

# Teachers as multimedia designers? Rethinking prospective teachers making multimedia learning packages

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## Abstract

*This paper discusses the perceived usefulness to practicing teachers of making multimedia learning packages during pre-service training, and reports on their self-reported practices of multimedia design. The discussion is based on the partial findings of a survey on 4,287 Singapore teachers who completed Instructional Technology, a compulsory course that all pre-service teachers take prior to joining the teaching force, in the period of 1999–2001. The result shows that the majority of the teachers think it is useful or somewhat useful to learn to create multimedia learning materials. However, the degree of perceived usefulness varies among the teachers at different school levels. Teachers teaching at lower grades (Grades 1–6) tend to be more positive about the experience than their counterparts teaching at higher grades, especially those teaching at Grades 11–12. Regardless of the views held, the majority of the respondents (68.9%) never create any multimedia learning packages for their students.*

## Keywords

*teacher education, pre-service teacher training, multimedia design, constructivist learning*

## Introduction

As a national effort in equipping its youth with skills necessary for the 21st century, Singapore's Ministry of Education launched two master plans for using ICT in education in 1997 and 2001 respectively. Under such schemes, pre-service teachers are required to master basic ICT skills and pedagogies necessary for using ICT in teaching. Instructional Technology is one of the core courses that prospective teachers are required to take to achieve the required basic skills. The course attempts to intertwine the learning of pedagogies with that of technical skills, and it also emphasises the learning of multimedia design and creation by prospective teachers. This paper reports on partial findings of a survey study, with the focus on the investigation of teachers' transferring the skills and knowledge of multimedia design to classrooms.

## Theoretical framework

The past decade saw unprecedented development in information and communication technologies (ICT), and increasing dollars being spent on training prospective teachers to use ICT for teaching. However, computers have not transformed the instructional practices of the majority of teachers (Becker, 2000; Cuban, 1993; 2001). The ability of teachers to use ICT in classroom instruction lags behind access to ICT in schools (Haymore & Reilly, 2004). As commented by Fullan and Stiegelbauer (1991), it is "frustratingly wasteful as the thousands of workshops and conferences that led to no significant change in practice when the teachers returned to their classrooms" (p. 315).

Teachers are the driving force in integrating ICT into teaching and learning, and they decide "the eventual success or lack of success of any computers-in-education initiative" (Collis, 1996, p. 22). Initial teacher training programmes play a vital role in preparing future teachers to use ICT for teaching and learning activities. Learning theorists claim that when learning is situated in meaningful contexts, learners tend to remember the information better (Brown, Collins & Duguid, 1989; Cognition and Technology Group at Vanderbilt, 1991). For this reason, learning may be enhanced if ICT skill training is related to the curriculum that prospective teachers will teach.

Research studies also suggest that ICT is most powerful in supporting constructivist oriented teaching (Becker & Riel, 2000; Kelley & Ringstaff, 2002; Knapp & Glenn, 1996; Office of Technology Assessment, 1995; Penuel, Golan, Means, & Korbak, 2000). It is reported that under supportive conditions teachers tend to shift toward student-centred instructional approaches as they increase their use of ICT (Becker & Ravitz, 1999; Knapp & Glenn, 1996; Penuel, Golan, Means, & Korbak, 2000).

It is also found that the teachers who are active computer users are more constructivist in philosophy and practice than the teachers who use computers less (Becker & Riel, 2000). Finally, teachers' uses of ICT in teaching become more frequent once they begin to develop content for instructional purposes by using tools such as word processors, presentation programmes and Web page editors (Haymore & Reilly, 2004). To sum up, pre-service teacher training in ICT skills could be enhanced if learning activities were situated in a meaningful context, and pedagogies were introduced along with technical skills.

## Background

National Institute of Education (NIE) at Nanyang Technological University, Singapore, is the only teacher training institution in the country. Since 1998, all prospective teachers are required to complete "Instructional Technology", a 24 or 36-hour course (depending on the programme a prospective teacher is enrolled in), before joining the teaching force. In the period of 1998-2001, the instructional Technology course intended to achieve three goals. At the completion of the course pre-service teachers were expected to be able to (1) identify and evaluate existing ICT resources for instruction; (2) adapt and integrate ICT resources into instruction; and (3) design and create ICT-based materials. To achieve the first and second objectives, a so-called computer-based lesson was introduced. Prospective teachers were introduced to the methods of evaluating educational CD-ROMs and web-based resources, and were helped to prepare a lesson into which the reviewed resource was integrated. Prospective teachers were also exposed to various types of school curriculum related resources developed by the Ministry of Education and private publishers. The computer-based lesson normally took about three weeks and accounted for about 30% of the course assessment.

