

# THE STUDY OF SOCIAL NORMS IN CLASSROOM USING TRANSFORMATIVE LESSON STUDY INCORPORATED WITH OPEN APPROACH

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## Abstract

The purpose of this research is to investigate classroom social norms in a class employing Transformative Lesson Study incorporated with Open Approach. Qualitative method was used in this study. The target group consisted of teachers and students from a school in Phang Nga province, which has been implementing Lesson Study with Open Approach since the 2023 academic year. The research instruments included lesson plans, a video camera, a still camera, and field notes. Data was collected during the second semester of the 2024 academic year through video and audio recording, along with field documentation. Data analysis was performed using content analysis and analytical description, based on the conceptual framework of Voigt (1985).

The research findings revealed the following classroom social norms in the class employing Transformative Lesson Study incorporated with Open Approach; 1) teacher and student interaction in jointly understanding the problem situation, 2) students presenting their ideas to peers and the teacher in the classroom, 3) the teacher proposing discussion points on the ideas, followed by students jointly discussing and comparing their ideas with those of their peers, 4) student-student interaction involving joint discussion, argumentation, and justification of the generated ideas, and 5) teacher-student interaction in jointly selecting the idea most appropriate for the problem situation.

**Keywords:** *Social norms, Lesson study, Open Approach, TLSOA model*

## Introduction

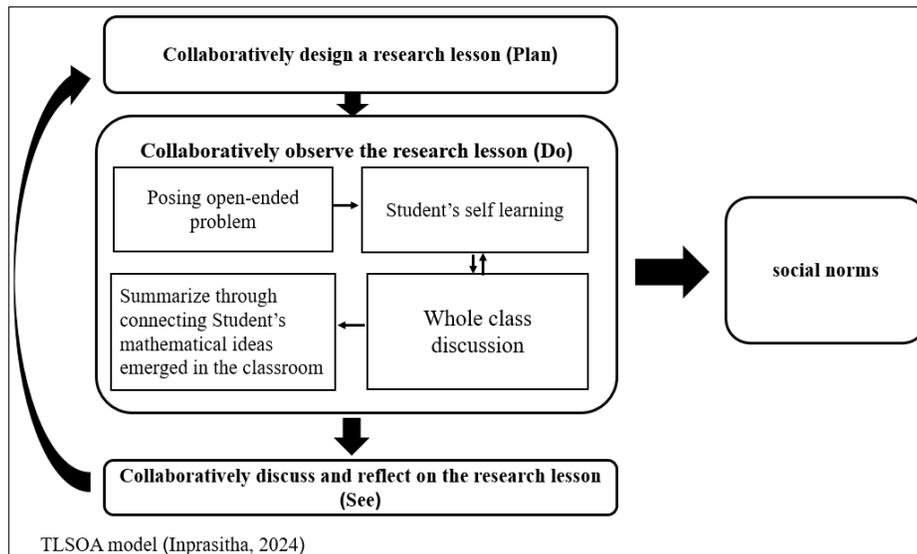
The cultural context of traditional mathematics classrooms often focuses on achievement derived from rote memorization and practicing problem-solving following teacher-specified examples. This approach effectively reduces the roles of independent thinking and collaborative student interaction. Consequently, students may come to believe that lecturing and memorization constitute the optimal learning process (Phoosanga et al., 2018; Premprayoon & Plianram, 2019). This approach restricts students' opportunities to express their ideas and severely limits the full development of their mathematical problem-solving ability. Therefore, there is a clear need for a strategy to reform learning and enhance mathematical competency for the 21st century. Moreover, the teacher's role must shift from that of an instructor to a

facilitator in creating interactions that promote students' thinking processes (Inprasitha, 2022). This change necessitates the establishment of classroom norms, which are the regular practices that consistently emerge in teacher-student interactions. Of particular importance are social norms, which enable students to recognize their duties as members and collectively create a space for participation and the acceptance of diverse ideas in problem-solving (Lim et al., 2023; Yackel et al., 1991).

