Implications of Flipped Teaching Strategy on Preservice Teachers' Self-efficacy and Intention to Integrate Technology in Future Classroom

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Abstract

This study investigates the implications of flipped teaching strategy on preservice teachers' self-efficacy and intention to integrate technology in future classroom. The researchers used the theory of planned behavior (TPB) as theoretical framework. Participants were 71 preservice teachers enrolled in graduate and undergraduate technology integration course. Multiple linear regression analysis and paired sample t-test were conducted to examine the preservice teachers' intention to use of technology in future classrooms and the change in their self-efficacy level. The results of the predictor model were able to account for 41% of the variance in students' intention to use technology and was statistically significant. The results also found that self-efficacy and perceived behavioral control are significant predictors of preservice teachers' use of technology in future classroom. Furthermore, the results show that the mean of all three variables at the end of the course did not differ significantly compared to prior attending the course with flipped teaching method. Implications of these findings were also discussed.

Keywords: flipped classrooms, theory of planned behavior (TPB), technology integration, preservice teachers' intentions

Introduction:

With the increase use of technology tools in classrooms, training preservice teachers to integrate technology in specific content area using a "traditional" lecture method, does not provide them with the context for classroom application. Researchers recommend that to use technology effectively in a classroom, teacher must master the interplay of three primary forms of knowledge: knowledge of content, good pedagogical practices, and technical skills as well as an understanding of how these forms of knowledge interactively relate to one another (Mishra & Koehler, 2006). Further, social learning theorists (i.e., Bandura, 1977; Vygotsky, 1978) asserted that learning process is complex, multidimensional, and connected to the learner's experiences. Although the new generation majoring in education are mostly familiar with social media and online interaction technologies, there is growing concern as to whether they are prepared to integrate technology tools into effective lessons for their students based on sound pedagogy (Nilson, 2016).

Although lecture-based teaching strategy used for decades as an effective way to help students acquire new knowledge (e.g., Hattie, 2009; Schwerdt, 2009), many educators argue that this teaching model is mostly static, passive and not suitable for teacher candidates preparing for extended field experience and careers in teaching. Students reported also that the information delivered during lectures may come too slowly or cover what they already know; other students have trouble taking in information so rapidly, or they may lack the prior knowledge needed to understand the presented content (Goodwin & Miller, 2013).

A growing number of teachers started using different teaching strategy through creating flipped or inverted classrooms. This teaching strategy involves moving the lecture content before class and working on homework and hands-on activities during class time. For example, the data from the Flipped

Learning Network (2012) indicated that membership on its social media site rose from 2,500 teachers in 2011 to 9,000 teachers in 2012. In the flipped teaching strategy, educators can employ online asynchronous educational video, recorded lectures or readings and spend time in class working on problems or exercises through active, group-based problem-solving activities. The learning materials can incorporate multimedia visual representations, such as interactive graphs, photos or animation. During watching the video, lectures or reading the text, students have the chance to control the pace of the multimedia streaming to match their own learning preferences. Students can also watch or listen to recordings of class lectures on their computers, tablets, smartphones, or personal media players outside of class, leaving class time to engage in learning activities that might otherwise assigned as homework (Frydenberg, 2013).

Theoretical framework:

The present study utilized the theory of planned behavior (TPB) (Icek Ajzen, 1985, 1991) to assess the intention change of preservice teachers regarding technology integration. According to TPB, there are three main factors may predict individuals' intention to perform a specific behavior: attitudes (individual's feelings about performing a behavior), perceived norms (individuals' perceptions of the social pressure to perform a behavior), and perceptions of behavioral control (PBC) (individuals' perceived ability to perform a behavior). Individual's Attitudes represent the overall evaluation of the significance of a behavior. If the behavior in question is believed to have positive consequences to the individual, it is more likely that he or she will be expected to perform the behavior. Perceived norms represent the individual's perceptions of the social pressure to perform a behavior. If individual believes that significant others (e.g., peers, students, superiors) want him or her to perform a specific behavior it is more likely that the individual will perform the behavior. Finally and consistent with Bandura's self-efficacy (1977, 1982), TPB adds perceived behavioral control (PBC) as a predictor of intention to perform a behavior (i.e., individual's perception as to how easy or difficult they can perform a behavior).

