

A Dynamic Model for a School-Based Lesson Study

Miranda Yee Han PARK & Ida Ah Chee MOK

The University of Hong Kong

Abstract

The aim of this study is to explore how and to what extent lesson study as a form of professional development in helping primary mathematics teachers to develop their collective pedagogical content knowledge (PCK) in teaching mathematics. The project is a staff development project led by Park, the mathematics panel chair, and supported by the school principal for enhancing the teachers' PCK via a dynamic model.

In this study, a qualitative-case study research approach was adopted. Two cycles of lesson studies (at the levels of primary 2 and primary 4) about the teaching of quadrilaterals were carried out. Totally seven primary teachers participated in this study.

Research Question.

How does the collective pedagogical content knowledge of primary mathematics teachers develop in their participation of lesson study?

Design of the Study

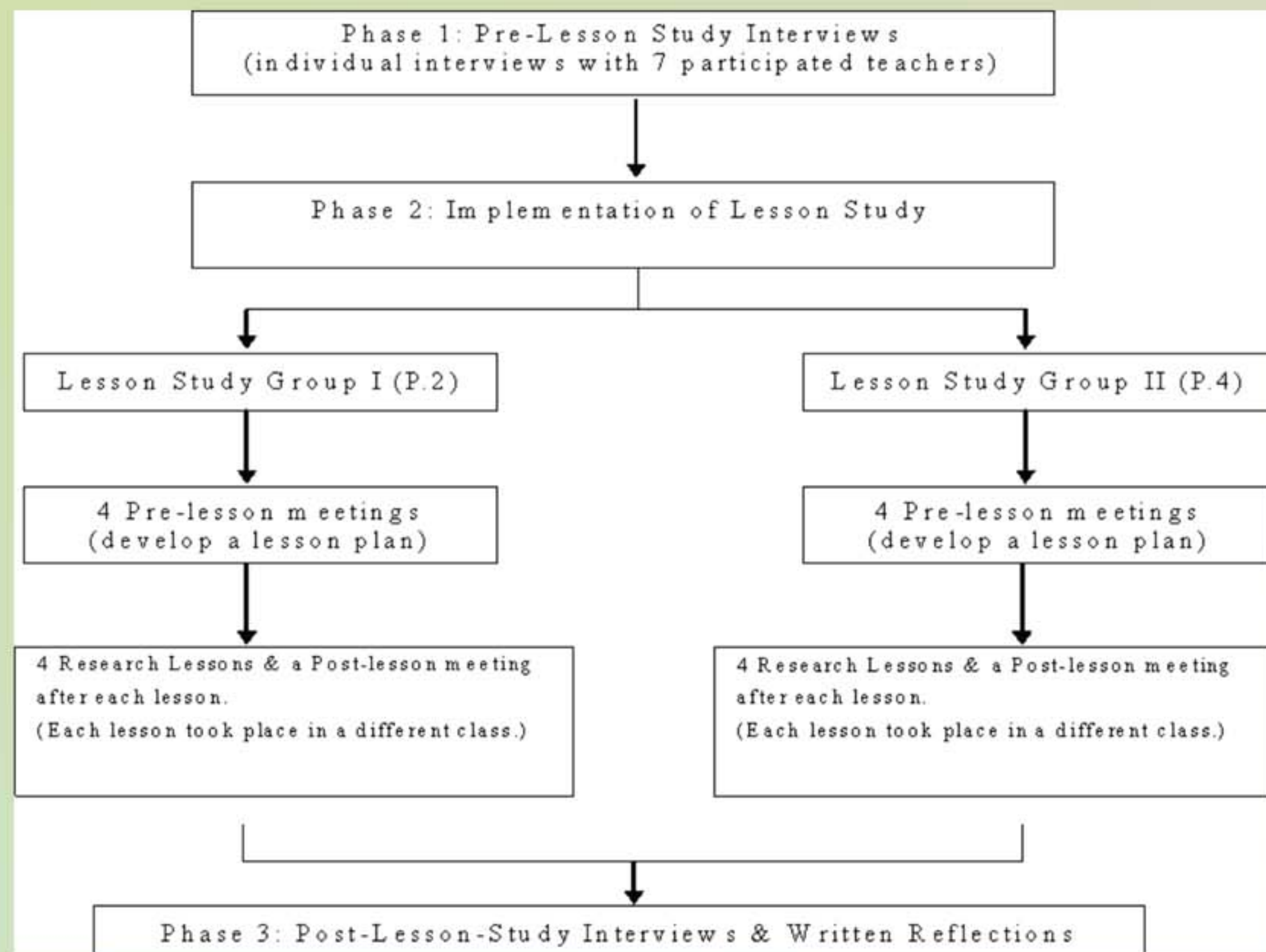
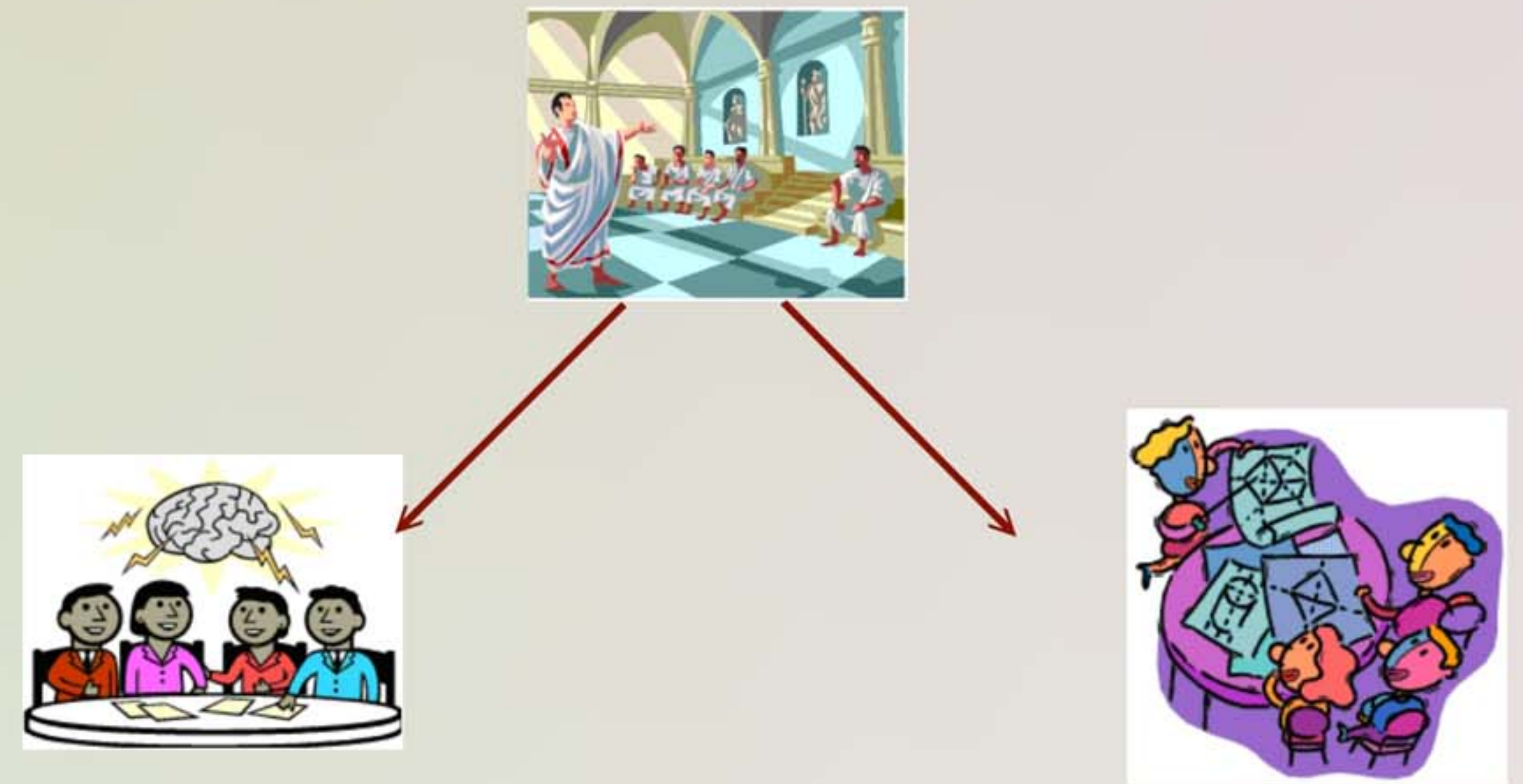


