Towards a Reflective Practice: The Case of a Prospective Teacher in Hong Kong

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A project was launched in the mathematics teacher education program at the University of Hong Kong. To facilitate the student teacher to carry out reflection during their teaching practice, they were asked to keep a reflective journal and there was one post-lesson interview during the teaching practice. A useful guideline was developed and it contained simple questions for the objectives, the teaching content and explanation, the teaching strategies and observing students. Via the case of a student teacher, I report the reflection of Tom based on two of his lessons reported in his reflective journal and a post-lesson interview. Tom had made careful planning and used a variety of resources for his two lessons. Analysis showed that careful use of probing in the post-lesson interview help Tom's reflection moved from a routine and technical level towards a dialogic level.

Key words: reflective practice, teacher's reflection, pre-service teacher

Introduction

In the pre-service teacher training program teaching practice is a very important component for student teachers to put what they have learned into practice. During the process, they may design their own learning tasks either by adopting the tasks in the textbook or by their own creation. There are a lot of self-investigation and reflection of the possibility for better teaching and learning. In general educators and researchers concur with the argument that reflection is essential. Reflection involves thinking that brings about a better understanding of the complexity of what happens in the classrooms, to interpret assumptions and questions taken-for-granted; and to evaluate their own teaching in contextualized situations. It helps teachers make judgment and decision for appropriate teaching strategies to achieve teaching and learning objectives in the lessons (e.g., Calderhead and Gates, 1993; Loughran, 2002; Ward and McCotter, 2004;). Therefore, establishing reflective

practice is important to both in-service and pre-service teachers of all subjects.

For this purpose, a project was launched in the mathematics teacher education program at the University of Hong Kong to help student teachers become a reflective teacher in their school experience. The primary objective is to help prospective teachers establish a reflective practice via careful planning, implementation and evaluation of the lessons in their teaching practices so that they can gradually develop an awareness of how to build up their professional knowledge via a reflective practice.

In this paper I report a case-study report of Tom, a student teacher, with a focus on his reflection on two lessons in his school experience. The research questions are: 1) What were Tom's upfront concerns in his reflection? 2) How did his reflection affect his strategy for teaching? 3) How might support be made to help Tom make more critical reflection?

A Theoretical Consideration

The overarching aim is to help the student teachers become critical reflective practitioners. In the project the student teachers were reminded to keep focus on learning task events that encompassed their own design of the task and how they carried it out in the lessons.

Learning Task Events

To bring about meaningful learning of mathematics in classroom, appropriate tasks that students can engage in are essential. Tasks can range from simple drill-and-practice exercises to complex problem-solving tasks set in rich contexts. However, it is not only the content of the tasks that determines the opportunity for learning. A challenging problem can be taught in such way that students simply followed some routine procedures, whereas a simple task can be taught in a culture fostering mathematical understanding (Carpenter & Lehrer, 1999). The learning environment that encompasses both the task and the interaction between the participants in the lessons thus determines the learning opportunity. Therefore, the idea of "learning task" event (LT event) is developed by Mok and Kaur (2006) which encompasses the task as well as what happens in the lesson.

In this project a learning task event (LT event) is defined by both the content of task and how the task was taught in the lesson. In order to create an experience for students to learn such skills and concepts, teachers usually demonstrate and explain what they want their students to learn with examples

or let their students explore some problems. Learning tasks include a wide range of designs such as examples for demonstration purposes and other learning activities carried out in either whole-class or group-work setting. Such examples or problems are called tasks or learning tasks in general. In brief, a LT event is characterized by its purpose that may be either for teaching something new or forming a part of a coherent sequence of the development of an object of learning. The interaction or discourse in the lesson was seen as a major vehicle for conveying the teacher's message to the students. Discourse according to NCTM (1999) refers to the ways of representing, thinking, talking, negotiating between teachers and students. Consequently the interaction in the lessons conveys values about knowledge and authority. Teachers, through such interaction they create with their students in their lessons presents messages about the nature of the mathematical knowledge, the way of thinking and value for the subject

