Research subjects were chosen by method of an online survey only accessible via a work managed email system using only the individual's electronic verification sign on certificate. Once logged on, the survey polling the teachers' opinion was introduced and the purpose of the survey was promoted by a video about introducing and applying Smart Education. The research survey was open between April 11th, 2012 and April 17th, 2012 and had a total of 1868 teachers participate, and excluding insufficient survey input from 51 of those teachers, the final tally of 1817 responses were sorted for final analysis.

Table 1: Reliability of research variables with respect to the entire sample and appropriateness analysis result

Construct	Composition of survey categories	Factor loading	t-value	CR	Cronbach α	AVE	Reference
Organization Citizenship Behavior	OCB1	0.782	20.560	0.898	0.864	0.595	○ Belogolovsky & Somech (2010) ○ Organ et al. (2006)
	OCB2	0.770	20.342				
	OCB3	0.832	23.728				
	OCB4	0.751	17.785				
	OCB5	0.806	22.306				
	OCB6	0.680	15.423				
Subjective Norms	SN1	0.896	69.040	0.948	0.931	0.784	○ Marcinkiewicz & Regstad (1996) ○ Venkatesh & Davis (2000)
	SN2	0.896	66.240				
	SN3	0.910	65.422				
	SN4	0.848	56.267				
	SN5	0.874	57.190				
Attitude	attitude1	0.885	67.245	0.945	0.927	0.775	○ Warburton & Terry (2000) ○ Keenan et al. (2006)
	attitude2	0.896	75.248				
	attitude3	0.831	62.338				
	attitude4	0.915	73.707				
	attitude5	0.873	67.713				
Educational Value	eduvalue1	0.876	68.771	0.959	0.946	0.823	○ LEE et al. (2003) ○ Singhal (1997)
	eduvalue2	0.916	83.024				
	eduvalue3	0.929	92.819				
	eduvalue4	0.917	90.391				
	eduvalue5	0.895	81.782				
Teacher Efficacy	efficacy1	0.846	61.933	0.930	0.905	0.727	○ Gangadharbatla (2008) ○ Goddard et al. (2000)
	efficacy2	0.893	72.011				
	efficacy3	0.728	32.531				
	efficacy4	0.883	68.722				
	efficacy5	0.899	68.224				
Intention to Use	intention1	0.856	72.499	0.958	0.945	0.821	○ Davis & Wong (2007)
	intention2	0.924	102.405				
	intention3	0.940	104.986				
	intention4	0.905	92.931				
	intention5	0.903	83.762				
Resistance to Class	resist3	0.892	15.744	0.891	0.834	0.732	○ Oreg (2003) ○ Ram (1987)
	resist4	0.766	3.785				

resist5	0.903	20.506

The survey was similar to a 7-scale likert type and there were no missing values. SPSS 18.0 and Smart PLS 2.0(M3) were the statistical packages used to analyze the qualitative data. Path Analysis utilizing PLS differs from LISREL, AMOS, etc., in that it is a structural equation mainly focused on the main dispersion factor. The strengths of PLS are not only its ability to read into the relationships between the variables, but also that it allows the prediction of variable values (Haenlein & Kaplan, 2004). On top of this, in contrast to the structural equation models that are based on common factors, this model has no limitations in terms of sample size or variable residual standard distribution (Fornell & Cha, 1994), and is a useful analytic tool that is better suited for causal relationship prediction rather than theoretical verification.

The benefit of PLS analysis is that it is the most appropriate empirical analysis method in determining and predicting a certain behavior such as the teachers' intent for introduction of Smart Education as suggested in this research.
Without separating the 2 entities and analyzing the measurement sample of the combined sample, the results, as seen in Table 1 show that the individual survey category load across the entire sample is more than 0.5, while the t value showed similar results. Complex reliability was also greater than 0.7 across all variables, and the average dispersion extraction value was also above the standard value of 0.5; therefore, showing that there was no problem with the appropriateness of the relationship between the survey elements. As for determinant appropriateness, the square root of the average dispersion extraction value exceeds the relational calculation value, and if the average dispersion extraction value exceeds 0.5 it is viewed as appropriate. Since all the analysis results meet the conditions, there are no problems with appropriateness. In addition the explanation values (R^2) for the intention to use, attitude, resistance to class, and organization citizenship behavior all exceed the appropriate threshold values.

