



## Determinants of Teachers' Attitude toward Microlecture: Evidence from Elementary and Secondary Schools

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### ABSTRACT

We study the factors that determine teachers' behavioral intention to adopt microlecture. We collect 500 survey responses across elementary and secondary schools in China and propose a model based on three previous works: Technology Acceptance Model 3 (TAM 3), Innovation Diffusion Theory and Model of Personal Computer Utilization (MPCU). Our results show that perceived usefulness is a significant determinant for teachers' attitude toward microlecture. Perceived ease of use and output quality significantly influence perceived usefulness, with the latter being more significant. Additionally, external control and computer self-efficacy are found to be factors that influence perceived usefulness. External control is a more significant contributor to perceived usefulness. Overall, our model accounts for 57.1% of variability in teachers' intention to use microlecture. Out of 11 formulated hypotheses, 6 are supported by the data. The results provide valuable implications for ways to increase teachers' acceptance of microlecture.

**Keywords:** behavioral intention, microlecture, technology acceptance model, teachers in elementary and secondary schools

### INTRODUCTION

Microlecture is an innovative teaching approach that utilizes a short video presentation on a single, narrowly defined topic. Microlectures are designed to be combined with specific activities, assignments and discussions to engage learners. It is widely applied in online courses, blended or flipped learning. It has become a popular teaching tool both inside and outside of classroom in the United States. Microlecture is further promoted with the emergence of free lecture sites Khan Academy and TED-Ed, which offer short lectures in the form of online videos. The interests surrounding the use of microlecture has continued to grow from the United States to China. However, the response of the Chinese educator community is rather mixed. In particular, microlecture has been slow in reaching Chinese classrooms, where busy teachers are reluctant to take the plunge (Zhong 2015, He 2015, Shu 2015).

To facilitate the acceptance of microlecture among Chinese teachers, researchers investigate the contributing factors in microlecture adoption in China. Zhong (2015) draws on technology diffusion theory to study challenges and barriers in adopting microlecture. He (2015) analyzes various reasons behind the unpopularity of microlecture in China from three aspects including environmental factor, microlecture quality and teacher themselves. Dai and Ceng (2014) finds that Chinese teachers in general lack relevant computer skill, therefore are unwilling to adopt microlecture. Additionally, a number of current research reveals that perceived usefulness and

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#### State of the literature

- Recent studies analyze the contributing factors for microlecture adoption in China.
- These studies use theories (TAM, technology diffusion theory, etc.) to explain low acceptance of microlecture in China.
- Previous studies did not adopt an empirical approach.

#### Contribution of this paper to the literature

- This paper reconsiders the driving forces of teachers' adoption of microlecture in China.
- This paper conducts a quantitative analysis of the driving forces based on a theoretical framework.
- This empirical paper provides valuable implications for ways to increase teachers' acceptance of microlecture in China.

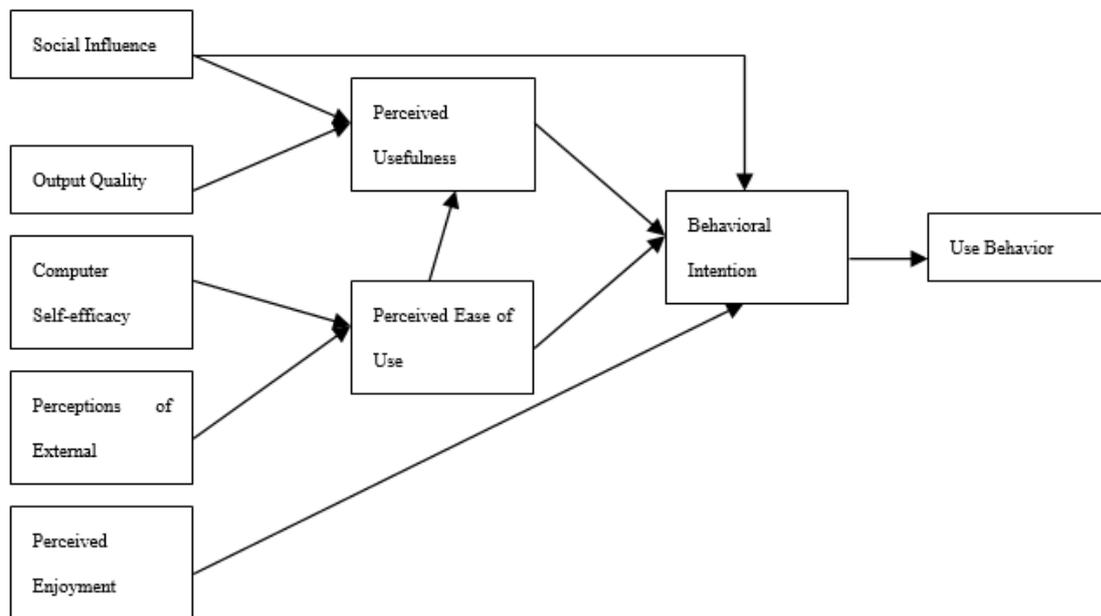
perceived ease of use affect education informatization. In particular, perceived usefulness is found to be a significant contributor to use of technology (Nair and Das 2012 and Moses et al. 2013). On the other hand, Kung-Teck et al. (2013) discovers that perceived ease of use, rather than perceive usefulness, has a significant impact on use of technology among teachers.