Reflection and Reflective Teachers

The notion of reflection is not new and many researchers referred to Dewey's ideas as classic (e.g., Stanley, 1998; Ward & McCotter, 2004). "Reflection involves not simply a sequence of ideas, but a consequence – a consecutive ordering in such a way that each determines the next as its proper outcome, while each in turn leans back on its predecessors. The successive portions of the reflective thought grow out of one another and support one another; they do not come and go in a medley." (Dewey, 1910, p.1-2) Extending this idea to teaching practice, reflection involves thinking and evaluation based on one's knowledge, conceptions and experiences in teachers' practicum. "For Schön (1983), reflection is bound upwith practice; teachers and other professionals understand and act on their situations in ways that cannot be reduced to rules or described fully by educational theory." (cited in Ward & McCotter, 2004, p.245).

Reflection is widely accepted as important for teachers' professional development. Many studies have been carried out to study teachers' reflection (both experienced and novice in their teaching practice and different frameworks are developed to serve various research agenda. For example: Chipin, Simon and Galipeau (2008) conducted an empirical study for pre-service teachers. They argue that a self-directed reflective approach supports pre-service teachers working with the complex issues during their practicum. In their approach, they promote among the pre-service teachers the schema of P1 (problem to be solved), TT (tentative theory), EE (error elimination) and P2

(new or reformulated problem).

Artzt and Armour-Thomas (1998) studied experienced teachers and beginning teachers of secondary school mathematics. Their approach applies a "teaching as problem solving" perspective. Based on the work of others, they further argue for the more influential metacognition components. They viewed instructional practice in terms of three stages: preactive (lesson planning), interactive (monitoring, regulating) and postactive (assessing, revising).

Ward and McCotter (2004) applied grounded theory approach (Strauss and Corbin, 1990) to study pre-service teacher reflection on student learning based on a rich data set generated in two research projects. Based on their analysis they developed a rubric that shows the dimensions and quality of reflection. They further argued "engagement in the process of reflection and reflection on the moral enterprise of teaching can be considered as important outcomes in their own right" (p.243).

A Framework for the Analysis of the Student Teacher's Reflection

In the analysis, I applied the reflection rubrics in the dimension of "focus" (Ward & McCotter, 2004). The main question is: what is the teacher's focus of concerns about his/her practice? In the framework, the dimension is further refined into routine, technical, dialogic and transformative levels. The meaning for the levels is recapitulated below:

"Routine – Focus is on self-centered concerns or issues that do not involve a personal stake, e.g., control of students, time and workload, gaining recognition for personal success, avoiding blame for failure.

Technical – Focus is on specific teaching tasks such as planning and management, but does not consider connections between teaching issues. Uses assessment and observations to mark success or failure without evaluating specific qualities of student learning for formative purposes.

Dialogic – Focus is on students. Uses assessment and interactions with students to interpret how or in what ways students are learning in order to help them.

Transformative – Focus is on personal involvement with fundamental pedagogical, ethical, moral cultural, or historical concerns and how these impact students and others." (Ward & McCotter, 2004, p. 250).

Context of the Study: Input from the Teacher Education Program

The pre-service student teachers enrolled in the mathematics major

methods course of the Postgraduate Diploma in Education (PGDE) program were invited to participate in the study on voluntary basis. The PGDE program is a one-year full-time teacher-training program for pre-service teachers. In the mathematics major methods course of the program, a topic on "reflective teaching" was included. In the teaching of the topic, it was emphasized that critical reflective practice supported a teacher's growth and professional development. They were encouraged to reflect upon and critically evaluate their own lessons in their main teaching practice. They were told to keep clear objectives for the activities of the lesson and evaluate their lessons with respect to the objectives.