The transition to process-product oriented learning necessitates collaborative idea formation through engagement with the teacher's instruction that focuses on identifying each student's unique thought processes and particular concepts (Inprasitha, 2022). Therefore, when students take advantage of opportunities to articulate their thoughts, make arguments, defend the logic behind new ideas, and confirm their comprehension with classmates, natural mathematics learning occurs (Cobb & Yackel, 1996; Schoenfeld, 2016). The problem-solving approach is a teaching strategy that encourages a variety of perspectives and idea comparisons. The instructor starts this method by outlining a problem situation. Students use a variety of approaches to solve the problem before working together to discuss and summarize the main ideas. (Isoda & Nakamura, 2010). Thus, the mathematical problem-solving process is driven by social elements. The establishment of this new classroom culture, however, depends on a "negotiation scheme" that organically develops based on "interaction patterns" rather than being automatic (Voigt, 1985). This is essential for norms to actively promote the development of an environment for engagement and idea exchange (Kang & Kim, 2016).

The educational innovation that emphasizes problem-solving and supports diverse thinking processes is Transformative Lesson Study incorporated with Open Approach (TLSOA). TLSOA integrates lesson study with the open approach to facilitate teacher development and create opportunities for students to argue, exchange ideas, and jointly construct the meaning of mathematics with their classmates (Inprasitha, 2023). TLSOA model is an innovation designed to promote students' critical thinking and reasonable justification skills (Inprasitha, 2022). Although there are researchers that study norms and socio-mathematical norms within the context of lesson study and open approach (Moonsarn et al., 2015; Sarapat & Changsri, 2022), there is a lack of clear explanation about interaction between the subjects in this classroom, therefore, this research aims to investigate the recurring and consistent social norms in mathematics classrooms utilizing TLSOA model. The findings will enable teachers to understand the social norms, leading to the genuine development of students' learning processes and mathematical thinking skills.

## Conceptual Framework



*Figure 1:* Conceptual Framework

## Research objective

To investigate the social norms in a classroom employing TLSOA model.

## Research Methodology

This research utilized a qualitative methodology. The target group consisted of teachers and students from a school in Phang Nga province, which has been implementing the TLSOA model since the 2023 academic year. The group of teachers carried out research based on the lesson study process, which includes jointly designing lesson plans, collaboratively observing the lessons, and regularly reflecting on the teaching results with experts on a weekly basis.

## Research Tools

1. Lesson Plan: the researcher and teachers collaboratively designed the lesson plans. The design was informed by activities found in Japanese mathematics textbooks, which were then adapted to create problem situations with specific contexts and conditions. Furthermore, they jointly designed the instructional media and the four-step instructional sequence of the Open Approach: 1) posing an open-ended problem; 2) student self-learning; 3) whole-class discussion and comparison of ideas; and 4) summary by connecting the emergent mathematical concepts of the students. Moreover, they also anticipated the students' ideas that would likely occur in the classroom. Subsequently, the designed lesson plans were implemented in the classroom, with a representative teacher serving as the instructor. Concurrently, the researcher and the observing teachers jointly observed and recorded students' emerging ideas. On a weekly basis, the

researcher, the experts, and the teachers collectively reflected on the instructions to adjust the problem situations and identify strategies for developing students' thinking skills.

1. Field Notes were utilized to document the behaviors of the teacher and students as they occurred in the classroom.

2. Camera was used to photographically document (or record images of) the collaboration between the researcher and the teachers during the lesson plan design phase and to capture images of the classroom instruction.

3. Audio Recorder was used to capture the voices of the target group during classroom instruction and to record the interviews conducted with the target group.

4. Video Recorder was utilized to document the behaviors and voices of the teacher and students during classroom instruction.

5. Semi-Structured Interview was used to interview the teachers regarding the students' emergent ideas.

### **Data Collection**

The researcher collected data during the second semester of the 2024 academic year. Data collection involved video and audio recordings, photographic documentation (still images), and field notes taken during the teacher and student instruction in the classroom. Subsequently, the researcher conducted interviews with the teacher immediately after the conclusion of each lesson.

### **Data Analysis**

This research data is qualitative, consisting of transcribed video and interview data. Therefore, the researcher chose to use content analysis to interpret the behaviors between the teacher and students, or students and students, based on the conceptual framework of Voigt (1985).