Evaluation goodness of fit of research model
For the structural model of the results' overall goodness of fit, there is a Redundancy index, which is cross-verified Stone-Geisser Q^2 test statistics. This index shows the structural model's suitability as structural model's statistically estimated volume, and the value must be positive (Chin, 1998; Tenenhaus & Esposito Vinzi, 2005). Like in table 2, centralizing in latent variable, all the values are positive in this research

Table 2: Model goodness of fit index

Construct	R^2	Communality	Redundancy
Teacher Efficacy		0.727	
Educational Value		0.823	
Intention to Use	0.769	0.821	0.140
Resistance to Class	0.065	0.732	0.038
Organization Citizenship Behavior	0.159	0.595	0.093
Subjective Norms		0.784	
Attitude	0.648	0.775	0.339

Outside of that, evaluation of goodness of fit on average about PLS structural model first requires us to consider the evaluation of each individual endogenous variable route structure, and is evaluated as relevant Latent variable R^2 value. According to Cohen (1988), R^2 value's effect degree is separated to high (above 0.26), medium (0.13-0.26), and low (0.02-0.13). Based on this evidence, established research module's goodness of fit in the model studied satisfies all thresholds.

Lastly, PLS path model's Goodness of Fit is defined as all endogenous variable's R^2 average value multiplied by communality's average value, then square rooted (Tenenhaus & Esposito Vinzi, 2005). The size of this goodness of fit must be at least above 0.1, and depending on the size, it is separated into the high (above 0.36), medium (0.25-0.36), low (0.1-0 .25) categories, and after measuring the overall goodness of fit of the research's

PLS path module, it is determined that the overall endogenous variable's R^2 average is 0.41, and communality average value is 0.75, and the square root of these two multiplied values is 0.56, thus the model's overall goodness of fit is shown to be very high.
Thus, the research model's goodness of fit is confirmed, the hypothesis' verified, and interpretation of the result is shown to be possible.

Results of the structure model against the entire survey participants
The results of the structure model against the entire survey participants, all 9 of the hypothesis were adopted with a significance level of 1%. As the core of this research lies in comparing and analyzing the path coefficient regarding the application intent of elementary and secondary school teachers, the analysis results for the entire sample is shown in Table 3. We determined that the result comparison between elementary and secondary school teachers had more significance than the analysis results of the entire sample size.

Table 3: Entire sample path coefficient value and verification results

Hypothesis	Path	Path Coefficient	Standard Error	t Value	Verification Result
H1	Attitude → Intention to use	0.489	0.023	20.976	**adopt ***
H2	Subjective norms → Intention to use	0.298	0.026	11.298	**adopt ***
H3	Teacher efficacy → Intention to use	0.123	0.026	4.709	**adopt ***
H4	Resistance to class → Intention to use	-0.069	0.012	5.702	**adopt ***
H5	OCB → Intention to use	0.047	0.015	3.179	**adopt ***
H6	Educational value → Attitude	0.458	0.029	15.828	**adopt ***
H7	Teacher efficacy → Attitude	0.386	0.029	13.256	**adopt ***
H8	Teacher efficacy → Resistance to class	-0.256	0.025	10.183	**adopt ***
H9	Teacher efficacy → OCB	0.399	0.023	17.608	**adopt ***

**, $|t| > 2.326$, $\alpha=0.01$ significance (or $p<0.01$)

ANALYSIS RESULTS COMARISON FOR EACH GROUP'S PATH
Next, we compare analysis results between groups of elementary school and secondary school teachers for each hypothesis. Each average cause value t is compared against the validated result and the path comparison results using the PLS method can be seen in Table 4 and Table 5.

In Table 4 of the elementary and secondary school teachers' average cause value comparison, it is shown that in the case of elementary school teachers, the organization citizenship behavior average score is significantly high.

Table 4: Factor average value comparison of elementary and secondary school teachers

Construct	Average		t Value	Difference
	Elementary(n=544)	Secondary(n=1273)		
OCB	5.77	5.58	4.226 *	**Elementary** > Secondary
Educational value	4.73	4.81	-1.090	Elementary < **Secondary**
Teacher efficacy	4.76	4.83	-1.191	Elementary < **Secondary**
Resistance to class	4.47	4.43	0.699	**Elementary** > Secondary
Attitude	4.76	4.99	-3.329 *	Elementary < **Secondary**
Subjective norms	4.68	4.75	-1.040	Elementary < **Secondary**
Intention to use	5.07	5.16	-1.352	Elementary < **Secondary**

***, p<0.001

In previous research for elementary school teachers' culture, consideration for others, cooperation, respect for individual teachers and school management, sharing of teaching materials, etc., were reported (Oh & Jung, 2006). Sharing and cooperation in the elementary school teachers' teaching culture seem to have contributed to the organizational citizenship behavior element in the survey.