Since teachers' behavior is linked to student learning outcomes (Tan et al. 2012, Zhang and Mou 2013, Zhong 2015), it's extremely important for school administrators, educators and parents to understand the driving forces of teachers' adoption of microlecture. We intend to investigate this issue by forming a theoretical framework and then conducting a quantitative analysis. To our best knowledge, this paper is the first empirical research, which applies a conceptual model to explain teachers' intention to adopt microlecture. Our empirical results provide valuable policy implications as to promote microlecture in Chinese schools.

### RESEARCH MODEL AND HYPOTHESIS DEVELOPMENT

We propose our research model based on technology acceptance model (TAM) 3 (Venkatesh and Bala, 2008), innovation diffusion theory (Rogers, 1995), and the model of personal computer utilization (Thompson et al., 1991). First, TAM is a theory that models how users accept and use a technology (Davis 1989). The model suggests that a couple of factors affect users' decision to adopt a technology: perceived usefulness (PU) and perceived ease of use (PEOU). The TAM is further updated by Venkatesh and Bala (2008) in the context of information technologies by including four different types of determinants of perceived usefulness and perceived ease of use: individual differences, system characteristics, social influence, and facilitating conditions. Second, innovation diffusion theory is developed by Rogers (1995), in which he introduces five different attributes of innovations: (1) relative advantage, (2) compatibility, (3) complexity, (4) trialability, and (5) observability. Lastly, Thompson et al. (1991) find that social norms and three components of expected consequences (complexity of use, fit between job and PC capabilities, and long-term consequences) strongly influence PC utilization.

Drawing on three different theoretical paradigms, we formulate our research model specifically for use of microlecture as shown in [Figure 1](#). The proposed model suggests that perceived usefulness and perceived ease of use are main contributors to behavioral intention (BI), which in turns relates to the use behavior (USE) of microlecture. In particular, we identify social influence (SI) and output quality (OUT) to be the determinants of perceived usefulness. As suggested in previous works (Venkatech and Bala ,2008; Rogers,1995; Thompson et al. 1991), computer self-efficacy (CSE), complexity (CO), and perceptions of external control (PEC) are theorized as factors that influence perceived ease of use. Moreover, a system characteristic "perceived enjoyment" (ENJ) as well as social influence helps determine behavioral intention. We also suggest that perceived ease of use plays a role in determining perceived usefulness.



**Figure 1.** Determinants of Use of Microlecture

As suggested in Davis (1989) and Venkatesh (2008), behavioral intention toward a technology serves as a predictor for use behavior. Therefore, we develop the first hypothesis.

**H1: Teachers' Behavioral intention toward microlecture positively influences use behavior.**

The model suggests four predictors for behavioral intention. They are social influence, perceived usefulness, perceived ease of use, and perceived enjoyment. First, social influence has been found to influence behavioral intention toward a technology (Shi, 2001; Venkatesh, 2008). Social influence accounts for various social mechanisms that advise individuals to form perceptions of various aspects of a technology (Venkatesh and Davis, 2000). For instance, if school decision makers are promoting microlecture, it is to the teachers' best advantage to adopt it since their evaluations might suffer if they turn against leaders' will. In addition, if a large number of colleagues begin to use microlecture inside the classroom, peer pressure would negatively affect teachers who are reluctant to use microlecture.