Intention according to TPB is an indication of a person's readiness to perform a given behavior and is assumed to be the immediate antecedent of behavior (Fraser et al., 2010). It is thus postulated that PBC and behavioral intention can be utilized to directly predict behavioral achievement. Especially, when behaviors pose no serious problems of control, they can be predicted from intentions with considerable accuracy (Icek Ajzen, 1991). Given this close relationship between intention and behavior, individuals' intention is the most important factor in predicting their decision to take a specific action. For example, many studies utilizing TPB framework found that attitude towards the behavior, subjective norm, and perceived behavioral control accounted for change in behavior and intention (Armitage & Conner, 2001).

In the context of the present study and based on the TPB, the researchers hypothesized that if preservice teachers are attending a technology integration course and use flipped teaching method as teaching tool, they will be anticipated to improve their intention to integrate technology in their future classrooms when: they improve the mastery of the use of technology in teaching. Second, when their peers, their students and their superiors favor them to do so. Finally, when they are confident to integrate technology in their future classrooms.

Flipped Classroom:

Researchers on the flipped classroom do not agree on the type of activity that constitutes the flipped teaching model. For example, some researchers tend to delineate the flipped classroom in a broad definition and suggest that assigning video or reading outside of class and having discussions in class constitutes the flipped classroom. Bishop & Verleger (2013) reject this definition and describe the flipped classroom as an educational technique that consists of two parts: interactive group learning

activities inside the classroom, and direct computer-based individual instruction outside the classroom. According to this definition, flipped teaching strategy may use videos or readings as an outside of the classroom activity. For example, Demetry (2010) provides lecture notes for students to read at home prior to the class session, rather than providing video lectures to help meet the goal of increasing "time on task" to complete course-related activities. Other researchers identified flipped classroom as "events that have traditionally taken place inside the classroom, now take place outside the classroom and vice versa" (p.32) (Lage, 2000). Therefore, flipped classroom is based on the idea that students are engaged in group interactive learning activities inside the classroom. To make sure that students watched the videos or completed the reading at home, students can respond to "clicker questions" to report their progress as they work on the exercises (Houston, 2012). Finally, the learning activities as well as the assigned homework in flipped teaching model vary widely between studies. For example, some activities are made up of asynchronous web-based video lectures and closed-ended problems or quizzes, while others consider that the flipped classroom actually represents an expansion of the curriculum, rather than a mere re-arrangement of activities (Bishop & Verleger, 2013).

Self-efficacy and Learning

According to social cognitive theory (Bandura, 1997) self-efficacy is a form of self-judgment that influences decisions about what behaviors to undertake, the amount of effort and persistence put forth when faced with obstacles, and finally, the mastery of the behavior. According to Bandura, self-efficacy is not a measure of skill; rather, it reflects what individuals believe they can do with the skills they possess. For example, in discussing self-efficacy in computer use, Compeau and Higgins (1995) distinguished between component skills such as formatting disks and booting up the computer and behaviors individuals can accomplish with such skills, such as using software to analyze data. Thus, preservice teachers' perception of their self-efficacy focuses on what they believe can accomplish with the knowledge they master during their learning. It does not refer to a person's skill at performing specific learning related tasks (e.g. class management, integrate technology in their teaching and mastering a content area). Instead, it assesses a person's judgment of his or her ability to apply knowledge and skills in a broader context.

Preservice teachers participating in a technology integration course learn skills and knowledge of teaching with technology in an actual classroom. Self-efficacy beliefs are a key component for preservice teachers' success in overcoming the fear they may experience in this new area. For example, Compeau and Higgins (1995) empirically show that there is a relationship between computer self-efficacy and computer use. Staples (1999) found that those with high levels of self-efficacy in remote computing situations were more productive and satisfied, and better able to cope when working remotely. Consequently, novice teachers enrolled in a technology integration course are required to develop set of skills to prepare them to teach with technology and to perform successfully a distinct set of behaviors required to establish, maintain and utilize effectively teaching with technology beyond basic personal Internet and computer skills.