### **Research Results**

The results of the analysis of social norms in the mathematics classroom employing TLSOA model were observed during the "Joyful Playground" activity. The objective of this activity was for students to write a number sentence based on a given situation. The teacher initiated the lesson by presenting the problem situation: "There are 7 children playing in the sandbox. Then, 5 more children join them. After that, 8 children go home. How many children are currently playing in the sandbox?", and then teacher given the conditions were 1) "Write a number sentence" and 2) "Show the solution method." Following the instructions, students worked on solving the problem independently and presented their ideas to the class. The teacher proposed discussion points to enable students to compare their ideas and jointly summarize the key concepts with the class. The following classroom interactions were observed:

## 1. Teacher-student interaction in jointly understanding the problem situation.



**Figure 2:** Students Reading the Problem Situation on the Blackboard

From figure 2 demonstrates a joint interaction between the teacher and students focused on understanding the image and the problem situation presented on the blackboard. In the image, the teacher is pointing to the problem situation on the board. Students in the class read the problem situation sentence by sentence, following the teacher. Subsequently, the students collectively considered the image, as follows:

Item 99	T	:	In the first image, what do you see?
Item 100	S	:	Children playing in the sand.
Item 101	S	:	There are 7 children.
Item 102	T	:	What did you say?
Item 103	Ss	:	There are 7 children.

As protocols, item 99 to item 103 demonstrates that students in the classroom jointly interpreted the image and the problem situation on the blackboard. They discussed what they observed on the board with the teacher and their peers. Students collectively interpreted the situation as follows: there were 7 children playing in the sand, 5 more children subsequently joined the sand play, and 8 children left the sand. This led to the following observation:

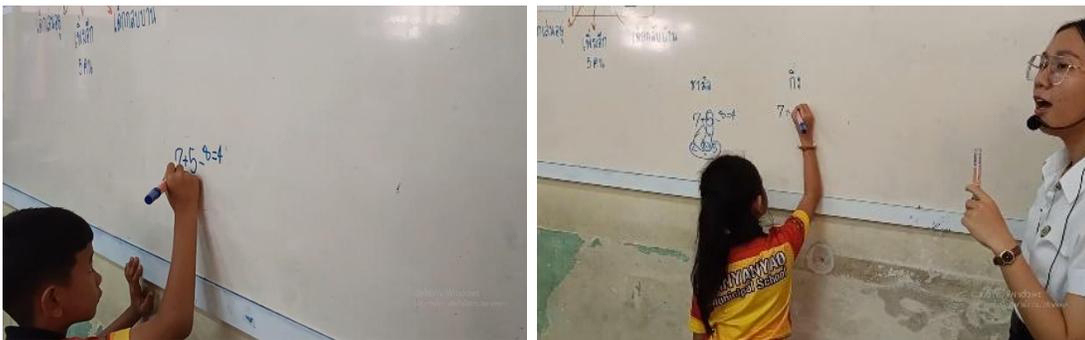
<p>คำสั่งที่ 1 : ให้นักเรียนเขียนประโยคสัญลักษณ์</p> <p>ประโยคสัญลักษณ์ <math>7-5=2</math></p>	<p>Number Sentence: <math>7-5=2</math></p>
<p>คำสั่งที่ 1 : ให้นักเรียนเขียนประโยคสัญลักษณ์</p> <p>ประโยคสัญลักษณ์ <math>7+5-8=\square</math></p>	<p>Instruction: "Students, write a number sentence."</p> <p>Number Sentence <math>7+5-8=\square</math></p>

**Figure 3:** Students Interpreting the Problem Situation Differently in the Classroom

Analysis of the interpretations of the same situation within the classroom revealed diverse student understanding, as shown in figure 3. The students interpreted the given situation as  $7 - 5 = 2$  and  $7 + 5 - 8 = \square$

## 2. Students presenting their ideas to peers and the teacher in the classroom.

This interaction occurs following the completion of the students' self-learning phase through problem-solving. The teacher-student interaction is characterized by a conversational dialogue. Subsequently, the teacher initiates the transition into step 3 for a whole-class discussion and comparison. The teacher begins by asking students about the written number sentence and the meaning of the numerals and mathematical symbols within the number sentence on the blackboard. Following this, the teacher selected the first student's idea by calling their name. The students voluntarily came to the front of the class to write their idea on the blackboard, as shown in the figure.



