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Teacher Attitude and Preparation for Technology Innovation: A Case Study of 1:1 Laptop Initiative

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Abstract: The success of one-to-one laptop learning initiative in a school largely depends on support and acceptance by teachers. Teacher's technological skills also play an important role in the implementation of one-to-one laptop learning initiative. This research, conducted in a middle school located in Beijing, China, investigated teacher attitude and technology preparation for the upcoming one-to-one laptop learning initiative. Research data were collected by interviews and surveys during the training before the commencement of the initiative. According to the data, most teachers acknowledged the effectiveness of laptop to teaching and learning, and showed great enthusiasm toward the technology innovation. Meanwhile, some doubts were expressed toward new pedagogy and class management strategies. And there existed attitude difference between different subject teachers. Based on the surveys, most teachers were familiar with only one specific operating system and can use PC proficiently. The findings of this research provide valuable planning framework and suggestions for the schools and educators that want to launch one-to-one laptop learning initiative.
Keywords: Teacher Attitude, Technology Innovation, One-to-one Laptop Initiatives, Classroom teaching

1. Introduction

Due to the development and diffusion of information and communication technologies, we have witnessed the greatest change in the domain of education. Ubiquitous computing and mobile technology make it possible that every student can have one laptop for his/her own use with 24-7 internet access. Not surprisingly, over the last ten years the emergence of one-to-one programs has grown increasingly in popularity. More and more schools around the worlds are implementing one-to-one programs as a means for increasing student achievement and performance. There is no doubt that one-to-one laptop initiatives have the potential to significantly impact education, especially classroom instruction. More importantly, we have to confront another question: are teachers prepared for the upcoming changes and able to handle all the technological challenges. From traditional teacher-lecturing-and-student-listening classroom to laptop and Internet supported learning environment, teaching styles are changing. Concerns of change by a teacher will definitely influence the integrating use of technology into the classroom.

2. Factors influencing 1:1 laptop learning initiative

Based on Ely's research on technology integration and a review of existing literature, he proposed eight conditions that facilitate the implementation of educational technology innovations: dissatisfaction with the status quo, knowledge and skills, adequate resources, time, rewards or incentives, participation, commitment, and leadership (Ely, 1990, 1999). These conditions can greatly influence the effect of technology innovation and even decide

whether the innovation is likely to succeed or not based on the number of conditions present. We know from prior research on innovation adoption that successful implementation is deeply rooted in an understanding of the concerns of the individuals delivering the innovation (Hall&Hord, 2001). Obstacles to change such as inadequate educational resources, not enough training time, and lack of leadership support have been excuses for not implementing new technology in schools.

When it comes to 1:1 laptop initiatives, many researches showed wide range of factors that can affect the success of this type of technology innovation. Those factors include both school- and teacher level ones, such as professional development, availability of resources and technical support, teacher readiness to integrate technology, and teacher beliefs and attitudes (Inan, Lowther, 2010).

3. Conceptual framework

All teachers cannot be expected to be excited about laptop initiatives. Although some teachers might be enthusiastic about the creative use of laptop in teaching, others might be reluctant because they might not have the confidence in using the laptop in classroom teaching. The Technological Pedagogical Content Knowledge approach proposed by Misha and Koehler (2003a, 2003b) showed that teachers connect technology with content and knowledge. The Figure 1 demonstrates the complex knowledge system that teachers have to possess for the successful technology integration.

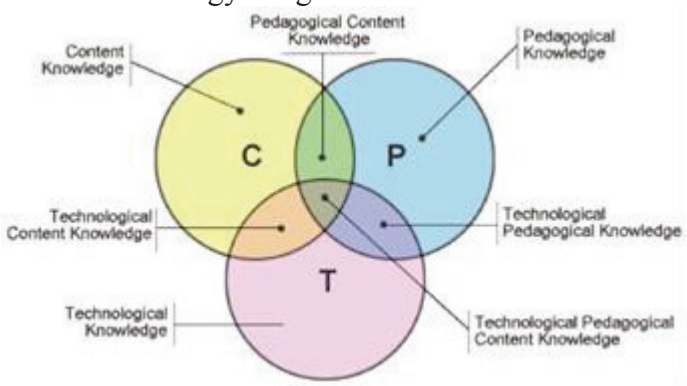

Figure 1. TPCK (Mishra & Koehler, 2003a, 2003b).