Research Questions

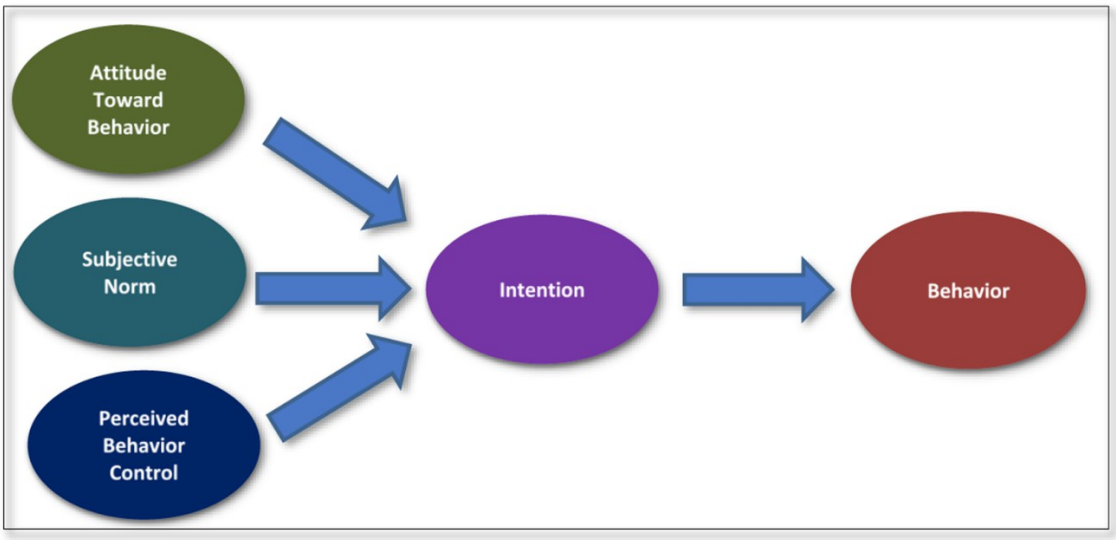
Although large body of research investigated the applications and practices of the flipped teaching strategy in different learning context, there have been limited research to examine its effect on preservice teachers' intention change to integrate technology in their future classrooms. Therefore, the purpose of this study was to investigate the effect of using flipped teaching strategy on preservice teachers' self-efficacy and intention to use technology in their future classroom. This study was guided by the following research questions:

1. What factors best predict preservice teachers' intentions to integrate technologies in their future classrooms in a flipped teaching setting?
2. Does flipped teaching method change preservice' teachers' intention, attitude and perceived behavioral control to use technology in their future classrooms?

Study Model Framework

Grounded in TPB (Icek Ajzen, 1991), this study employed a model with four main constructs to predict students' technology integration in their future classrooms: Students' attitudinal beliefs, Students' subjective norms, Students' perceived behavioral control and students' intention to integrate technology in their future classroom.

Figure 1: Study model addressing preservice teachers' intention to use technology in their future classroom



Methodology:

Research design

This study employed quantitative method to examine the effect of flipped teaching method on preservice teachers' intention to integrate technology in their future classroom. The researchers employed multiple linear regressions to identify the strength of the effect that flipped teaching method has on preservice teachers' attitudinal beliefs, subjective norms, and perceived behavioral control leading to change in their intention to use technology in their future classroom. Data were collected through using an online survey questionnaire to collect their opinion, demographic information and participants' responses to multiple items measuring each construct reflected in the research model (Fig. 1). IRB was obtained for this study and all ethical requirements were observed.

Participants

The researchers employed a convenient sample to select participants in the current study. Participants were preservice teachers (n = 71) enrolled in three different sections in a required technology integration course in a Midwest university (one graduate section and two undergraduate). Out of the 71 participants, 62 students completed all surveys and received course extra credit for participation.

Instruments:

Researchers in this study employed two questionnaires: Demographics and TPB surveys. The demographic questionnaire consisted of eight categorical response-type items to collect information about the participants' makeup, such as students' gender, age, years in college, major, ethnicity and learning style. The TPB survey was adapted from Ajzen (2014) and modified to measure constructs predicting students' intention to use technology in their future classrooms. The TPB survey consisted of four sections: Attitudinal Beliefs, subjective norms, perceived behavioral control and intention.

Attitudinal Beliefs: This construct comprised of two items: students' perceived usefulness of using technology in their classrooms and perceived level of proficiency to use technology. The questionnaire was to solicit about students' perceived usefulness of technology tools they created or used during attending the technology integration course. For example, a question was: I would have no difficulty explaining why technology may or may not be beneficial. Students had the five-point Likert scale to choose from (1 = Strongly Disagree, 2 = Disagree, 3 = Neither Agree nor Disagree, 4 = Agree, 5 = Strongly Agree). Regarding students' perceived level of proficiency to use technology, students responded to several statements to solicit about their perceived level of proficiency. For example, a question was: Please list your level of proficiency with the following technology tool (technology tools they learned about, created or used during attending the course such as building educational website, etc.): Students' responses were measured using four-point Likert scale (1 = Never Use, 2 = Novice, 3 = Competent, 4 = Proficient).