Figure 1: The design of the study

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In this study, the multiple roles of the participants were emphasized. The participant researcher, in this case was not only as a panel chair, but also a project researcher. The other teacher participated in lesson study took the roles as both of peer observers and those being observed. Both top-down and bottom-up exchanges of ideas contributed to the enhancement of teaching and learning. There was no intention of applying any specific learning theory at the beginning of the meeting. The input from the panel chair and the teachers interacted freely, resulting in modification of the lesson plan for the next implementation of the research lesson. Tracing the contents in the meetings and lessons, we trace how the plan and the actual lesson might be affected by the teachers' PCK.



Data Analysis

In the post-lesson meetings, some events in the lessons were identified. Modification of teaching strategies and follow up action were often decided after active discussion. Sometimes, the teachers reviewed the events in the following meetings and had further development. These events are called "Seed Events" in the analysis.

An example of a Seed Event

Seed events are real episodes in the actual research lessons selected by the teachers in the post-lesson meetings. Seed events provide real episodes which are opened to the team members. Via the discussion of a seed event, the team members learn something collectively, make suggestions for actions in the following research lessons which are further evaluated and developed. In tracing the development of a seed event, the collective pedagogical content knowledge shared by the team becomes explicit.

Teacher: Teacher G
Class: P.4A
Peer observers: Teachers C, E, F and Teacher P (panel chair)

An Episode in the first research lesson: The students were asked to mark each pair of opposite sides of quadrilaterals by using different color chalks. Here was the answer given by one group of students. Only the parallel sides of the right-angled trapezium were marked with color chalk (Diagram 1)

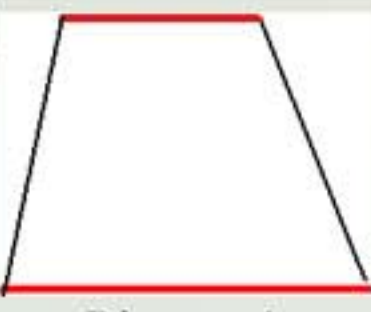


Diagram 1

A translation of the dialogue in the lesson episode
Teacher G: Why you thought it has only one pair of opposite sides on the right-angled trapezium?
Student: It was because the other two sides would meet together when they were prolonged.

Reflection

The discussion and reflection about the seed event was coded based on the four components of pedagogical content knowledge, namely, subject matter knowledge, knowledge of students' understanding, curriculum knowledge, and knowledge of instructional strategies. Some examples of the teachers' input with reference to this lesson episode in the meeting are given below.

"Because of the concept of parallel lines, students thought that a right-angled trapezium only had one pair of opposite sides with the "top and bottom" sides while the "left and right" could not be defined as opposite sides because they were not in parallel. The result showed that students considered the opposite sides and parallel sides of a quadrilateral were the same things".

Teacher F

"The teacher had not talked about the concept of opposite sides in depth and had not shown enough examples for this. I think we should emphasize what the term "opposite" means"

Teacher E

"It would be better if the teacher picked up any example of quadrilateral to introduce two pairs of opposite sides simultaneously.

Teacher E

"Since a trapezium with one pair of sides in parallel and the other pair not in parallel, it is a good example to show these two situations to students".

Teacher P

From the selected meeting excerpts above, we observed that that teachers' collective pedagogical content knowledge often initiated from students' misconceptions. When the teacher (Teacher F) first pointed out the possibility that made the students marked the opposite sides incorrectly, the follow up discussions stimulated the input of comments about the understanding of the subject matters and teaching strategies and students' understanding from the other teachers. Through the discussion of Seed Event, teachers tended to have a more comprehensive understanding of students' prior knowledge of learning quadrilaterals and their misconception of parallel sides and opposite sides. Teachers also realized that choosing a suitable example with a skilled demonstration strategy was essential in dealing with students' misunderstanding in this issue. The negotiation also provoked subject matter knowledge related to the topic such as intersection point, parallel lines and adjacent sides.

Therefore, the seed event provides a nursery for the development of the collective pedagogical content knowledge in the team work of the school mathematics panel. We believe that the teachers' awareness of seed event would promote the development of the collective pedagogical content knowledge in the team.