Design of Tasks

For a good design of a learning task, two aspects are important. One aspect is the cognitive demand that put focus on relationship between concepts, clear explanation and demonstration. The other aspect is the affective demand: to arouse students' interest; to engage students in the work. These can be applied to tasks for the purposes of individual work or collaboration.

Reflection: A Guideline for Beginning Teachers

To facilitate them to develop their reflection systematically with a focus on the design of the teaching content of the mathematics and their skills of delivery, some questions were suggested but the student teachers were also encouraged to reflect upon their lessons freely. In other words, the student teachers might choose their own style to write their reflection notes.

For the objectives of the lesson:

What are the objectives for the lesson?

How far did you achieve your objectives?

How far did your students achieve the objectives?

For the teaching content and explanation:

How did you sequence your teaching materials to facilitate an inductive/deductive approach of learning?

How effective was it in helping the students to acquire the concept taught in the lesson?

For teaching strategies:

How did you organize classroom activities to enhance students' learning?

> *How effective was it for encouraging your students to learn?*
>
> *How did you cater for the needs of students with different abilities and interests?*

For observing students:

> *What feedback did you get?*
>
> *How did you encourage pupil-talk through discussion and questioning? What was its impact on students' learning?*
>
> *How well do your students achieve the objectives of the lesson?*

Research Methods

The research methods followed a simple model of action research carried out by the student teachers, by keeping a reflective journal and maintaining a communication with their teacher mentors and supervisors to facilitate their reflection. The reflective journal should contain their lesson plans, teaching materials and their own notes of reflection.

The student teacher was interviewed once during their main teaching practice. Either the method of stimulation recall was used or a post-lesson interview was adopted. The student teacher was invited to explain their objectives of the observed lesson and how they designed the tasks and activities of the lesson to achieve the objectives. Then they were asked to comment on how well they saw the lesson in terms of achieving the objectives, the strength and weakness of their lesson by referring to what happened in the lesson. At the end of the interview, they were invited to give suggestions for improving the lesson. The interviews were audiotaped.

The data was collected during the teaching practicum embedded in a pre-service teacher-training program. The group was a small class of 10 students and 5 students joined the research project on voluntary basis. Many found their preparation and experience in the schools too fully occupied to have time to write a reflective journal. To keep their worry minimum, they were free to choose at least one lesson during their practice to make video and write their reflective journal. Some chose to have the interview and gave a lesson video, but not writing the reflective journal. Tom was among the few participants who had managed to complete the three parts of data collection: reflective journal, making a video for his own lesson and having an interview. His case was chosen for he had written about two lessons and in his interview he on his own initiative drew upon the experience of the earlier lesson to support the rationale of the observed lesson. He explicitly reported the making

of changes with a specific purpose. A follow-up interview by phone was made to ask for his rationale for choosing the two lessons in his reflective journal. His rationale for his choice was that rich resources were found in the Internet for the topic and he thought that the topic was suitable for trying out ideas he learned in the course. And he found the participation in the project encouraged him to try teaching ideas and reflect upon his teaching more often. These features made his case more worthy to report as a unique case study than the others.

Tom taught 10 to 12 lessons every week during his two months of school experience. The data consists of the video of one lesson and a folder of lesson materials submitted by Tom, the audio of an interview, and a reflective journal. The folder of lesson materials consisted of the video of one lesson, lesson plans and lesson materials for two lessons. The lesson materials consist of the PowerPoint files, worksheets, exercises and video-clips that he had used in his lessons. The reflective journal consisted of Tom's reflective notes for two lessons selected by Tom himself.

The analysis consisted of two stages. In the first stage, the author read through all the data submitted by Tom very carefully. The interview data was transcribed. Segments of reflective nature and writing were identified and categorized into conceptual themes: planning, objectives, teaching strategies, knowledge about students, pedagogical beliefs, modification and adjustment. In the second stage, the level within the dimension of focus of concerns was further categorized to routine, technical, dialogic and transformative. English translation of the selected transcriptions is used to illustrate the level and quality of the reflection in the next section.