On the other hand, in the case of secondary school teachers, there was statistical significance in the attitude towards Smart Education. Through this, it is determined that the fear of early Smart Education for elementary school teachers (Newby, 2000; Lee, 2001) caused their attitude towards Smart Education to have less of an impact on the average attitude towards Smart Education than that of secondary school teachers.
It is suggested that path-coefficient that composite research module may also have a slight difference depending on groups, so we will try to account for this. The analysis of path difference between groups by Teo at al. (2003), and Keil et al. (2000) is processed as it is presented in table 5 below.

Table 5: 2 groups' path coefficients difference's comparison analysis process

step	method of progression	note
step 1	Reliability and validity verification for the overall group	If suitable move on to step 2
step 2	Reliability and validity verification for individual group	If suitable move on to step 3
step 3	Correlation and distinction validity verification	After overall group and individual group's validity is tested, move on to the next step if it is suitable
step 4	Path-coefficient can be compared path coefficient difference only about similar hypothesis	Using second path-coefficient difference compare modification (formula 1), compare difference of path coefficient

$$S_{pooled} = \sqrt{\frac{(N_1-1)}{(N_1+N_2-2)} \times SE_1^2 + \frac{(N_2-1)}{(N_1+N_2-2)} \times SE_2^2}$$

$$t = \frac{(PC_1 - PC_2)}{S_{pooled} \times \sqrt{\frac{1}{N_1} + \frac{1}{N_2}}}$$

S_{pooled} = pooled estimator for the variance
t = t-statistic with $N_1 + N_2 - 2$ degrees of freedom
N_i = sample size of dataset for culture i
SE_i = standard error of path in structural model of culture i
PC_i = path coefficient in structural model of culture i

Formula 1: Path coefficient difference comparison modification

As can be seen in Table 6, with the exception of elementary school teachers group's H5 (Organization Citizenship Behavior→ Intention to use), all path coefficients of the hypothesis differed from the significance level by approximately 5%. If one particular group's specific path was not significant, even without statistical analysis, it can be determined that the path that shows a significant value has a greater effect (Mun & Kim, 2011; Kim et al., 2010). In other words, in the case of the secondary school teachers group H5, the path is significant but the same is not true for the elementary school teachers group. Therefore, in the secondary school teachers group, it can be determined that the organizational citizenship behavior had a larger impact of application intent than it did for the elementary school teachers group.

Table 6: Path coefficient comparison between elementary and secondary school teachers

Hypothesis	Path	Path Coefficient		Path Difference t-value	Difference
		Elementary (n=544)	Secondary (n=1273)		
H1	Attitude → Intention to use	0.494*	0.486*	4.497**	**Elementary**>Secondary
H2	Subjective norms → Intention to use	0.265*	0.314*	-24.743**	Elementary<**Secondary**
H3	Teacher efficacy → Intention to use	0.156*	0.108*	23.677**	**Elementary**>Secondary
H4	Resistance to class → Intention to use	-0.076*	-0.065*	-12.695**	**Elementary**>Secondary
H5	OCB → Intention to use	0.037	0.045*	-7.488	Elementary<**Secondary**
H6	Educational value → Attitude	0.497*	0.441*	26.216**	**Elementary**>Secondary
H7	Teacher efficacy → Attitude	0.350*	0.403*	-24.855**	Elementary<**Secondary**
H8	Teacher efficacy → Resistance to class	-0.283*	-0.240*	-24.507**	**Elementary**>Secondary
H9	Teacher efficacy → OCB	0.324*	0.440*	-70.589**	Elementary<**Secondary**

1)*, $p<0.05$ 2)**, $p<0.05$

When the paths of each group are both significant, the PLS model must analyze the difference between the groups using a deduction equation. By comparing the path coefficient value, the elementary school teachers group's H1 (Attitude → Intention to use), H3 (Teacher efficacy → Intention to use), H4 (Resistance to class → Intention to use), H6 (Educational value → Attitude), and H8 (Teacher efficacy → Resistance to class) path coefficients were shown to be greater than that of the secondary school teachers group's. For the secondary school teachers group the H2 (Subjective norms → Intention to use), H5 (Organization citizenship behavior → Intention to use), H7 (Teacher efficacy → Attitude), and H9 (Teacher efficacy → Organization citizenship behavior) path coefficients were shown to be higher than that of the elementary school teachers group's.
The results for the difference in the path coefficient for each hypothesis regarding each group were observed. First, in the case of H1 (Attitude → Intention to use) it was shown that attitude had a positive effect for the application intent for both elementary and secondary school teachers. The elementary school teachers' path coefficient value was shown to be significantly greater than that of the secondary school teachers. This can be translated as elementary school teachers having the ability to be moved more effectively towards Smart Education through policies that are positive towards the attitude element compared to secondary school teachers. Therefore, offering a slight relative change to the attitude of elementary school teachers will show a favorable response to applying Smart Education.