Second, perceived usefulness and perceived ease of use are theorized and tested as factors that influence behavioral intention toward a technology (Venkatech, 2008; Kung-Teck et al., 2013; Cai and Duan, 2016). Perceived usefulness is defined as the extent to which a person believes that using a technology will improve his/her performance. Teachers' intention greatly enhances as they believe microlecture would help them improve teaching performance both inside and outside classroom. Perceived ease of use is related to the degree to which a person believes that using a technology will be effortless. A steep learning curve would discourage teacher from using microlecture.

Third, Perceived enjoyment is found to be an important determinant to behavioral intention toward technology (Webster, 1992; Martocchio, 2004; Moon, 2001, Tan et al., 2013). Venkatech (2008) introduces perceived enjoyment as the degree to which "the activity of using a specific system is perceived to be enjoyable in its own right, apart from any performance consequences resulting from system use." A teacher is more likely to adopt microlecture if he or she deems such activity an enjoyable and pleasurable experience. Therefore, we developed the following hypotheses:

**H2: Perceived usefulness positively influences teachers' behavioral intention to use microlecture.**

**H3: Social influence positively impacts teachers' behavior intention to adopt microlecture.**

**H4: Perceived ease of use positively influences teachers' behavioral intention to adopt microlecture.**

**H5: Perceived enjoyment positively influences teachers' behavioral intention to adopt microlecture.**

Three constructs are theorized to affect perceived usefulness: social influence, output quality, and perceived ease of use. First, social influence is proposed to predict perceived usefulness (Venkatesh, 2008; Shi, 2001; Li et al., 2016; Cai and Duan, 2016). Teachers' perceived usefulness of microlecture increases as more colleagues begin to adopt microlecture. Second, output quality plays a role in affecting perceived usefulness. Output quality is defined as the degree to which an individual believes that the system performs his or her job tasks well (Venkatesh & Davis, 2000). If a teacher believes that microlecture would improve his or her teaching performance and evaluation, potentially tied to promotion and salary increase, he or she would perceive microlecture as a useful activity. This is consistent with current research findings (Venkatesh, 2008; Fang, 2015; Fang, 2016). Lastly, when microlecture becomes effortless to adopt, teachers are able and more likely to recognize the usefulness of such approach (Nair & Das, 2012; Moses et al., 2013; Kung-Teck et al., 2013; Tan et al., 2013). Therefore, we developed the next three hypotheses:

**H6: Social influence positively influences perceived usefulness.**

**H7: Output quality positively influences perceived usefulness.**

**H8: Perceived ease of use positively influences perceived usefulness.**

As suggested in the model, three constructs are contributors to perceived ease of use: computer self-efficacy, complexity and perceptions of external control.

First, it has been proved computer self-efficacy significantly influences perceived ease of use of information technology (Venkatesh, 2008; Fang, 2016). Computer self-efficacy refers to individuals' beliefs regarding his or her personal ability to use a system. Bandura (1970) finds that if an individual realizes an action may result a consequence, he or she would choose the action accordingly. When a teacher is proficient with computers, he or she would be more confident and comfortable to use microlecture in classrooms, thus leading to an increase in perceived ease of use of microlecture.

Second, microlecture may not be easy to implement. Effective and successful use of microlectures in a classroom environment requires a significant amount of planning. Teachers interested in creating microlectures should also acquire basic skills in video or audio recording, screen recording, and video editing. Complexity is defined as the extent to which an innovation is perceived as relatively difficult to understand and use. Teachers' perceived ease of use would drop as a result of a rise in perceived difficulty level.

Third, perceptions of external control are found to significantly influence perceived ease of use of information technology (Venkatesh, 2008; Fang, 2016). Perceptions of external control are associated with individuals' beliefs regarding the availability of organizational resources and support structure to facilitate the use of a system. If teachers are provided with ample guidance and support on the use of microlecture, their perceived level of difficulty would significantly lower.