Results

Tom's Lessons and His Reflection

Tom wrote about two lessons in his reflective journal. The first lesson was about the teaching of the area of circles and the second lesson was about the teaching of the volume of prisms. The activities for the two lessons are summarized in Table 1 and Table 2. What he wrote in his reflection journal is given in Table 3. One interview was carried out immediately after the second lesson. He also submitted the video of the second lesson for data.
Tom obviously had put in a lot of effort and made very detailed planning. His lessons consisted of rich contents. He designed his own activities with careful instruction and worksheets. He used multimedia and models to support his

explanation. Both lessons ended with exercises for consolidation and practice. The second lesson that Tom chose to report in his reflective journal was a lesson on the volume of prisms that took place ten days later. The two lessons had mathematical content of similar nature. The structures of the lessons were similar except that he added a component of lecture to elaborate the basic features of prisms in the second lesson.

In his reflective journal, Tom wrote his reflection under three headings: "things I have done well", "things needed to be done better" and "things that I can improve". He appreciated his strengths in the planning and design. He mentioned strengths such as the clear explanation, the interesting tasks and examples specially designed for the class, the variety of visual tools and models, and the varying levels of difficulty for the examples and exercises. Reviewing his limitation, he was aware of the fact that he needed to ask more questions. With respect to class discourse, he identified missing opportunities of scaffolding from a student's question. He admitted the need to adjust his way of handling students' responses, the way of asking questions and the nature of the questions.

Table 1
The Lesson on Circles: The Formula of the Area of a Circle

1	Introducing an interesting question about a $10 coin.
2	A class activity to let student to explore the formulae of areas of circles (πr^2) by themselves with the help of the teacher's instruction and a teacher-designed worksheet.
3	Showing a short video clip for about 5 minutes to consolidate students' understanding on how to work out the formulae of areas of circles.
4	The teacher demonstrates how to do questions related to areas of circles by revisiting the interesting question ($10 coin) mentioned in the beginning of the lesson. The demo has two foci: 1. Clarify the differences between circumference and area. 2. Clarify the formulae of areas of circles concerns with radius, not diameter.
5	Class exercises

Table 2
The Lesson on Prisms: The Basic Features of a Prism

1	Introducing an interesting question about volume of the "triangular chocolate".
2	Lecture* on the basic features of prism that include definition, uniform cross-section and polygonal base.
3	Showing a model of a cuboid that can be divided into three identical triangular prisms, the teacher guides the students to find the formula of the volume via questions and answers.
4	Giving the students a milk box to let them explore and identify the base, height and volume.
5	Showing a video clip to consolidate the concepts
6	Examples and exercises

Planning, Objectives, Teaching Strategies

Tom was very clear about his objectives of his lesson. The objectives he mentioned in the interview were consistent with what he put down in his lesson plan. Tom's focus for his planning of the lesson is *routine* and *technical*. In the interview, he said,

> First, they might not have much concept for a prism. So, first I needed to tell what a prism was; secondly, to use the formula base times height; thirdly, to consider whether the base was only the bottom of the solid. Then I needed to tell them how to find the base and the height. Finally, to do some exercises.

When he commented things that he had done well in his reflective notes, the comments were focused on the design of teaching tasks and activities, hence also *routine* and *technical*. He wrote what he had chosen and gave the class with a belief that these had worked well. "The materials were clearly and explained in details." "An interesting question was raised to arouse their curiosity." "A dynamic illustration was adopted and it helps students understand how the formula was derived." "The worked examples were well set and arranged in increasing difficulty."

Knowledge about Students

While he evaluated how successful his lesson was, his comments was *dialogic*, taking into account whether the students could understand the contents and whether they could complete the questions in class. Tom

evaluated his lesson based on how he saw the students achieving the objectives of the lesson, how the students performed the tasks and the questions that the students raised in doing their work. He said in the interview:

> First, they will be clear with the definition of a prism. I give this to them in a lecture style. They will also grasp the formula. There is a part that may be less successful. They may not identify what a base is and what a height is. When they did their seatwork, most of their questions are about this. That is, they can use the formula but they could not identify the base and the height.