In the case of H2 (Subjective norms → Intention to use), both elementary school teachers and secondary school teachers showed that subjective norms had a positive effect on application intent. The path coefficient value for secondary school teachers showed greater significance than that of elementary school teachers. This means that for secondary school teachers, by raising subjective norms for Smart Education, application intent can be higher than that of elementary school teachers. Therefore, if it is possible to give a slight relative change to subjective norms, it can be inferred that secondary school teachers are more likely to apply Smart Education. These results mean that for secondary school teachers, when utilizing a new technology such as Smart Education, they are more concerned about what other people who are interested in the matter will perceive of the new adoption results of technology.

In the case of H3 (Teacher efficacy → Intention to use) it was demonstrated that for both elementary and secondary school teachers, teacher efficacy had a positive effect on application intent. The path coefficient value for elementary school teachers was shown to have greater significance than that of secondary school teachers. This can be translated as elementary school teachers being more likely to apply smart learning by raising Smart Education teacher's efficacy compared to secondary school teachers. In this result, elementary school teachers had low teacher's efficacy towards Smart Education, but through related training if teachers efficacy is raised, it is determined that it is possible to impact their intent to utilize Smart Education in the classroom for improved teaching.

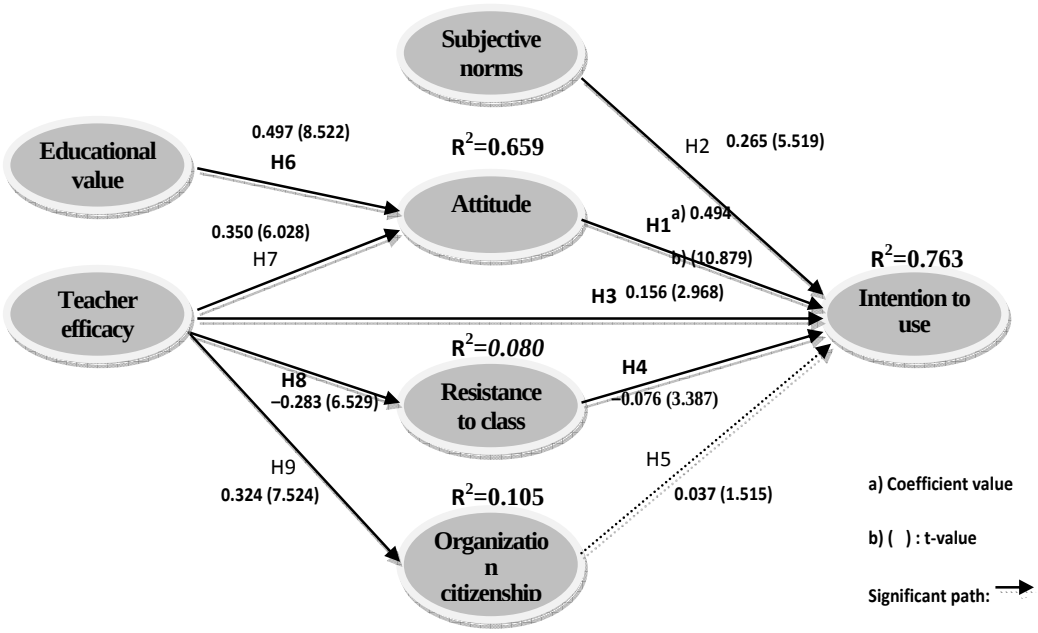

Figure 2: Survey analysis results for elementary school teachers

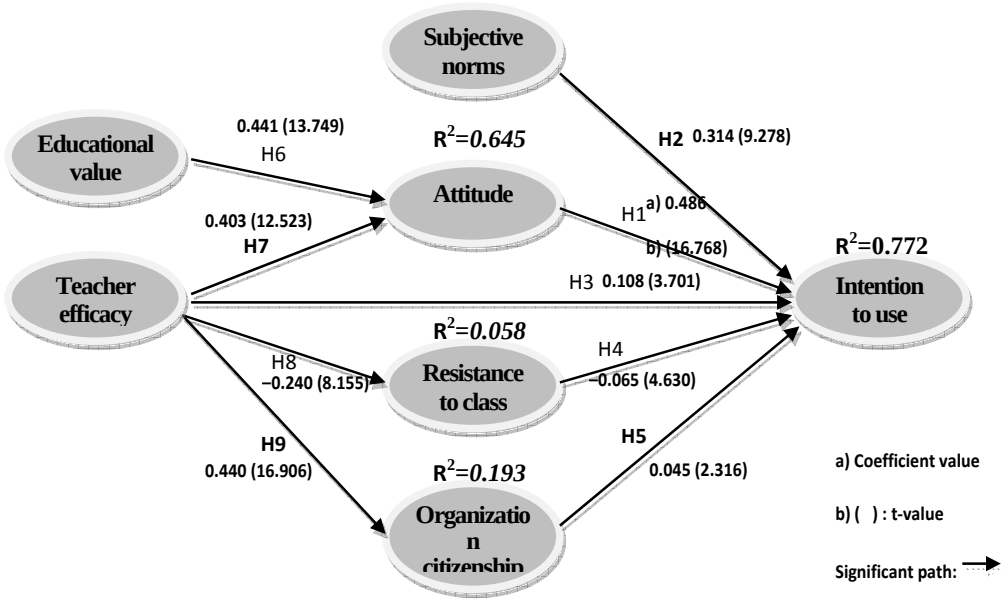

Figure 3: Survey analysis results for secondary school teachers

In the case of H4 (Resistance to class → Intention to use), it was shown that for both elementary and secondary school teachers, teaching pressure had a negative effect on application intent. The path coefficient value for elementary school teachers had a greater negative significance than that of the secondary school teachers. This can be translated as, if the teaching pressure of Smart Education can be relieved slightly for elementary school

teachers, their intent for utilizing Smart Education can be greater than that of secondary school teachers. This result is determined to mean that if elementary school teachers are able to reduce teaching pressure because they have more opportunities to exercise flexibility in the curriculum and teaching method, their application intent can be affected more in comparison to secondary school teachers.

In the case of H5 (Organization citizenship behavior → Intention to use) it was shown that for both elementary and secondary school teachers, organizational citizenship behavior had a positive effect on application intent. The path coefficient value for secondary school teachers was shown to have greater significance than that of elementary school teachers. Thus, if the organizational citizenship behavior towards Smart Education in regards to secondary school teachers can be raised slightly, they will utilize Smart Education more than elementary school teachers. Since the organizational citizenship behavior causal average for secondary school teachers was relatively low, if there is a reason to slightly raise the dedication towards students, colleagues, and the school in the form of organizational citizenship behavior, there is a greater impact on the application intent than that of elementary school teachers.

