

## **A student teacher's recontextualisation of teaching mathematics using ICT**

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In university mathematics education courses, messages about the pedagogy and content of teaching mathematics are conveyed to student teachers. During the teaching practicum, mentor teachers also have their own set of messages about mathematics teaching. My research investigates the messages conveyed to student teachers and the ways student teachers acknowledge these messages and incorporate them into their teaching using the notion of recontextualisation. The use of information and communication technology (ICT) in teaching mathematics is generally viewed positively in the university and by mentor teachers. In this paper I share some data and analysis of the messages about ICT, and how one student teacher recontextualises these messages into his own teaching of mathematics.

**Keywords: ICT, student teachers, recontextualisation**

### **Introduction**

For student teachers, the teaching practicum is a difficult experience as they try to select 'approved' methods of teaching set by the university discourse. A study by Goh and Matthews (2011) on Malaysian student teachers' journal writing revealed their frustrations in choosing the appropriate methodology and techniques for teaching. They are also worried that they are unable to answer students' questions. The problems faced by Malaysian student teachers could be due to the design of teacher training programs in Malaysia. Lee (2004) has described some of the weaknesses of teacher training programs in Malaysia which focus mostly on general pedagogical knowledge such as time on task, questioning techniques and preparing lesson plans and not on actual methods for teaching subjects. Furthermore, the presence of a mentor teacher who may not have aligned views about the appropriate approaches in teaching mathematics may make the practicum an even more confusing experience for many student teachers. Lee (2004) highlighted that mentor teachers are not being prepared to provide effective supervision to help student teachers develop their practices in teaching.

This scenario has led me to develop a research project to investigate the various messages about teaching mathematics provided by a teacher training program in Malaysia. I am also investigating how student teachers acknowledge and apply these messages during the teaching practicum in consideration of the messages about teaching mathematics of their mentor teachers. One of the themes that has arisen from the data is the emphasis on use of information and communication technology (ICT) in teaching mathematics. I will present in this paper analysis on the program's messages about use of ICT in teaching mathematics. Finally, I will show how one student teacher acknowledges and applies this message in his teaching, with respect to his mentor teacher's interest.

## **Theoretical framework**

I am using the notion of recontextualisation (Bernstein 2000) to conceptualise the transformation of messages about teaching mathematics from the teacher training program to the setting of the mathematics classroom. Recontextualisation selectively relocates, and refocuses a discourse and relates it to other aspects to focus onto another principle. Recontextualisation will occur as student teachers adjust the messages about teaching mathematics to the new site, subject to the conditions of the social and political relations of the new site (Thomas 2003). This means that, in recontextualisation, student teachers will select from their experiences concerning teaching mathematics in the teacher training program and refocus it to the principle of teaching the class at hand. For example, when planning a lesson, a student teacher has to select ICT tools to incorporate into their lesson. In the teacher training program setting, they have experienced in the teacher training program setting guidelines on appropriate ICT tools and how to use these tools in teaching mathematics. They select from this experience, relocate and refocus the guidelines, while also considering the requirements of the mentor teacher.

## **Methodology**

The data collection consisted of observing and video recording sessions from courses in the university setting that focused on developing student teachers' knowledge about teaching of mathematics. The courses are Methods for teaching mathematics, Microteaching and Laboratory in mathematics education.

I am using a critical discourse analysis approach to draw out the messages about teaching mathematics from the university setting. To do this, I focus on the objects (what counts as an ICT tool) and value statements regarding the objects. I also focus on suggested methods in using the tools and value statements regarding the methods. In the end, I may develop an observational scheme that will assist in helping to identify student teachers' recontextualisation of these messages.

In the school setting, six student teachers and their mentors were participants for this research. The mentor teachers were interviewed and their messages about teaching mathematics were drawn out. The student teachers were observed three times each and interviewed at least once. In considering student teacher's recontextualisation of using ICT, I focus on two aspects. First I focus on student teachers knowing the messages about using ICT in the interviews. This concerns their acknowledgement of the messages, and the ways in which student teachers position themselves in the acknowledgement. Then, I focus on student teachers acting out the messages of using ICT in their mathematics teaching, focusing on the functions of the tools and the similarities and differences in the ways they use ICT from the university setting and the mentor's advice.