These claims were based on his observation of the students' work in class for he said in the interview:

> They wrote the definition of prism, uniform cross-section; secondly, the features; thirdly, the difference between oblique and right prism. Based on what they wrote, I assumed that they understood."
> "I first gave a milk cartoon box to every group of four or five. The box had seven faces and asked them to decide which face was the base. I went to each group and listen to their discussion. At that moment, I had not told them that the base should be the uniform cross-section. I heard some students say that the bottom was the base. But some said no and that it was the section cutting along AB. Hearing this, I knew that some students might have some of the concept. Then I asked one group to tell their answer. Then I explained what the height and base. Some students might still not be very clear. So, I showed a short video to show them the difference between vertical cut and horizontal cut. In the exercises some students seemed that they still had not quite acquired this. Some had acquired this before I spoke.

Pedagogical Beliefs

When he talked about things that were less successful and how to improve his teaching, his focus was *dialogic*, focusing on the students and also revealed his pedagogical preference for the student-centered approach and the use of questions. The following scripts are extracted from his reflective journal:

> Students raised interesting question during the class activity but I did

not address well. I may lose a valuable learning opportunity."
"Not enough flexibility, always expect students to answer my model answers.

Ask the students to finish the whole class activity without stopping them and checking their progress. Some may get lost."
"Too teacher-centered, may leave more space for students to get involved.

Give more space for students to discuss. If they have interesting ideas, let them elaborate more.
Set more open-ended questions and do not always restrict the answers by students.

Modification and Adjustment

While observing students' behavior is a kind of evaluation, evaluating students' understanding requires a deeper and more critical reflection. This happened when the interviewer made a provoking comment that the students simply copied the basic features from the board. Tom then differentiated the repetition of facts from understanding, suggested further how he should have asked more questions. His reflection was dialogic showing a potential of being *transformative*, accommodating change and modification in the assumptions for he might do and the possible alternatives. He said,

Yes. That is copying from the board. These are factual. I think that they can understand. Perhaps I may add some questions such as what are the lateral faces. I first incorporate these questions but I feel that this did not assess. Some students might answer the lateral faces. Some told the difference between right and oblique. When they said this, I should have asked them to explain more clearly. I did not. I should have asked them to elaborate. Then I can know how well they know about the definition of the prism. I could do more here.

Although the lesson included an exploratory activity in the lesson of prisms, the time for students to really be really engaged in free discussion between peers was only about 2 minutes. Tom was very strict in the time control of this part of the lesson and he actually set an alarm clock to resume the whole class discussion at the end of the activity. In the interview, Tom

explained the rationale for his decision-making. His planning had taken into the consideration of the evaluation of the earlier lesson of circles. For that reason he chose to talk more in this lesson.

> But I had tried a lesson for area of circle with this class. They had difficulty to see the proof. The proof was about cutting a circle to many sectors and rearranged. They had difficulty to grasp a proof like this. Based on this experience, I talked more and hoped that they could follow.

Nonetheless, looking back at his lesson, he admitted that he was too dominating. He was worried about time management and that he could not manage if he gave too much freedom to the class in exploration. After trying the strategy of talking more, he ended up with a realization that he should give students more opportunities to explore and talk.

> Perhaps, to conclude, I had not improved them much. I should give them more time to discuss. For example, the only discussion was the part on the milk cartoon box, where they could debate a little. After that they did the exercises. Before that they had not much chance to talk but only listen.