In the case of H6 (Educational value → Attitude) for both elementary and secondary school teachers the perception of the educational value regarding Smart Education has a positive impact on the attitude towards Smart Education. The path coefficient value of elementary school teachers showed to have greater significance than that of secondary school teachers. This means that setting up policies that improve the perception of educational value for Smart Education to elementary school teachers will have a more positive impact compared to secondary school teachers.

In the case of H7 (Teacher efficacy → Attitude) for both elementary and secondary school teachers, Smart Education teachers efficacy had a positive impact on the attitude towards Smart Education. The path coefficient value of secondary school teachers was shown to have greater significance than that of elementary school teachers. This means that in the case of secondary school teachers, educational policies that increase the teacher's efficacy towards Smart Education having a relatively greater impact will have a more positive impact on attitude than that of elementary school teachers.

In the case of H8 (Teacher efficacy → Resistance to class) for both elementary and secondary school teachers, teachers efficacy was shown to have a negative impact on Smart Education teaching pressure. The path coefficient value of elementary school teachers had a greater negative impact than that of secondary school teachers. In the case of elementary school teachers, educational policies that increase the teacher's efficacy towards Smart Education will have a greater impact in reducing teaching pressure compared to that of secondary school teachers.

In the case of H9 (Teacher efficacy → Organization citizenship behavior) for both elementary and secondary school teachers, Smart Education teachers efficacy was shown to have a positive impact on organizational citizenship behavior. The path coefficient value of secondary school teachers showed greater significance than that of elementary school teachers. In the case of secondary school teachers, educational policies that increase the teacher's efficacy towards Smart Education is more efficient at manifesting the organizational citizenship behavior of secondary school teachers compared to that of elementary school teachers.

CONCLUSIONS AND PROPOSAL

Through the path coefficient group comparison above, it is possible to confirm that it is necessary to provide educational policy according to the circumstances and characteristics of the group. In other words, even if a superior educational method and policy are planned, care must be taken to avoid the disappearance of an innovative educational method, or the inability to maximize its effectiveness due to forced and hurried implementation without an effective plan of action.

Based on the results of this research, the current affairs surrounding the introduction and utilization of Smart Education are as follows.

First, for the introduction and spread of Smart Education in the case of elementary school teachers, if educational policies that raise the attitude, education value, and teacher's efficacy towards Smart Education are implemented, more efficient utilization of Smart Education relative to secondary school teachers can be expected. Also, by reducing the teaching pressure towards Smart Education for elementary school teachers, it is possible to increase the utilization of Smart Education for elementary school teachers relative to secondary school teachers.