According to TPCK, it is very important to provide teachers who will participate in the technology innovation programs with exposure to educational technology professional development and require them to attend sessions. Sufficient pre-program preparations for teachers' confidence and self-efficacy with technology can greatly affect the result of technology programs in school. Getting teachers started in their use of technology and establishing an expectation of applying integration strategies may be all that most teachers need (Yost, 2007). However, teacher competency in using specific hardware and software used to be the focus of former educational technology professional development. More and more researches supported the professional models that can expand teachers' knowledge, skill and confidence in integrating use of technology in their classroom teaching activities (Borthwick & Pierson, 2008).

Hence, we think effective training and appropriate professional development are the important factors to promote teachers' attitude and preparation, which meanwhile can be the crucial factor to the success of technology innovation in schools. The following research will carry on under that conceptual framework (shown in figure 2).

Figure 2. The research conceptual framework

4. Method

4.1 Participants

The participants are 18 teachers from The High School Affiliated to Renmin University of China (abbreviated to RDFZ) Xishan School in Beijing, China. RDFZ Xishan School is a public middle school with many educational reform thoughts. The one-to-one laptop initiative was enthusiastically propelled by the school leaders. The initial implementation planned to begin at September, 2010 including 70 students at the 7th grade and 18 teachers of several subjects, such as Chinese language, mathematics, English, history, biology, art, geography, psychology. A two-day training was carried out by the researchers in the school with specifically designed courses. All the program teachers participated in the training in August, 2010. All the teachers can PC for daily work, but none of them had experience of teaching in 1:1 laptop classroom. The laptop for the program is Apple MacBook, which was completely unfamiliar to all the teachers. 2 of the teachers had taken a laptop computer skill training from the technology company 4 months before the pre-program training.

4.2 Data collection

A mixed method was applied to collect teachers' attitude and concerns of 1:1 laptop initiatives. The researcher interviewed 5 teachers during the break time of the training, including one teacher who had taken new laptop technology training before. A questionnaire was designed based on the result of teacher interviews. Five teachers took the interview during the training while the survey was conducted at the end of the training for all the program teachers.

The interview outline was composed of following questions:

- How do you think about the technology innovation in the school?
- How would you expect the integrating use of laptop will influence your pedagogy?
- Do you have any ideas of how to implement laptop integrating use in classroom?
- What is your biggest concern of the 1:1 laptop initiative in the school?
- How do you think of your laptop computer skills? Can you use laptop expertly?
- Are you familiar with the new type of laptop and new software?
- Are you comfort with the scenarios of one student with one laptop?
- Do you think you are technically ready for the 1:1 laptop initiative?

During the interview session, teachers responded to these open-ended questions. Teachers' responses were written down by the researchers.The questionnaire includes 16 items about teachers' attitude toward the effect of laptop using in the classroom teaching.

5. Results

After reading and analyzing interview transcriptions, data analyses resulted in the following themes: great enthusiasm of the forthcoming program, excitement of the new pedagogy, concern about the classroom management, anxiety of different laptop computer.

The interview was conducted after the first day training lectures. The training lectures were about digital instructional design and new teaching models for 1:1 laptop class. Teachers were very excited about the new program. Some of the teachers described the laptop use could become an opportunity for fulfilling their 21st century education ideal. Some teachers talked about using laptop to foster students' 21st century skills, showing great active, embracing attitude about technology innovation. Several teachers however were more conservative about the laptop use in classroom. These teachers would like to stick to their conventional teaching method. They admitted the advantages of laptop for students, but they were very uncertain about the new pedagogy for 1:1 laptop classroom. Almost 5 teachers, including the one had learned how to use Apple MacBook laptop said they were very unfamiliar with the new laptop. One teacher even insisted that school should use PC instead of Mac. All the interviewed teachers said they would feel very confident about their computer skills if the program laptop were PC.

14 items of the questionnaire use 4-range answers to show teachers' attitude of laptop use in class. The results are shown in table 1. According to the results, all the 18 teachers confirmed the positive influence of laptop use on 5 items, which are: effect of teaching and learning, teaching efficiency, students' learning motivation, involvement in learning, and knowledge extent. This result showed all program teachers' great optimism and confidence of the laptop initiative.

The other positive influence teachers would like see are test scores, communications between students and teachers in classroom, understand of learning content. The percentage of teachers to support these influence is 92.8%. And 71.4% teachers thought positively about the knowledge sustain by laptop use in class.

Among the negative influences, the most concerned issue is teachers' workload. 64.3% teachers thought laptop will increase their workload. Teachers said that they would spend more time on instructional design, preparing the learning resources. But there are still 21.4% of teachers thought laptop can make their teaching much easier because of the teaching assisted software. We can see that technology competence is the factor that effect teachers' attitude.