Conclusion and Discussion

Good reflective practice should involve critical thinking and good use of resources in developing the lessons. The analysis of his reflective journal and interview shows that Tom had obviously set off with a good direction in planning his lesson. He has adopted a simple approach for looking upon what he could do and improve in his own capacity. Tom's preparation of his own lessons gives a very good example of reflection with focus at the *routine and technical level* (Ward & McCotter, 2004). It is important that teachers possessing knowledge that they can make choices and act in their teaching (Artzt & Armour-Thomas, 1998; Calderhead & Gates, 1993; Shulman, 1987). Tom being aware of his own objectives carefully planned his lecture. The sequence of the teaching content is very clear and showed a coherent logic. At the same time, he obviously invested efforts in using various resources including video, models and authentic examples in the synthesis to make his lecture rich and interesting. Upfront in his reflection are the concerns for the objectives and his chosen strategies. This is indeed the very fundamental basic that a beginning teacher needs to achieve. In the follow-up interview, he

further explained that he chose these two lessons to be recorded in his reflective journal for the fact he could use various resources found in the internet for this topic and he could use various strategy such as using the milk box in the design of the teaching activity.

Another aspect of reflective practice comes from reflection in the direction of developing a deeper understanding of the teacher's own practice with respect to strength and weaknesses; and also establishing an understanding of his own students in the class. This was not quite shown based on data from his reflective journal. However, in the interview, he explained more about the reasons for choosing his teaching strategies. In the first lesson, his choice was collaborative group work that turned out to take more time in the lesson than his expectation. For the fear of losing control of time and class management, he changed his strategy in the second lesson and chose lecture as the main strategy. He had a simple assumption that the lecture might help the student understand the basics of a prism. He might have thought no further from this point without the post-lesson interview. Although it is sometimes not easy for the pre-service teachers to go for a higher-level of reflection such as the dialogic and transformative levels by themselves, it does not mean that we should not include the higher levels in our aims. In the post-lesson interview, the researcher who also had the role a mentor successfully led Tom to express more concern for students' understanding, hence showing some degree of the *dialogic level* (Ward & McCotter, 2004). As shown in Tom's case, this in fact has been achieved easily by a few questions in their conversation such as: "How do you think about how well your students learned in the lesson?" "How do you notice this?" "What episodes in the lesson will let you know that you have achieved the objectives?" These questions guide him to tell what he had observed in his students, and took into the students' aspect when making decision. The input from the research project helped him turn these observations into deeper reflection. For example, Tom said, "They may not identify what a base is and what a height is. When they did their seatwork, most of their questions are about this." "I should have asked them to elaborate. Then I can know how well they know about the definition of the prism. I could do more here."

With a probing comment that the students in the lesson were only copying from the slides, the interviewer expressed successfully the implicit question: "Is this understanding?" Tom admitted that he had not really assessed how the students had understood this part of the lecture and he should ask more questions. His conversation at this point changed to explain his

worries about time, his observation of the students work in their seat and the awareness of the students' questions. This change indeed played an important role to let him share open-heartedly in his evaluation, ending with a further appreciation of more opportunities for students expressing their views despite his choice of lecturing. Such "wholenheartedness" showing that "one can overcome fears and uncertainties to make meaningful change and critical evaluation" is a pertinent feature for critical reflection (Yost, Sentner & Forlenza-Bailey, 2000) and making transformative reflection on fundamental pedagogical concerns.

To conclude, developing a habit of reflection is a very important part for helping student teachers become a professional. The upfront concern for a beginner is always what to present and how to deliver his lessons. There are always lots of factors and worries that a student teacher has to face in the new environment in his teaching practice. It is important for the beginning teachers learn a self-directed approach to be reflective in their own teaching and an awareness of their quality of reflection (Chitpin, Simon & Glaipeau, 2008; Ward & McCotter, 2004). The example developed in this case report of Tom is very helpful for a student teacher to set off for developing a reflective habit for his teaching practice. Such habits are likely to settle at the routine and technical level because a beginning teacher is likely to focus on what they can teach and give to the students in the lesson. The case of Tom shows the potential of interaction with the mentor to bring about other levels of focus. This broadening of the levels of the focus dimension is important and it should be a useful agenda for future research for exploring how such broadening of levels and dimensions can be further developed.

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