Second, for the introduction and spread of Smart Education, in the case of secondary school teachers, educational policies that focus on increasing the subjective norms, organizational citizenship behavior, and teachers' efficacy will effectively increase Smart Education utilization relative to that of elementary school teachers.

Third, for the introduction and spread of Smart Education, teacher's efficacy is very important for both elementary and secondary school teachers, therefore there is a need for drawing up a proposal in order to increase teacher's efficacy through educational policy and also to work hard to win the support of society in general. As is characteristic of an educational professional, if a teacher's efficacy is increased, the teacher does not only offer unbarred loyalty to the organization but also develops a high level of organizational citizenship behavior. In other words, teacher's efficacy not only increases a teacher's professionalism but also develops public education as a whole, and it is undeniable in that it also plays a critical role in developing school organization culture.

This study aimed to collect the opinions of teachers who actually have a role in the successful introduction and utilization of Smart Education. However, since the application intent of Smart Education was focused on the individual teacher's perception and psychological capacity, there could possibly be various additional variables. This study plans to address these issues in a follow up study.

First, based on the results of this study, a comprehensive discussion of the various possible influential factors on Smart Education application intent is necessary. For the application of Smart Education, the teacher's application intent was focused on the individual teacher's perception and psychological capacity. The reason the focus was placed on the teacher's perception and psychological capacity is that it was seen that teacher's application intent towards Smart Education primarily seemed to be decided upon by the teacher individual's perception and psychological capacity. But, in a school organization, because the teacher's perception and psychological capacity is not an independent element, there will in fact be various influencing factors.

REFERENCES

Ashton, P. (1984). Teacher efficacy: A motivational paradigm for effective teacher education. *Journal of teacher education, 35*(5), 28-32.

Bandura, A. (1997). *Self-Efficacy: The excercise of control*. NY: W. H. Freeman & Company.

Bateman, T. S., & Organ, D. W. (1983). Job satisfaction and the good soldier: The relationship between affect and employee "citizenship". *Academy of management Journal, 26*(4), 587-595.

Belogolovsky, E., & Somech, A. (2010). Teachers' organizational citizenship behavior: Examining the boundary between in-role behavior and extra-role behavior from the perspective of teachers, principals and parents. *Teaching and Teacher Education, 26*(1), 914-923.

Brady, K. P., Holcomb, L. B., & Smith, B. V. (2010). The use of alternative social networking sites in higher educational settings: A case study of the e-Learning benefits of Ning in education. *Journal of Interactive Online Learning, 9*(2), 151-170.

Bullock, D. (2004). Moving from theory to practice: An examination of the factors that preservice teachers encounter as they attempt to gain experience teaching with technology during field placement experiences. *Journal of Technology and Teacher Education, 12*(2), 211-237.

Chin, W. W. (1998). Issues and opinion on structural equation modeling. *MIS Quarterly, 22*(1), 7-16.

Cho, S. (2009). Smartphones used for foreign language learning. *Multimedia Assisted Language Learning, 12*(3), 211-228.

Choi, S., Kim, K., Lee, C., & Seul, Y. (1999). Effective use of multimedia computer courseware in English language teaching and learning. *Multimedia Assisted Language Learning, 2*(1), 179-256.

Cochrane, T., & Bateman, R. (2010). Smartphones give you wings: Pedagogical affordances of mobile Web 2.0. *Australasian Journal of Educational Technology, 26*(1), 1-14.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). New Jersey: Lawrence Erlbaum.

Compeau, D. R., & Higgins, C. A. (1995). Computer self-efficacy: Development of a measure and initial test. *MIS quarterly, 19*(2), 189-211.

Davis, R., & Wong, D. (2007). Conceptualizing and measuring the optimal experience of the e-Learning environment. *Decision Sciences Journal of Innovative Education, 5*(1), 97-126.

Ellsworth, J. B. (2000). *Surviving Change: A Survey of Educational Change Models*. Syracuse University, Syracuse, NY: ERIC Clearinghouse on Information and Technology.

Fishbein, M., & Ajzen, I. (1975). *Belief, attitude, intention and behavior: An introduction to theory and research*. Reading, Mass: Addison-Wesley.