**Figure 4:** Student Presenting Their Idea to the Class

From figure 4 illustrates the teacher-student interaction characterized by the student's presentation of their ideas on the blackboard. In this interaction, the teacher provided assistance to facilitate the student's presentation. The presentation commenced once the students had written their idea. The teacher then solicited feedback from the peers regarding their understanding of the concept: "Can anyone decipher Shamil's idea? How did they do it?", students in the classroom collectively shared their opinions on Shamil's method. Following this, the teacher asked the student to explain their own idea to the class, as follows:

Item 276	T	:	Let's listen to Shamil.
Item 277	S	:	Take 7 plus 5.
Item 278	T	:	First take 7 plus 5.
Item 279	Sa	:	12.
Item 280	S	:	And then you subtract 8 from that.

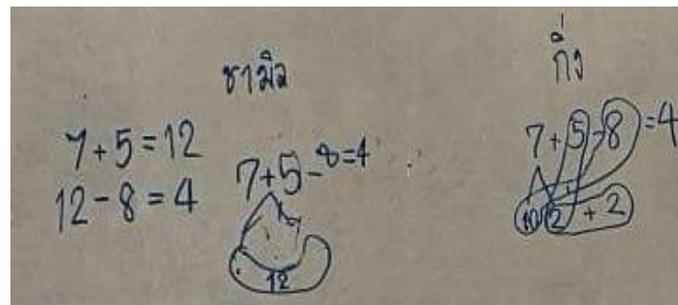
As protocols item 276 to 280 demonstrate that while the teacher was having the student present their idea to the class, the teacher functioned to expand the student's idea by repeating it. This finding is consistent with the interview with the teacher, who commented on the interpretation of the number sentence and the students' classroom perception, as follows:

Researcher : What were the characteristics of problem-solving/perception/interpretation/understanding behaviors observed in the classroom?

Teacher : .....in the 'Joyful Playground' activity, based on the students' number sentence writing, their peers understood the origin of the number sentence and could explain that the operation was addition because of the keyword 'joined/added', and the subtraction was performed because of the keyword 'Went home/left'

### 3. The teacher proposes discussion points (for ideas), and then students collaboratively discuss and compare their own ideas with those of their peers.

This behavior represents the teacher-student interaction, commencing when the teacher raised discussion points about the emergent ideas, allowing students to collaboratively discuss the concepts. Figure 5 illustrates the two ideas that emerged in the classroom: Idea 1 (Shamil): Shamil presented the idea  $7 + 5 = 12$ , followed by  $12 - 8 = 4$ . Idea 2 (King): King presented the idea  $7 + 5 = 12$ . She then decomposed 12 into 10 and 2, calculated  $10 - 8 = 2$ , and finally calculated  $2 + 2 = 4$ .



**Figure 5:** Emergent Ideas in the Classroom

As protocols item 265 to item 266 further demonstrate that the teacher initiated the discussion of ideas by inviting students to interpret Shamil's concept, as follows:

Item 265 T : Whose should we look at?

Item 266 T : The first one... Let's use Shamil's. How did Shamil do it?

Subsequently, the class transitioned into a phase of perceiving the first peer's concept and method written on the blackboard. Students in the classroom collaboratively commented on the origin of that idea. Following this, after the second student had written their idea on the board, the teacher invited the class to jointly interpret the second concept, as follows:

Item 292	T	:	Let's look at King's idea next. How did King do it?
Item 293	T	:	Focus on your peer's idea.
Item 294	S	:	It's the same

As protocols item 292 to item 294 indicate that one student in the classroom perceived a similarity between the two peer concepts presented on the blackboard. The student's comment, "It's the same," was heard after the teacher invited the class for a joint interpretation of the concepts. This perception immediately created a focal point for discussion in the lesson regarding how the concepts were similar or different.

Item 299	T	:	Is it the same.?
Item 300	Ss	:	It is not the same.
Item 301	S	:	Teacher, I see that they are different.
Item 302	T	:	Where is the difference, Rada?
Item 303	S	:	Wrote the numbers in a different order

Students in the classroom expressed their views on the difference between the two concepts they were jointly interpreting. Students collaboratively compared the two emergent ideas and then jointly commented to the teacher and peers regarding the difference, as shown in protocols item 299 to item 303. Figure 6 illustrates the student's behavior of pointing out the perceived difference on the blackboard. The specific student comment was: "At the bottom, because Shamil and King swapped the numbers." The student's utterance allowed the entire class to recognize a method different from Shamil's original concept.