Another issue teachers are worried about is students' attention. 14.3% teachers thought laptop would become a distraction in class. But 85.7% teachers thought they can use more interesting learning tasks and classroom management strategies to "draw back" students from non-learning related activities.

Items	Increase	Decrease	No Influence	Uncertain
*Effect of classroom teaching & learning	100%	0	0	0

Students' standardized test score	92.8%	7.2%	0	0
Teachers workload	64.3%	21.4%	7.1%	7.1%
*Teaching efficiency	100%	0	0	0
Teaching pace	64.3%	0	28.6%	7.1%
Communication between teacher &students	92.8%	7.2%	0	0
*Students' learning motivation	100%	0	0	0
Students' attention	85.7%	14.3%	0	0
Students' understanding of the learning content	92.8%	0	7.2%	0
Students' knowledge sustain	71.4%	0	28.6%	0
*Students' involvement in learning	100%	0	0	0
*Broadening knowledge extent	100%	0	0	0
Students' enrollment rate to high school	71.5%	7.2%	7.2%	14.1%

Table 1. teachers' attitude of laptop use in class

Generally speaking, program teachers from RDFZ, Xishan School hold a very positive attitude toward the up-coming 1:1 laptop initiative. Besides of support of school leaders, the pre-program training would be thought as another essential reason. After the interview, the researchers adjusted the form of training. Simulating-classroom teaching workshop took place the original lectures. Teachers were asked to practice what they have learned in the previous lectures. Digital instructional design and new teaching models were the focus of all program teachers. They implemented the new design methods and teaching models during the workshop session, and discussed the effectiveness of the instructional design and teaching models. The adjustment of the training course was friendly accepted and thought highly helpful by all the program teachers.

Chart 1 shows that teachers of different subjects use laptop in their teaching with different frequencies. Only 28.6% teachers thought laptop use is very frequent for the subjects they teach. While there are still 28.5% teachers who thought other teachers of the subject rarely use laptop in class. 35.7% teachers think laptop use is an occasional activity for their subject teaching. The explanation for this result could be the features of different subjects will be taken into great consideration when it comes to laptop use in class.

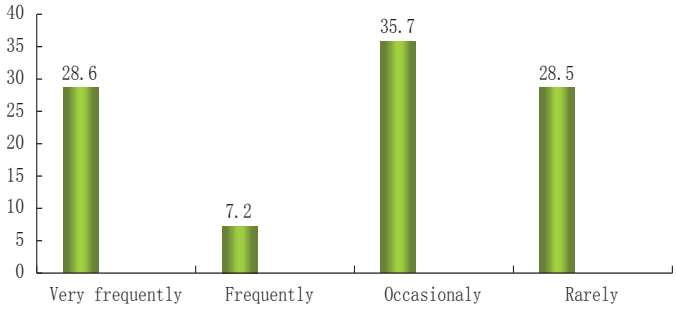

Chart 1. Teacher perception of the laptop integrating use in the subject teaching

According to the survey result (shown in chart 2), teachers planned to use laptop in their classroom for different amount of time. Only 7.2% teachers would like let students use laptop for a whole class. Over 70% of the program teachers would not use laptop more than half of class time. The result brings a very key question: will it be necessary for students to use laptop for the whole class? Another question worthy of further discussion is: what kind

of teaching and learning activities we employ in the laptop classroom.

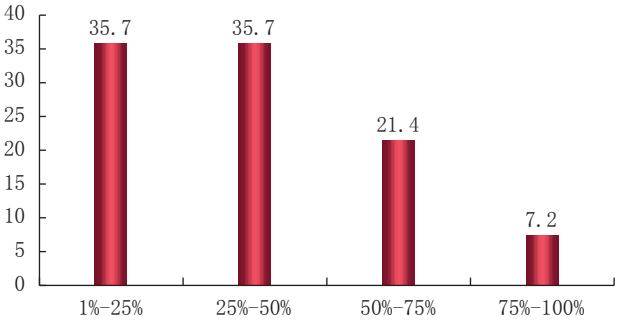

Chart 2. The amount of time that teachers plan to carry out laptop learning in class

6. Discussion

Implementing 1:1 laptop initiatives in schools is a huge step in bridging the digital gap. The excitement of this kind of technology innovation needs to be appreciated by all the teachers because they are not only the crucial factor of successful implementation, but also an important part of the technology innovation in education. As long as teachers feel they are embraced by the innovation programs, they can completely engage in their everyday teaching with technology. The first stage of programs should improve teacher attitude and gain their support. Teachers not only need technology skills, but also should attain advice and help about the pedagogy and beliefs toward technology innovation. Before the commencement of 1:1 laptop initiatives, teacher training must be carefully planned and conducted. The content of the training should be designed specifically, including all the technology skills based on teachers' need and the professional development plans. Teachers will feel confident about teaching in a 1:1 laptop classroom with tacit