## **Data analysis of messages from university setting**

In the analysis regarding the messages about mathematics teaching, I focus on the objects demonstrated to the student teachers, and value statement regarding the objects. The table is a portion of a transcript from a Microteaching class, where a lecturer was giving her initial comments on a student teacher's lesson regarding her use of a ministry approved ICT tool in teaching matrices. In the text, the object talked about is technology and the value statement about the use of the official ministry tool is that it saves time for teachers. The message given here is that the use of official

ministry tool is viewed as sufficient (good) because teachers can save time in teaching preparation as they do not have to build their own tools.

Table 1: data analysis extract

Text	analysis
Ok. Let's look at her strengths.	
One thing is she used <u>technology</u> .	Object: technology
That is very <u>good</u> . you can apply that	<b>Evaluation of use of ICT:</b> very good/ more than sufficient.
You don't have to do it yourself, so there is <u>no need to waste time</u> .	Further explanation of why it's good because it saves time.

### Messages about teaching mathematics using ICT in university setting

The three courses, Methods for teaching mathematics, Microteaching and Laboratory in mathematics education, held distinct messages according to the objectives of each activity, therefore portraying different evaluations of use of ICT in teaching mathematics. The Methods class focused on the ICT objects, emphasising the novelty and the quality of each tool displayed. Therefore the values conveyed focused on the ICT tool itself. The Microteaching class was about applying ICT tool into teaching. Here, the comments focused on the teacher's ability to find a balance between the role of the teacher and the role of the ICT. Finally, the Laboratory class aim was to develop technological pedagogical content knowledge among student teachers and the activity was to demonstrate by allowing student teachers experience learning school level mathematics using ICT based tools. Table two summarises the messages conveyed about teaching mathematics using ICT tools and value statements regarding the use of ICT.

Table 2: messages conveyed about use of ICT in teaching mathematics

	Methods for teaching math	Microteaching	Laboratory in math education
<b>1a. What objects are demonstrated or displayed to student teachers?</b>	<p>Tool 1: A song about the rules of exponent.</p> <p>Tool 2: An energetic song about the difference of 'log' use in everyday life and in mathematics.</p> <p>Tool 3: A static powerpoint with no animations.</p> <p>Tool 4: A PowerPoint about vectors with animation and very colourful.</p>	<p>Tool 1: a ministry approved tool which has narration and animation about the introduction to matrices. It has the starter set that showed items ordered in rows and columns. It had activities where students or the teacher can key in the answer. Had use of matrices in other fields.</p>	<p>Tool: MSWLogo. Students learn to program the turtle to move around the playground. Through the activity, the students construct knowledge about polygons.</p>

<p><b>1b. What values are placed on the objects?</b></p>	<p>Tool 1: the song is <u>satisfactory</u>. But, the mathematical notations <u>need</u> to be correct.</p> <p>Tool 3: the static PowerPoint is <u>usual and unauthentic</u>.</p> <p>Tool 4: the PowerPoint with animations is <u>satisfactory</u>.</p>	<p>Tool 1: the ICT tool was <u>interesting</u>. However, it was <u>only interesting</u> for the first two minutes because students may not be able to concentrate on the display for long. It was <u>good</u> because it <u>assisted</u> in the teaching and learning process where the ‘teacher’ could use the tool for several segments of the lesson.</p>	<p>Tool is open source, free, and compatible with many operating systems.</p>
<p><b>2a. What is the suggested method in using these tools?</b></p>	<p>Tool 2: <u>Must</u> explain the difference between use of certain terms in life and in mathematics. Teachers <u>have</u> to make this clear in the lesson.</p> <p>Tool 4: students <u>should</u> use this PowerPoint which has animations and colours as an example in creating their own PowerPoint.</p>	<p>The ministry tool was played for the starter set which explained examples of matrices in everyday life.</p> <p>In the closure, a mini activity was conducted where students had to individually solve some matrices problems in cryptography.</p>	<p>Introduction of tool using tutorial. Giving direct/basic instructions. Math activity: Whole class problem solving activity about creating polygons. Student teachers construct knowledge of interior angles while learning to program the turtle to create polygons, guided by the lecturer.</p>
<p><b>2b. What values are placed on the suggested methods?</b></p>	<p>Tool 2: differentiating the use of terms in mathematics and in life helps students to understand better the <u>language of mathematics</u>.</p> <p>Tool 4: colourful and animated powerpoints is <u>motivating to students</u>.</p>	<p>The use of ICT is viewed <u>positively</u>. However, there needs to be a balance between the use of ICT and pedagogical strategies. Teaching needs to be <u>student centred</u> where students are <u>active</u>, have <u>group activities</u>.</p>	<p>Students can construct knowledge about mathematics through technological based activities. However, <u>teachers need to closely guide</u> students so that the students construct the knowledge intended.</p>