**Figure 6:** Students Discussing and Comparing Ideas

Subsequently, when the teacher had the student present the second idea in the same manner as the original idea, the emergent ideas in the classroom yielded the same answer (result). One student also noted this similarity in the final answer, as shown in Protocols 343–345.

Item 343	T	:	So, what is the final answer for King's method on this problem?
Item 344	Sa	:	4
Item 345	S	:	Shamil also answered 4.

Based on the evidence presented above, it was found that the teacher-student interaction in the classroom occurred as a reciprocal dialogue concerning the emergent ideas in the classroom. The teacher initiated the discussion points about the concepts, and the students collaboratively discussed and compared their own ideas with those of their peers.

#### **4. Student-student interaction in collaboratively discussing, challenging, and explaining the rationale for the emergent ideas.**

The argumentation behavior emerged while the teacher and students were interacting about a peer's idea. The teacher selected the first and second ideas to be presented on the blackboard and then invited the entire class to interpret both concepts. One student commented that the two ideas were not different: "It is the same as Shamil's." This led the students in the class to perceive Shamil's and King's ideas on the board as identical. Another student in the class stated, "It is not the same," demonstrating student-student interaction through challenging the concept. This peer argumentation prompted the class to explain and justify the rationale behind the idea. Following this, the teacher asked the students about the similarities and differences, as shown in protocols item 298 to item 303.

Item 298	S	:	It is not the same.
Item 299	T	:	Is it the same?
Item 300	Ss	:	It is not the same
Item 301	S	:	Teacher, I see that they are different
Item 302	T	:	Where is the difference, Rada?
Item 303	S	:	Wrote the numbers in a different order

The argumentation and justification behavior involves both teacher-student and student-student interaction. The teacher shifted roles to function as a supporter/facilitator, which gave students more opportunities to express their own opinions. This behavior is consistent with the field notes recorded by the Lesson Study team, which observed students disagreeing with their peers' methods in the classroom.

เวลา	หมายเลขพฤติกรรม	คำพูด	พฤติกรรม
๗.๓	4	พิจารณาวิธีแก้โจทย์	วิธีทำเหมือน / ต่าง / สะท้อน / กำหนดหน้าที่
Time	Number	Saying	Behavior
Step 3	4	Understand the concept	- Method is the same/Different/

**Figure 7:** Field Note Record of the Joyful Playground Activity

From figure 7 indicates that the lesson study team observed student behavior focused on attempting to understand the concepts and collaboratively discussing the emergent ideas. The student-student interaction enabled the class to compare the similarities and differences of the emergent concepts.

**5. Teacher-student interaction in collaboratively selecting the most appropriate idea for the problem situation.**

This behavior occurred after the teacher and students collaboratively discussed and compared the ideas. This behavior represents a teacher-student interaction focused on making a decision to accept the simplest idea, as detailed in protocols item 349 to item 352.

- Item 349      T      :      Whose method do you think is easier?
- Item 350      Ss     :      Shamil's
- Item 351      T      :      Those who think Shamil's is easier, raise your hand."
- Item 352      T      :      Those who think King's is easier, raise your hand."

As protocols above illustrate the teacher-student interaction in collaboratively selecting the most appropriate idea for the problem situation in this lesson. This behavior commenced when the teacher asked students to choose the concept that was easiest for them: "Which one do you think is simpler/easier?" Subsequently, the teacher had the students in the class select the concept by raising their hands, demonstrating acceptance of the collaboratively chosen idea. This observation is consistent with Figure 8, which shows students selecting the concept.



**Figure 8:** Students Selecting the Idea

Following figure 8, students accepted their peer's idea by raising their hands. Subsequently, the teacher functioned to organize and write the concept's summary on the blackboard for the entire class to learn collaboratively. The teacher then wrote the concept chosen by the students in red pen to emphasize and consolidate the emergent idea, as shown in Figure 9.