Our hypotheses are formed as follows:

**H9: Computer self-efficacy positively influences teachers' use behavior.**

**H10: Complexity negatively influences perceived ease of use.**

**H11: Perceptions of external control positively influences teachers' use behavior.**

## METHODOLOGY

This study used a stratified random sampling technique to collect data. The participants in this study were 500 teachers at elementary, middle and high schools, located in the East and Northwest, China. We report data from 415 participants, because 85 participants were removed due to missing responses. 42.9% of respondents are males and 57.1% are females, and their title ranks and course subjects varied. Among the participants, 27.3% of teachers taught engineering courses, 31.8% taught science courses, and 39.8% taught art classes. In regards to title ranks, secondary school teachers in China move through a clear career hierarchy. They begin at a second-rank level and then can move to first rank, to senior rank and higher. 16.7 % of the secondary school participants are at or above senior rank while 14.3% and 15.1% are at second-rank and first-rank level respectively. Elementary schools teachers count 28.9% of the total respondents.

The survey instrument contained 2-4 items for each of the 9 constructs adapted from previous studies (Appendix). The survey measured participants' perceptions with a 5-level Likert scales, ranging from strongly disagree to strongly agree. This study consisted of two parts. First, the participants were asked to provide general information (e.g., gender, academic rank and course subject). Second, they complete a survey about their perceptions on microlecture.

**Table 1.** Results for Convergent Validity

Constructs	Mean	Std dev	Factor loadings	Cronbach $\alpha$	Composite Reliability	Average Variance Extracted
USE1	3.2286	1.10896	0.723	0.833	0.8374	0.6351
USE2	3.4048	1.01330	0.925			
USE3	3.7048	.90637	0.726			
BI1	3.7381	.95995	0.819	0.808	0.8455	0.6474
BI2	3.8762	.91970	0.778			
BI3	3.7810	.75749	0.737			
PU1	3.6048	.91817	0.736	0.803	0.824	0.6101
PU2	3.5000	.88718	0.836			
PU3	3.6429	.86454	0.768			
SI1	3.4095	.89331	3.4095	0.834	0.8342	0.6266
SI2	3.5095	.88712	3.5095			
SI3	3.4333	.87923	3.4333			
OUT1	3.3619	.98432	0.761	0.771	0.8634	0.6134
OUT2	3.5095	.87627	0.861			
OUT3	3.5190	.87612	0.769			
OUT4	3.5286	.84244	0.736			
PEOU1	3.1667	1.04256	0.830	0.834	0.8539	0.5943
PEOU2	3.0571	1.07453	0.738			
PEOU3	3.0667	1.03310	0.789			
PEOU4	2.7143	1.10859	0.722			
CSE1	3.3286	.96426	0.762	0.751	0.8254	0.6126
CSE2	3.3619	.89254	0.845			
CSE3	3.5095	.80810	0.737			
PEC1	2.9476	1.08585	0.849	0.828	0.9035	0.7012
PEC2	2.9857	1.10449	0.840			
PEC3	3.2667	1.03310	0.881			
PEC4	3.3667	.93514	0.776			
CO1	3.8476	.72258	0.732	0.742	0.7775	0.5382
CO2	3.8857	.72961	0.709			
CO3	3.8810	.74508	0.759			
ENJ1	3.3762	.94155	0.812	0.871	0.6936	0.8716
ENJ2	3.4095	.87709	0.855			
ENJ3	3.4048	.89815	0.831			

**Table 2.** Discriminant Validity Results

Construct	USE	BI	PU	OUT	PEOU	SI	PEC	CSE	ENJ
USE	.797								
BI	.457	.806							
PU	.395	.544	.781						
OUT	.345	.222	.275	.783					
PEOU	.439	.312	.294	.472	.771				
SI	.475	.315	.268	.369	.420	.792			
PEC	.542	.336	.320	.367	.498	.585	.837		
CSE	.448	.331	.299	.348	.383	.537	.510	.783	
ENJ	.417	.406	.306	.255	.321	.453	.544	.606	.933