Fornell, C., & Cha, J. (1994). Partial least squares. In R. P. Bagozzi (Ed.), *Advanced methods of marketing*

research (pp. 52-78). Cambridge, England: Blackwell.
Gangadharbatla, H. (2008). Individual differences in social networking site adoption. In C. Romm-Livermore & K. Setzekorm (Eds). *Social networking communities and e-dating services: Concepts and Implications*(pp. 1-17). Hershey, PA: IGI.
Gibson, S., & Dembo, M. H. (1984). Teacher efficacy: A construct validation. *Journal of educational psychology, 76*(4), 569-582.
Goddard, R. D., Hoy, W. K., & Hoy, A. W. (2000). Collective teacher efficacy: Its meaning, measure, and impact on student achievement. *American Edztcaliortal Research Journal, 37*(2), 479-507.
Greenberg, J., & Baron, R. A. (2008). *Behavior in organizations*. Upper Saddle River, NJ.
Greenhow, C., & Robelia, B. (2009). Informal learning and identify formation in online social networks. *Learning, Media & Technology, 34*(2), 119-140.
Haenlein, M., & Kaplan, A. (2012). A beginner's guide to partial least squares analysis. *Understanding Statistics, 3*(4), 283-297.
Hur, J. (14 May. 2012). Half of mobile phone subscribers use a smartphone. *Hankookilbo* [Online],< http://news.hankooki.com/lpage/economy/201205/h2012051421092821540.htm>. (27 Jul. 2012)
Hysong, S. J., & Miguel, A. (1998). *The relationship between self-efficacy and performance: A meta-analysis*. Working Paper, Rice University.
Jang, D., & Cho, S. (2002). The factors influencing on intra-organizational innovation resistance of users and the moderating effects of self-efficacy. *Journal of Consumer Studies, 13*(3), 245-262.
Jo, J., & Lim, H. (2012). A conceptual model of smart education considering teaching-learning activities and learner`s characteristics. *The Journal of Korean association of computer education, 15*(4), 41-49.
Kang, B., & Kang, J. (2009). The study on factors affecting the use intention of traceability system. *The Journal of Internet Electronic Commerce Research*, 9(2), 409-438.
Keenan, A. P., & Lee, Y. K. (2006). The influence of system characteristics on e-learning use. *Computer & Education, 47*(3), 222-244.
Keil, M., Tan, B. C. Y., Wei, K. K., Saarinen. T., Tuunainen, V., & Wassenaar, A. (2000). A cross-cultural study on escalation of commitment behavior in software projects. *MIS Quarterly, 24*(2), 299-325.
Kersaint, G., Horton, B., Stohl, H., & Garofalo, J. (2003). Technology beliefs and practices of mathematics education faculty. *Journal of Technology and Teacher Education, 11*(4), 549-577.
Kim, D., & Kim, S. (2011). Factors influencing users' resistance to location based SNS application for smart phones. *Korean journal of broadcasting, 25*(3), 133-166.
Kim, H., & Kim, H. (2012). A framework for developing learning activities for smart education and an instructional model. *The Journal of Korean association of computer education, 15*(4), 25-39.
Kim, I. (1998). *The theory and practice of multimedia English education of 21 century*. Seoul: Parkmungak.
Kim, M., & Han, G. (2006). A study on factors affecting the satisfaction and intention to use ICT in elementary, junior and commercial high schools. *The Journal of Korean Teacher Education, 23*(3), 143-166.
Kim, M., Cho, H., Han, J., & Han, G. (2009). Factors influencing elementary school teachers' intention of accepting the robot-in-education program. *The Journal of Korean Teacher Education, 26*(1), 427-449.
Kim, T., Oh, M., & Kim, M. (2010). An empirical investigation of the critical factors influencing learner intention: EBS vs private e-Learning contents providers` cases. *Journal of Korean Association for Educational Information and Media, 16*(3), 363-383.
Kim, Y., & Son, J. (2011). A study on design of K-12 e-learning system for utilization smartphone. *Journal of Korean Society for Internet Information, 12*(4), 135-143.
Lee, J. (2011). A dynamic modeling on the adoption of smart learning by system dynamics. *The Journal of Korea Society of IT Services, 9*(1), 89-92.
Lee, M. (2001). A critical analysis on the mandatory computer education for elementary school children. *The Journal of Elementary Education, 14*(2), 279-301.
Lee, S. (2010). Smartphone and university education. *Engineering education and technology transfer, 17*(2), 10-13.
Lee, S., & Jung, A. (2010). A study on the learning and teaching processing for the e-learning contents using smart phone. *The Institute of electronics engineers of Korea conference collection of dissertations, 11*(1), 593-594.
Lee, Y. (2012). The influence of smartphones on the off-task behavior of college students. *The Journal of Yeolin Education, 20*(1), 221-250.
Lee, Y., Kozar, K. A., & Larsen, K. (2003). The technology acceptance model: Past, present,. and future. *Communications of the Association for Information Systems,12*(5). 752-780.
Lim, K. (2011). Research on developing instructional design models for enhancing smart learning. *The Journal of Korean association of computer education, 14*(2), 33-45.
Marcinkiewicz, H. R., & Regstad, N. G. (1996). Using subjective norms to predict teachers. *Journal of Computing in Teacher Education, 13*(1), 27-33.