Subjective norms: This construct comprised of three items: students' influence, superior influence and peer influence. Subjective norms: Students responded to several statements soliciting about the influence of their students, superior and peers on their decision to use technology in future classrooms. For example, a sample question was "My students will think it is important to use technology in my classroom", "My superiors will think it is important to use technology in my classroom" and "My peers will be using technology in their classrooms". Students can indicate their choices from five-point Likert scale (1 = Strongly Disagree, 2 = Disagree, 3 = Neither Agree nor Disagree, 4 = Agree, 5 = Strongly Agree).

Perceived behavioral control: This construct comprised of two items Students' learning autonomy and perceived self-efficacy. A sample question solicit about students' learning autonomy was "I am comfortable with using technology in teaching and learning". Students choose one from four-point Likert scale (1= not at all comfortable, 2 = a little comfortable, 3 = comfortable, 4 = Very comfortable). To solicit about students perceived self-efficacy, they were asked several questions to solicit about confidence to conduct different tasks related to integrating technology in a classroom. An example of a question was: "After concluding technology integration in teaching and learning in your content area: How certain are you that you can use technology your content area to increase productivity, promote creativity, and facilitate academic learning. Rate your degree of confidence by recording a number from zero to 100 using the scale given below". Students can indicate one from eleven-point Likert scale (1 = 0 cannot do at all to 11 = 100 highly certain can do).

Intention: Students' intention to use technology in their future classroom was addressed through several statements such as "I plan to use the following technology tool in my future classroom to supplement my students' learning". Tools include building educational website, cartoon strip, online collaboration, digital storytelling, digital flashcards, animation, podcast, instructional games, interactive whiteboard video, smart board lesson, social networking, and WebQuest. Students' responses were measured using true or false scale (1 = False, 2 = True).

Validity and Internal Reliability of the Measurement Instrument

The researcher assessed the construct validity of all used scales and found that all variables were significantly correlate to each other. The Pearson correlation coefficient was calculated for each scale, and it was positive and significant. The Cronbach's alpha internal consistency reliability ranged from 0.383 to 0.695.

Procedure

Students completed all surveys during the first week of the semester and then they attended a 15-week technology integration course. Students created projects and artifacts for all the learning topics. The final project was creating a personal e-portfolio to compile and present all projects created during the semester. At the end of the semester students completed a modified version of the same surveys they completed during the first week of the semester.

Results:

Data Preparation and screening: All eight variables were screened for incomplete or unengaged responses (students who answer the exact same value for every question on the survey leading to zero variance). Responses with more than 20% missing values and unengaged responses were removed from the data set. Responses less than 5% missing values were replaced with the median for ordinal scales and the mean for continuous scales.

Multiple regression assumptions: The regression descriptive statistics output was checked for multicollinearity assumption between predictor variables and found that correlations between variables were less than 0.7 and therefore none of included predictors has multicollinearity. Further, all predictor variables correlate with the outcome variable (student's intention) at a value greater than 0.3. The linear relationship between the independent variables and the dependent variable was checked through the probability plot and found that all points were following a straight line. Then the scatter plot was checked and found that regression standardized residual on the y-axis and the regression standardized predicted value on the x-axis within negative 3 to 3. Next the residuals statistics was checked through standard residual and found that standard residual the minimum -2.008 and the maximum 2.023. Finally, the Cooks Distance was checked and found that the minimum was .000 and the maximum .505 and it was less than 1. ANOVA table showed that there is statistical significance and therefore we reject the null hypothesis that the regression slope is 0. The researchers used the R-square (this research has small sample size 71 cases) and the dependent variable (intention) is normally distributed (Kolmogorov-Smirnova = .200).

Research Questions:

First question: To answer the first question "What factors best predict preservice teachers' intentions to integrate technologies in their future classrooms in a flipped teaching setting?" The investigators conducted multiple regression analysis to identify the unique variance predicted by independent variable.

Multiple Regression analysis: Regression finding: Multiple linear regression analysis was conducted to develop a model predicting preservice teachers' use of technology in future classrooms from their attitudinal beliefs, subjective norms, perceived behavioral control and intention. The predictor model was able to account for 44% of the variance in the dependent variable and was statistically significant at $p < .000$. Individual predictors were examined further, and the result indicated that out of the all independent variables, the only variable found not to be a significant predictor of

preservice teachers' use of technology in future classroom was students' attitude (t = -1.928, p = .059). Basic descriptive statistics and regression coefficients summarized in Tables 1 and 2.