**Table 3.** Model Fit

Fit Indices	X2/df	GFI	RMR	RMSEA	AGFI	NFI	CFI	IFI	AIC	ECVI
Recommended Threshold	<3.0	>0.9	<0.5	<0.1	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9
Values	2.149	0.967	0.250	0.086	0.914	0.974	0.949	0.925	576.41	7.543
Fit?(Y/N)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

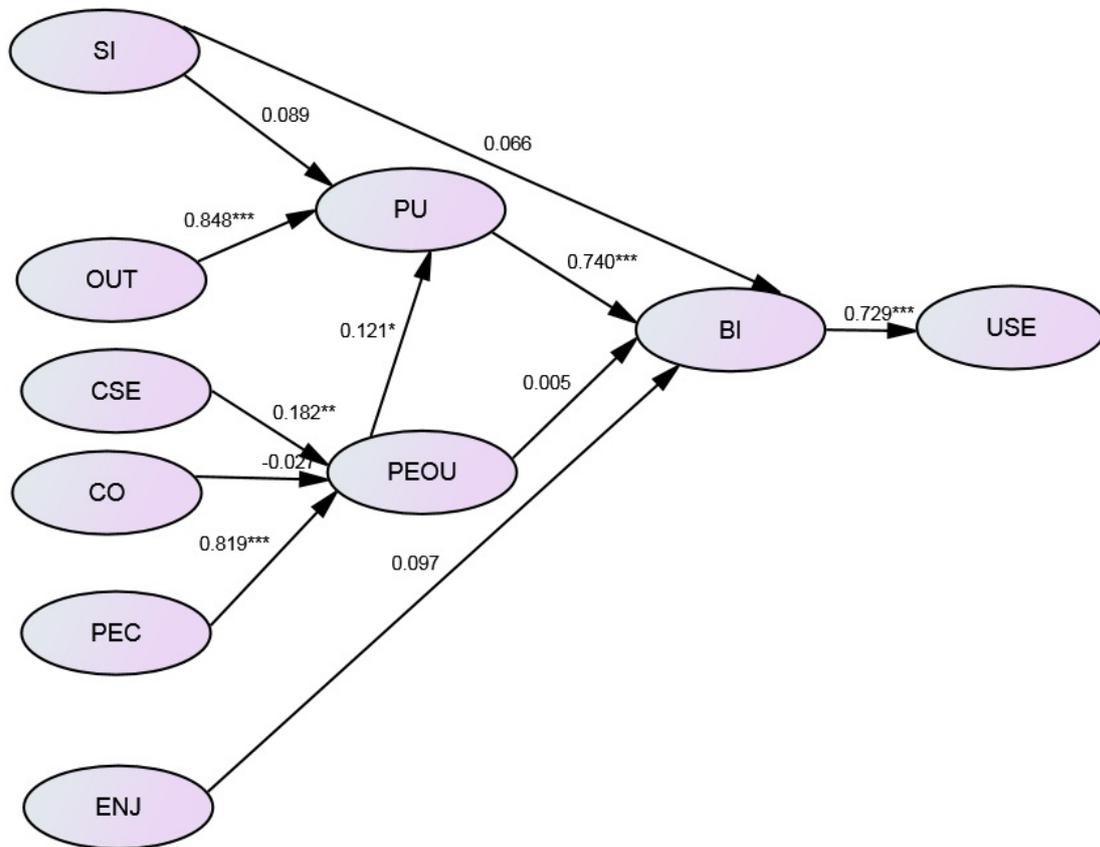
This study used structural equation modeling program in AMOS21.0 to test the model. **Table 1** presents a summary of the Cronbach's a, standardized factor loadings, composite reliability, and average variance extracted. As shown in **Table 1**, all values of the Cronbach's a exceed 0.7, showing satisfactory reliability for all constructs. There are two types of validities to be assessed: convergent validity and discriminant validity. Three measures are associated with convergent validity: a) factor loadings of each construct, b) composite reliability, and c) average variance extracted (AVE). Confirmatory factor analysis shows that factor loads of all items lie between 0.7 and 0.9, above the recommended criteria 0.7. For composite reliability, all values exceeded 0.7, the recommended threshold. Moreover, all values of average extracted variance surpass 0.5.