To reach the third objective, i.e. to design and create ICT-based materials, prospective teachers learned to use Microsoft PowerPoint, a simple authoring tool, to produce a learning package called microLESSONS. As the name implied, microLESSONS were small units of learning activities with specific learning objectives. The conception of microLESSONS evolved in the late 1990s from a collective effort by the NIE faculty members in preparing pre-service teachers to use ICT in classrooms. Instructional design approaches to microLESSONS progressed from teacher-centred direct instruction in the initial years to more learner-centred activities, which could range from simple drill/practice and tutorials to more constructivist oriented learning activities. Trainee teachers were encouraged to explore alternative instructional approaches in the design of microLESSONS, such as inquiry-based learning and problem-based learning, and they were encouraged to adopt situated cognition as an epistemology (Brown, Collins, & Duguid, 1989) for instruction and microLESSONS design.

A typical microLESSONS unit contained about 15 slides. It began with a title page followed by a page of instructional objectives. If the microLESSONS unit took the approach of problem-based learning, a problem scenario would be presented. Learners would be given specific tasks to accomplish and be provided with web links and other necessary tools, such as a hyperlinked word document or Excel spreadsheet. Good microLESSONS would take advantage of multimedia features of Microsoft PowerPoint and add elements that could enhance all senses of a learner. Examples of microLESSONS may be viewed at <http://www.microLESSONS.com>. A microLESSONS project usually took about four to five weeks and accounted for 40–50% of the course assessments.

In the period of 1999–2001, about 4,000 prospective teachers successfully completed the Instructional Technology course and produced microLESSONS. How do the graduating teachers view their experiences of creating microLESSONS? How do they evaluate their competency in making microLESSONS? Most importantly, do they use the skills gained from the experience to create microLESSONS for teaching? A grant from National Institute of Education, Nanyang Technological University, Singapore, made it possible to explore the answers to these questions in the context of an evaluation of the whole Instructional Technology course.

## Method

A questionnaire was designed and mailed to 4,264 teachers in 350 schools who had completed the Instructional Technology course in the period of 1999–2001. By the time the questionnaire was administered, the participants had taught in schools from 24 to 48 months. The teachers with less than two years' experience were excluded from the study because it was believed that the initial years were difficult for most beginning teachers. They had to make adjustments to work environments and teaching loads and may not have had time to experiment with ICT integration. A total of 3,027 questionnaires were returned. The return rate was about 71%. After eliminating 29 invalid questionnaires, 2,998 questionnaires were used for analysis.

The questionnaire contained three sections: (1) demographic data of the respondents, (2) self-reported use of ICT in teaching related activities, and (3) evaluation of pre-service training in ICT. Finally, the respondents were invited to provide suggestions and comments on how pre-service teacher training could be improved in the aspect of integrating ICT into teaching.

Three items in the questionnaire focused on microLESSONS: (1) the respondents' perceived usefulness of learning to create microLESSONS, (2) frequencies in which they create microLESSONS for teaching purposes, and (3) self-reported competency in creating microLESSONS.

In addition to the questionnaire, focus group discussions were conducted with 60 teachers in 12 schools; five Grades 1–6 schools, five Grades 7–10 schools, and two Grades 11–12 schools. The data were analysed by using SPSS.

## Findings

The discussion in this section is based on the findings to the three questions focusing on the respondents' experiences with microLESSONS. Having spent about 4–5 weeks on design and creation of microLESSONS during their pre-service training, how do the graduating trainees view the usefulness of such an experience? A likert scale of 1 to 4 was used to evaluate the perceived usefulness and the findings are presented in Table 1.

*Table 1: Perceived usefulness of learning to create microLESSONS*

	<b>N</b>	<b>Mean</b>	<b>SD</b>
All teachers	2783	2.92	.851
Teachers of Grade 1–6	1710	2.87	.862
Teachers of Grade 7–10	1073	3.00	.828
Teachers of Grade 11–12	257	3.32	.740

1 — Very useful; 2 — Useful; 3 — Somewhat useful; 4 — Not useful

The findings appear to suggest that in general the teachers thought learning to create microLESSONS was somewhat useful. The lower the grade a teacher taught, the more positive he or she tended to find the experience. While the Grade 1–6 teachers were most positive about learning to make microLESSONS, the teachers of Grades 11–12 viewed the experience as less useful. When asked about the possible reasons for such a finding in the focus group discussions, the teachers interviewed suggested that the visual and animation effects of PowerPoint help to engage younger learners better. However, the teachers interviewed also indicated that different views could have been attributed to the curriculum content taught at different school levels. Obviously, further investigations are needed to explore the reasons.

Do the teachers use the pedagogical and technical skills learned from developing microLESSONS for teaching? A 5-point scale was used, ranging from “almost everyday” to “never”, to indicate the frequencies of the teachers' creations of microLESSONS (Table 2).