## **Saiful's mentor teacher's messages about teaching using ICT**

Saiful is a student teacher participant who took the same university courses prior to his teacher training semester. The rest of the paper depicts Saiful's mentor teacher's messages and Saiful's recontextualisation of teaching mathematics using ICT. Saiful's mentor teacher is highly interested in seeing him incorporate the use of ICT especially in developing and using interesting and animated PowerPoint. This view seems to be aligned with tool 4 in the Methods class, where the use of multimedia based ICT incorporates amusing and motivational elements into the classroom.

## **Saiful's recontextualisation of teaching mathematics using ICT**

### ***Saiful Knowing the Messages about teaching using ICT***

During the interview, Saiful clearly identifies his mentor teacher's interests in using PowerPoint to teach mathematics as it includes creative elements.

My mentor teacher, she likes fun activities, such as PowerPoint, she likes use of teaching aids which are very creative, so the teaching does not seem too traditional bound.

In using ICT, Saiful states that he does not use PowerPoint much because he views its use is to be limited. Saiful appears to align himself with the laboratory class, where the use of mathematics applications allows students to experiment with mathematical objects. He explains how he used a mathematics application in class to teach straight lines.

I think mathematics applications are a lot better than PowerPoint. I used it for form four students teaching straight lines. The students can key in the gradients and see how a small and big gradient looks like. It's online.

Furthermore, Saiful views that the use of PowerPoint is limited for teaching mathematics because this requires both practical work and understanding. This suggests that he views PowerPoints as only useful for displaying notes such as tool 3 in methods class.

I think that use of PowerPoint is useful in teaching mathematics. However, there is a limit. When compared with other subjects that require more reading, mathematics is an understanding and practical subject. So, these two aspects need to be considered when using PowerPoint.

### ***Saiful acting out the messages about teaching using ICT***

In one of the lessons I observed, Saiful's mentor teacher was also there to observe him. Saiful had taken into consideration his mentor teacher's preferences by compiling several ICT based tools which he uses throughout the lesson. For the starter, pictures of an obese and underweight man were displayed and students had to guess the topic which was mass. In the exchange about the pictures, the term weight was used consistently. However, the students were able to guess the topic name correctly which is mass because Saiful had asked the students to open the textbook to the topic page before the class began. Despite this, Saiful did not differentiate between the different use of the terms 'weight' and 'mass' in mathematics and in life. This was an element emphasised in Methods class where use of terms in life and in mathematics should be differentiated by the teacher.

The avatar selected stated the definitions of mass, but it was exactly as the content in the textbook. However, there was an element of amusement as the students laughed when Saiful played the avatar. Their response seems to be aligned with Methods class and the mentor teacher's view that ICT should give an element of amusement for students.

The notes displayed were static and exactly the same as in the textbook. This is one of the concerns of Microteaching class, that the use of ICT can make the class still appear dull. In Microteaching class, it is advised that group activity must be included to overcome this. However, Saiful was unable to conduct the group activity because he did not prepare the weighing tools beforehand. To compensate, Saiful asked the students to guess the weight of selected objects by calling them out to him.

## Conclusion

This research focuses on the ways student teachers recontextualise the messages about teaching mathematics using ICT from the university setting and the mentor teacher. During the interview, Saiful aligns himself with the Laboratory class, where he says he prefers using technological tools to teach because it allows students to experiment with mathematics knowledge. However, the class observed did not include any elements of experimentation. This observation seem to show a mismatch between his own verbal preference about having a lot of interesting activities, to his actions where the tools displayed were just resources for the content and did not provide interesting activities for students to conduct. Saiful also attempted to apply group work as advised in Microteaching class, but the tools were not prepared beforehand, so the group activity was unable to be carried out successfully.

No officials from the university were present during this observation. Therefore it is possible the criteria selected for this lesson was dominantly from the expectations of the mentor teacher because she was there to observe him. The analysis show that although a student teacher is clearly aware of the interests of his mentor teacher in seeing him teach using PowerPoint, his own values about mathematics learning being practical and his beliefs that PowerPoint is limited for teaching mathematics means that he does not entirely fulfil the mentor teacher's interest. To compensate, Saiful compiled a set of tools to support his teaching. However, there is rigidity in his selection as the avatar and the notes were clear repetition from the textbooks and did not provide much variety to the lesson.

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