To establish discriminant validity, we need to show that measures that should not be related are in reality not related. As shown in **Table 2**, the square root of AVE is greater than the cross-construct correlation, indicating satisfactory discriminant validity.

Rong (2009) recommended a variety of model fit measures when determining model fit. **Table 3** presents several model fits as well as the recommended thresholds. All model fits exceeded the recommend level of acceptable fit. The results indicate the proposed model has a good fit.

## RESULTS

**Figure 2** shows the graphical description of the results of path coefficients. Consistent with hypothesis 1, teachers' behavioral intention toward microlecture significantly impacts use behavior. Between perceived usefulness and perceived ease of use, the former is found to significantly influence behavioral intention with 0.74. The result supports hypothesis 2. In addition, output quality and perceived ease of use are found to significantly impact perceived usefulness with 0.848 and 0.121, respectively. Hence hypotheses 7 and 8 are supported. In particular, output quality is a more significant impact on perceived usefulness. Finally, both perception of external control and computer self-efficacy are significantly associated with perceived ease of use with 0.819 and 0.182, respectively. Therefore, the results are consistent with hypotheses 9 and 11. Perception of external control is the most significant contributor to perceived ease of use.



(\*p<0.05, \*\*p<0.01, \*\*\*p<0.001)

**Figure 2.** Path Graph

**Table 4.** Means of Constructs

Constructs	USE	BI	PU	PEOU	SI	OUT	CSE	CO	PEC
Mean Likert Scale Score	3.4	3.8	3.6	3.0	3.5	3.5	3.4	3.9	3.1
Percentage Score	68.9	76.0	71.7	60.0	69.0	69.6	68.0	77.4	62.8

Overall, our model accounts for 57.1% of variability in teachers’ intention to use microlecture, 74.2% and 70.5% of variability in perceived usefulness and perceived ease of use respectively.

### DISCUSSION

**Table 4** shows the mean Likert scale scores of all 9 survey items. The values range from 3.0 to 3.9 on a 1-5 scale. Perceived complexity has the highest score of 3.9. This is consistent with the belief that microlecture requires teachers to work through many time-consuming learning curves. Perceived ease of use scores the lowest with 3.0, indicating subjects in our study may not be knowledgeable about microlecture.

The findings of this study have significant implications in the perspective of research on teachers’ attitude toward microlecture. Our study provides further evidence on the appropriateness of using the TAM 3 model to measure the different dimensions of adoption of microlecture at schools. Two behavioral beliefs - namely perceived ease of use and perceived usefulness - well explain the adoption of microlecture. Additionally, factors such as computer self-efficacy, perceived external control, and output quality are key factors affecting the adoption of microlecture.

The proposed model of microlecture adoption describes a number of factors affecting teachers' use of microlecture in elementary and secondary schools in China. Thus, decision-makers in schools can manipulate those factors to facilitate teachers' involvement and use of microlecture. Particularly, our results about the importance of perceptions of external control suggest that administrators of schools enhance perceptions of external control and improve teachers' attitude toward microlecture by providing funding opportunities and training workshops to learn and implement microlecture in teaching. Moreover, as the results of our study shows, output quality is deemed more important than perceived ease of use, school administrators can link the adoption of microlecture to teachers' evaluations and promotions. In addition, a microlecture learning platform should be developed so that teachers can share resources, tools and examples of best practice on microlecture.

As suggested in Venkatesh and Bala (2008), the influential factors of use of a system might vary over time. Anchoring factors might play a bigger role in the early period while subjective experience might weigh more as time goes by. We intend to study such time effect in our future work. Additionally, we intend to increase the sample size by adding responses from college and university faculty in China, thereby creating a more complete picture of the actual use of microlecture in China's education system.

## CONCLUSION

This study examines the driving forces affecting Chinese elementary and secondary school teachers' attitude toward microlecture. The results show that 57.1% of intention to adopt microlecture is explained by our proposed model. The significant factors are perceived usefulness, perceived ease of use, output quality, perceived external control, and computer self-efficacy. The findings of the study suggest practical implications for decision makers of schools in China. To encourage teachers to accept microlecture, a teacher development platform should be proposed. Schools should also provide technical assistance, informational workshops, funding opportunities, as well as promotion incentives for teachers to develop microlecture.

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