*Table 2: How often do teachers create microLESSONS?*

	<b>Almost everyday</b>	<b>At least once a week</b>	<b>At least once a month</b>	<b>At least once a term</b>	<b>Never</b>	<b>N</b>	<b>Mean</b>	<b>SD</b>
All teachers	0.5%	2.1%	5.6%	22.9%	68.9%	2847	4.58	.736
Teachers of Grade 1–6	0.3%	2.9%	6.1%	24.7%	66.0%	1499	4.53	.767
Teachers of Grade 7–10	0.6%	1.4%	5.7%	22.0%	70.3%	1088	4.60	.717
Teachers of Grade 11–12	0.8%	0.4%	2.3%	15.4%	81.1%	260	4.76	.736

1 — Almost everyday; 2 — At least once a week; 3 — At least once a month; 4 — At least once a term; 5 — Never

\* Each school term consists of 10 weeks.

Apparently, only a handful of teachers used the skills learned in pre-service teacher training to create microLESSONS. The majority, close to 69%, never created microLESSONS after joining the teaching force. Again, the findings revealed that the lower the grade a teacher taught, the more likely that he or she would create microLESSONS. Are these differences real? Table 3 shows identical levels of significance for both parametric and nonparametric statistics, indicating that significant differences do exist among the teachers teaching at three school levels. In terms of the frequencies of creating microLESSONS, the higher the grade a teacher taught, the less likely he or she would create microLESSONS.

Table 3: Parametric and non-parametric tests for statistical differences

	Grades 1-6 (mean)	Grades 7-10 (mean)	Grades 11-12 (mean)	F test	Sig.	$\chi^2$	df	Sig.
Frequency of creating microLESSONS	4.53 SD=.77	4.60 SD=.72	4.76 SD=.59	11.683	0.000	27.075	2	0.000

1 — Almost everyday; 2 — At least once a week; 3 — At least once a month; 4 — At least once a term; 5 — Never

The majority of teachers never created microLESSONS after their initial teacher training. Is it because they do not have necessary skills? Table 4 shows the responding teachers' self-reported competency of designing and creating microLESSONS by using a four-point scale.

Table 4: Self-reported competency of designing and creating microLESSONS

	N	Mean	SD
All teachers	2198	3.18	.800
Teachers of Grades 1-6	1345	3.18	.806
Teachers of Grades 7-10	853	3.18	.791
Teachers of Grades 11-12	191	3.35	.737

1 — Very high; 2 — High; 3 — Moderate; 4 — Low

It is obvious that competency reported by the teachers was not high, somewhere between “moderate” and “low”. Such a finding seems to suggest that the teachers do not create microLESSONS because they do not have necessary skills. How important is the perceived competency of creating microLESSONS in relation to the frequencies of the teachers' actual creation of microLESSONS? Bivariate Correlations procedure was used to compute the correlations of these two variables and the findings are presented in Table 5.

Table 5: Self-Reported competency and frequencies of creating microLESSONS

Self-reported competency & frequencies of creation of microLESSONS	Pearson correlation
Teachers of Grades 1-6	0.544
Teachers of Grades 7-10	0.530
Teachers of Grades 11-12	0.423

Table 5 shows positive correlations between the teachers' self-reported competency and the frequencies in which they create microLESSONS. Interestingly, the correlations between the two variables were stronger for the teachers teaching Grades 1-10 (significant at the 0.01 level). Self-reported skill competency appeared to have an appreciable effect on the actual creation of microLESSONS by this group of teachers. The teachers who felt competent in creating microLESSONS tended to create them more often. However, a weaker correlation was observed in the teachers teaching at Grades 11-12 ( $R=0.423$ , significant at the 0.01 level, 2-tailed). Such a finding seems to suggest that for the teachers of Grades 11-12, skill competency may be a less important factor preventing them from creating microLESSONS.

The respondents took the Instructional Technology course in three different years, so the pedagogical approaches used to design/create microLESSONS were somewhat different. While microLESSONS created by the participants of the course in 1999 were largely drill/practice type learning activities, those produced in 2000 and after were more in the orientation of constructivist learning. Nonetheless, the types of microLESSONS created during the pre-service teacher training had no effect on the frequencies in which the teachers created microLESSONS. No differences were found among the teachers who graduated in different years.

## Discussion

The teachers in this study spent 4–5 weeks of their pre-service training to learn to design and create microLESSONS. Thirty percent of the responding teachers agreed that the experience was very useful or useful and 42% agreed it was somewhat useful. Nonetheless, close to 69% of the teachers never produced any microLESSONS after joining the teaching force. Positive correlations were found between the teachers' self-reported skill competency and the frequencies in which they produced microLESSONS. Correlations were stronger for the teachers of Grades 1–10.