Marcinkiewicz, H. R., & Regstad, N. G. (1996). Using subjective norms to predict teachers' computer use. *Journal of Computing in Teacher Education, 13*(1), 27-33.

Mun, C., & Kim, J. (2011). Interaction and flow as the antecedents of e-learner satisfaction. *The journal of Korean association of computer education, 14*(3), 63-72.

Ncube, K. (1998). *Science and mathematics centres: Their development and current status.* Paper presented at the Swaziland regional workshop on Developing Teacher Leadership for Curriculum Innovation in Mathematics and Science, Manzini.

Newby, T., Stepich, D., Lehman, J., & Russell, J. (2000). *Instructional Technology for Teaching and Learning: Designing Instruction, Integrating Computers, and Using media*. OH: Prentice-Hall.

Noh, K., Ju, S., & Jung, J. (2011). An exploratory study on concept and realization conditions of smart learning. *The Journal of Digital Policy and Management, 9*(2), 79-99.

Oh, Y., & Jung, J. (2006). A qualitative study on the teachers' culture of vocational high school. *The journal of educational administration, 24*(1), 69-96.

Oreg. S. (2003). Resistance to change: Developing an individual differences measure. *Journal of Applied Psychology, 88*(4), 680-693.

Organ, D. W., Podsakoff, P. M., & MacKenzie, S. B. (2006). *Organizational citizenship behavior: Its nature, antecedents and consequences*. Thousand Oaks: Sage Publication.

Park, S. (2009). An analysis of the technology acceptance model in understanding university students' behavioral intention to use e-learning. *Educational Technology & Society, 12*(3), 150-162.

Pelgrum, W. J. (2001). Obstacles to the integration of ICT in education: Results from a worldwide educational assessment. *Computers & Education, 37*(2), 163-178.

Potosky, D. (2002). A field study of computer efficacy beliefs as an outcome of training: the role of computer playfulness, computer knowledge, and performance during training. *Computers in Human Behavior, 18*(3), 241-255.

Ram, S. (1987). A model of innovation resistance. *Advances in Consumer Research 14*(1), 208-212.

Schon, D. A. (1987). *Educating the reflective practitioner*. Presentation to the 1987 meeting of the American Educational Research Association.

Singhal, M. (1997). The internet and foreign language education: Benefits and challenges. *The Internet TESOL Journal, 3*(6). 391-408.

Tenenhaus, M., & Esposito Vinzi, V. (2005). PLS regression, PLS path modeling and generalized procrustean analysis: a combined approach for PLS regression, PLS path modeling and generalized multiblock analysis. *Journal of Chemometrics, 19*(1), 145-153.

Teo, H. H., Chan, H. C., Wei, K. K., & Zhang, Z. (2003). Evaluating information accessibility and community adaptivity features for sustaining virtual learning communities. *International Journal of Human-Computer Studies, 59*(5), 671-697.

Teo, T. (2010). A path analysis of pre-service teachers' attitudes to computer use: applying and extending the technology acceptance model in an educational context. *Interactive Learning Environments, 18*(1), 65-79.

Thomas, H. (2010). Learning spaces, learning environments and the dis "placement" of learning. *British Journal of Educational Technology, 41*(3), 502-511.

Tondeur, J., Valcke, M., & Van Braak, J. (2008). A multidimensional approach to determinants of computer use in primary education: Teacher and school characteristics. *Journal of Computer Assisted Learning, 2*4(6), 494-506.

Tschannen-Moran, M., Hoy, A. W., & Hoy, W. K. (1998). Teacher efficacy: Its meaning and measure. *Review of educational research, 68*(2), 202-248.

Venkatesh, V., & Davis, F. D. (2000). A theoretical extension of the technology acceptance model: Four longitudinal field studies. *Management Science, 46*(1), 186-204.

Warburton, J., & Terry, D. J. (2000). Volunteer decision making by older people: A test of a revised theory of planned behavior. *Basic and Applied Social Psychology, 22*(1), 245-257.

Yang, S. (2012). Exploring college students' attitudes and self-efficacy of mobile learning. *The Turkish Online Journal of Educational Technology, 11*(4), 148-154.

Yuan, y., & Lee, C. Y. (2012). Elementary school teachers' perceptions toward ICT: The case of using magic board for teaching mathematics. *The Turkish Online Journal of Educational Technology, 11*(4), 108-118.

Yue, K., De Silva, D., Kim, D., Aktepe, M., Nagle, S., Boerger, C., Jain, A., & Verma, S. (2009). Building real world domain-specific social network websites as a capstone project. *Journal of Information Systems Education, 20*(1), 67-76.

Zimmerman, J. (2006). Why some teachers resist change and what principals can do about it. *NAASSP Bulletin, 90*(3), 238-252.