In this study, the researchers proposed an experiential training framework for the pre-program teachers, showed in Figure 3. The training takes on the form of a three-step-circle workshop. First step is watching. Teachers will be organized to watch and discuss some successful laptop teaching class videos. Secondly, after taking training course of technology and pedagogy, teachers will try to practice the teaching strategies and experiences they learned in their own class. Thirdly, teachers will write reflection of their teaching practice in the workshop and obtain advice and help from experts and program researchers.

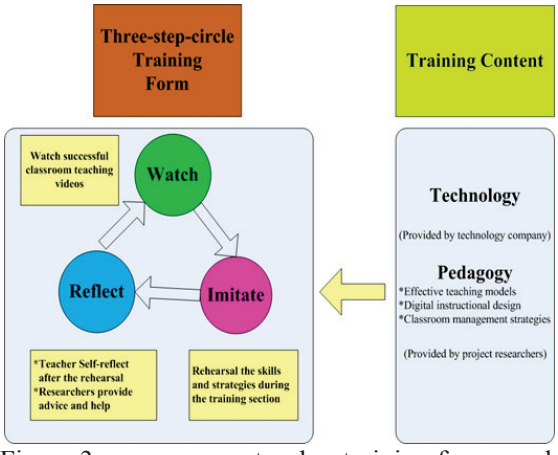

Figure 3. pre-program teacher training framework

Educational technology professional development also plays an important role in the implementation of technology innovation. Only pre-program training is far from enough to motivate teachers' support and passion toward technology innovation. High-quality professional development, no matter small or large, may have different goals, but all should be planned to convince teachers to involve, learn, and then constantly use technology and instructional strategies in their daily work. Professional development also can be achieved in many different ways. Training (pedagogy and technology), workshop, school-based researches are some examples of commonly recognized professional development forms, and not all of them are equally suitable for every school. Therefore, schools that want to start 1:1 laptop initiatives must find the most appropriate professional development of their own.

According to the interview and survey results, we designed a systematic professional development 3-year-plan (shown in Table 2) for the program teachers of RDFZ Xishan School. The plan includes six sections with the different sub-goals for every section. The six sections have covered six aspects of teachers' concerns of the 1:1 laptop initiatives while the forms are flexible. The plan will be carried out through the whole process of the 1:1 laptop initiative, assuring teachers will reach out help and advice any time they need them.

Section	Content
Understanding the Program	● Plan Goal, Vision of the Program
Constructing Digital Learning Environment	● Laptop computer skills ● Teaching and Learning Software ● Web-based educational platform ● Multimedia information technology
Digital Pedagogy	● Instructional design for 1:1 laptop learning ● 5-step innovation teaching model for middle school ● Learning resources design ● Evaluation and reflection
Information Technology Integrating Use	● Theory of information technology integration ● Case study of classes with successful information technology integration ● Problem-based learning in 1:1 laptop scenario
Teaching and Learning In 1:1 Environment	● Classroom management strategies and cultures for 1:1 laptop learning ● Fostering students' 21st century literacy ● Nursing students' creative thinking skills ● Bridging the digital gap between students

Thinking and Working Like A Researcher	• 21st century teacher professional development • Introduction of educational research • How to conduct research and write research papers

Table 2. Professional development plan

7. Conclusion

Successful implementation of one-to-one project is deeply rooted in an understanding of teachers. Obstacles such as inadequate technology skills, not enough training time, and lack of new pedagogical support have been causes for one-to-one project failures. Hence, the design and practice of professional development plan must maintain consistency with teachers' needs in a very specific school.

This research, conducted in a middle school located in Beijing, China, investigated teacher attitude and technology preparation for the upcoming one-to-one laptop learning initiative. Research data were collected by interviews and surveys during the training before the commencement of the initiative. According to the surveys and interviews, teachers of program school hold a very positive attitude toward the up-coming 1:1 laptop initiative. This result will become a positive factor for the implementation of the project. Otherwise, additional work should be carried out to promote teachers' attitude. Teacher training should be innovative, flexible and updated according to the teachers feedback of pre-program training. After analyzing the data, the researchers proposed an experiential training framework for teachers and a designed a systematic professional development 3-year-plan. This professional development should be altered to meet different schools concrete requirement.

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