Table 1

Standard Multiple Linear Regression of Students' Intention to Integrate Technology in their Future Classrooms Reported by Preservice Teachers in Technology Course based on their perception of their attitude toward technology usefulness, proficiency, peer, student and superior influences, learning autonomy and self-efficacy (n=61)

	PB Control		Sub Norms	Attitude	Intention	***β***	***Sig.***
PB Control		1				.251	.040
Sub Norms	Pearson	.573**	1			.558	.000
Attitude	Pearson	.225	.475**	1		-.215	.059
Intention	Pearson	.523**	.600**	.107	1		

Note. *** Correlations Coefficient p* < 0.01, ** p* < 0.05; Sig. Indicate the unique variance predicted by independent variable.

Table 2

Model Predictors: Attitude, Perceived Behavioral Control & Subjective Norms. Dependent Variable: Intention

					Change Statistics				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change
1	.666	.443	.414	9.619	.443	15.394	3	58	.000

Note: *The predictor model accounts for 44% of the variance in the dependent variable and was statistically significant at p < . 000.*

Second question: To answer the second question "Does flipped teaching method change preservice' teachers' intention, attitude and perceived behavioral control to use technology in their future classrooms?"

The investigators conducted a paired-samples t-test. The results show that the mean of all three variables at the end of the course did not differ significantly from the mean of all three variables prior to attending the course with flipped teaching method. These results suggest that the use flipped teaching method doesn't change preservice' teachers' intention, attitude and perceived behavioral control to use technology in their future classroom. Basic descriptive statistics and paired samples t-test summarized in Table 3.

Table 3

Basic descriptive statistics and paired samples t-test comparing preservice' teachers' perceived self-efficacy, perceived proficiency and intention to use technology in their future classrooms before and after (n=62)

	Mean	***Std. Deviation***	***Std. Error Mean***	**95% Confidence Interval of the Difference** Lower	Upper	***t***	***df***	***Sig***
Intention (B – A)	1.721	11.405	1.460	-1.200	4.642	1.179	60	.243
Attitude (B – A)	.197	13.313	1.705	-3.213	3.606	.115	60	.909
Behave. Ctr. (B – A)	-.049	13.203	1.690	-3.431	3.332	-.029	60	.9

	7
	7

Note. Intention, Attitude & Perceived behavior control (B – A): before & after

Discussion and scholarly significance of the study:

The purpose of the present study was to examine the effect of flipped teaching method on preservice teachers' intention to integrate technology in their future classrooms. The study found that the predictor model was able to account for 41% of the variance in students' intention to use technology and was statistically significant. The first question was to identify factors best predict preservice teachers' intentions to integrate technologies in their future classrooms. The results of the current study indicated that preservice teachers perceived behavioral control toward their intention to use technology is generally a better predictor of their attitude or subjective norm. These findings were demonstrated by the multiple linear regression results that indicated that although students' attitude, subjective norm and behavioral control account for a collective of 41% significant effect on their intention to use technology. The finding in this study is consistent with findings from other studies that concluded that perceived behavioral control and subjective norms are generally a better predictor of intention to act (Ahmad & Rainyee, 2014; Montano & Kasprzyk, 2015).

Furthermore, the results show that the mean of all three variables at the end of the course did not differ significantly from the mean of all three variables prior to attending the course using flipped teaching method. These results suggest that although the use of flipped teaching method can predict preservice teachers' intention to use of technology, it does not change their attitude and perceived behavioral control toward this behavior. One possible interpretation is that preservice teachers who are using personal technology, such as smartphone or personal computer tend to believe that they are familiar with the use of technology for teaching and learning and their self-reports on self-efficacy and attitude to use technology are inflated. This was evident when they reported high level of self-efficacy to use technology at the beginning of the technology course. However, after going through 15 weeks of the theory and practice of the science of technology integration in teaching, they reported lower level of attitude. The other interpretation is that preservice teachers who do have high level positive attitude are more likely to continue with the positive attitude throughout the semester and report positive attitude to integrate technology in their future classrooms. Therefore, the results of this study should be quite reassuring to those who believe that high self-efficacy and positive attitude produce positive intention and lead to the desirable act they are working to achieve.

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