On the surface, lack of technical skills is the primary reason for the teachers not to create microLESSONS. But evidence shows that other factors may also have prevented the teachers from creating microLESSONS. One of the possibilities is teachers' beliefs in using ICT for teaching and learning in general, an important factor overlooked in the design of the questionnaire for this study. To overcome this major weakness, efforts were made in focus group discussions to solicit teachers' beliefs in use of ICT including multimedia creation in teaching. In the focus group discussions with 26 Grades 1–6 teachers in five schools, it was found that most teachers believed that colours and visuals could help increase students' interests and motivate them to learn. However, they also felt that traditional teaching materials would work just as well.

Similar feelings were expressed by the Grades 7–12 teachers interviewed. Surprisingly, no teacher interviewed wanted to commit himself/herself to the statement that ICT could help his/her students to learn better. Most felt that ICT helped but only to a certain extent. One teacher commented that only when integrated appropriately could ICT enhance students' learning, as animated objects could sustain students' interests and add emphasis to certain important points so as to help students remember better. This was particularly true for the students who are visual learners.

All the teachers interviewed did not hesitate to say that ICT had limitations. One mathematics teacher commented that for topics like differentiation and integration, traditional chalk and talk was still the best method. Another teacher confessed that he was sceptical that ICT would help students to learn better. To him, the most important outcome was that students passed the final examination — a written examination on paper. Still another teacher claimed that the obstacles in using IT outweighed the benefits. Setting up the projector and getting the equipment ready for an ICT based lesson could be a waste of precious curriculum time. According to this teacher, students' attitudes towards learning was more important than the use of ICT to aid learning. To sum up, the findings from the focus group discussions are similar to what is found by other researchers (Parr, 2000; Dexter, 2000), that is many educators still have doubts about what ICT can do to enhance learning. In other words, the teachers' belief systems could have contributed to no creation of microLESSONS.

Inability to apply the pedagogies learned could be another possible reason preventing the teachers from creating microLESSONS. microLESSONS evolved as a result of an effort to introduce prospective teachers to a new role of teachers. Instead of simply imparting knowledge to students as traditional teachers do, prospective teachers were exposed and encouraged to use a diverse range of instructional strategies and the techniques related to these strategies. The rationale behind this is that effective use of ICT has to be linked to adaptation of new teaching/learning strategies. For example, prospective teachers learned the principles of problem-based learning (PBL) and how to make PowerPoint presentations. They then used the newly acquired knowledge on PBL and technical skills to design "stimuli" and to present their problem scenarios as well as to produce "tools" with which students could use to solve the problem presented.

Unfortunately, today's schools are still largely confined to traditional teacher-centred teaching thus making it difficult for the teachers to utilise alternative instructional strategies learned during their pre-service teacher training. Moreover, for beginning teachers, there are many other issues that they need to deal with on daily basis — pressures of completing the curriculum on time and producing high student achievement scores, just to name a few. When these other issues become too daunting, teachers often opt not to use ICT but rather to stick with traditional practices (Haymore & Reilly, 2004) where advantages of ICT may not be fully utilised.

By the time this study was conducted, the participating teachers had been out of the teacher training programme for at least two years. They had been busily involved in day-to-day teaching commitments and school related responsibilities. The time lapse and the fact that the teachers had been out of touch with the microLESSONS experience may have attributed to their low perception of their abilities in creating microLESSONS. When the teachers do not feel confident in their skills of creating microLESSONS, it is most likely that they will not try to create any of them.

## Conclusion

The Singapore government's determination to promote ICT use in education has made it possible for all the schools in the island country to be equipped with excellent ICT infrastructures, including broadband connections to the Internet, high computer-student and computer-teacher ratios, and provisions for necessary software. However, from what is seen from this study, easy accesses to ICT resources do not necessarily warrant the implementation of new instructional strategies or innovative use of ICT such as microLESSONS.

microLESSONS is deemed successful only if its use is actually implemented by classroom teachers. Lack of competency, as found in the study, may have prevented the teachers from creating microLESSONS for their students. Apparently, ways must be found to sustain teachers' interests in and skills of creating microLESSONS after they leave teacher training programme. There is well-documented evidence on the impact of continuous support on teachers' use of ICT in classrooms. According to the studies by Joyce and Showers (1983; 1988; 1995), when peer-coaching teams are offered as a follow-up to staff development, the implementation rate could be as high as 90% in comparison to 5–10% when no support is offered. In every school, there are teachers who are more skilful in making microLESSONS and who create them more often than others. If these teachers could help their peers, an impact could be made. It takes time to change teachers' belief systems. After all, every teacher comes to the classroom with long-standing views of education that are based on a personal model of learning and experiences. If teachers have experienced the benefit of ICT and made ICT an integral part of their lives, they may begin to develop new understanding and begin to create new learning environments, including the more frequent creation of microLESSONS.

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