	<p><u>Summary</u>    The children went home.</p> <p><math>7 + 5 - 8 = 4</math></p> <p>The playing child    the new children</p> <p><math>7 + 5 = 12</math></p> <div style="border: 1px solid red; padding: 5px; color: red;"> <p>The peer added 7 + 5 first, and then subtracted.</p> </div>
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**Figure 9:** Teacher and Students Selecting the Most Appropriate Concept for the Situation

## Discussion

The research findings indicate that, in instructional management utilizing TLSOA model, social norms emerged in every lesson plan. These social norms appeared in the form of interactions between the teacher and students, and students and students, as follows: 1) teacher-student interaction in jointly understanding the problem situation. 2) Student presentation of their ideas to peers and the teacher in the classroom. 3) The teacher proposes discussion points for concepts, and students collaboratively discuss and compare their own ideas with those of their peers. 4) Student interaction in collaboratively discussing, challenging (arguing), and explaining the rationale for the emergent ideas. 5) Teacher-student interaction in collaboratively selecting the most appropriate idea for the problem situation.

The research findings state that social norms relate to the interaction of two or more individuals in the classroom, involving the consistent, mutual interpretation and acceptance of mathematical learning behaviors. This is consistent with Voigt's (1985) theory of interaction patterns. Furthermore, this research indicates that the teacher must create and maintain norms that help promote student engagement in classroom activities, discussion, and argumentation, thereby opening learning opportunities for the teacher and students in mathematical activities (Cobb and Yackel, 1996).

## Recommendations

1. Implication of the study: future research investigating classroom interaction should take into account the context of students at each specific grade level (or developmental stage).
2. Recommendations for Future Research: how to create the social norm in TLSOA model classroom.

## References

- Cobb, P. & Yackel, E. (1996). Constructivist, emergent, and sociocultural perspectives in the context of developmental research. *Educational Psychologist*, 31, 175-190.
- Inprasitha, M. (2022). Lesson study and open approach development in Thailand: a longitudinal study. *International Journal for Lesson & Learning Studies*, 11(5), 1-15. doi:10.1108/IJLLS-04-2021-0029
- Inprasittha, M. (2024). Lesson study and open approach: 15 years of mathematics teaching in Thailand. In M. Inprasittha (Ed.), *The 17th National Open Class Conference* (pp. 63–75). Institute for Research and Development of Teaching Profession for ASEAN, Center for Research in Mathematics Education, Khon Kaen University, and Foundation for the Development of Thinking Skills.
- Isoda, M., & Nakamura, T. (2010). Lesson Study: Problem Solving Approaches in Mathematics Education as a Japanese Experience. *Procedia Social and Behavioral Sciences*, 8, 17–27.
- Kang, S. M. & Kim, M. K. (2016). Sociomathematical norms and the teacher's mathematical belief: A case study from a Korean in-service elementary teacher. *Eurasia Journal of Mathematics, Science and Technology Education*, 12, 2733-2751.
- Lim, W., Yoon, H., Bae, Y., & Kwon, O.N. (2023). The development of sociomathematical norms in the transition to tertiary exam-oriented individualistic mathematics education in an East Asian context. *Educational Studies in Mathematics*, 113, 57–78. <https://doi.org/10.1007/s10649-022-10203-y>
- Munsan, P. Thinwiangthong, S. & Inprasitha, M. (2015). Norm in Mathematics Classroom Using Lesson Study and Open Approach. *Journal of Education Graduate Studies Research, KKU*, 38(4), 186-193.
- Poosanga, S., Thinwiangthong, S. & Inprasitha, M. (2018). Levels of Scaffolding Strategies in Mathematics Classroom Using Lesson Study and Open Approach. *Journal of Education Graduate Studies Research, KKU*, 12(2), 84-94. <http://doi.org/10.12973/eurasia.2016.1308a>.

- Premprayoon, K. & Plianram, S. (2019). Teachers' competency in mathematics teaching by lesson study and open approach. *Journal of Education Khon Kaen University*, 42(1), 33-52.
- Schoenfeld, A. H. (2016). Learning to Think Mathematically: Problem Solving, Metacognition, and Sense Making in Mathematics (Reprint). *Journal of Education*, 196(2), 1-38. <https://doi.org/10.1177/002205741619600202>
- Voigt, J. (1985). Patterns and routines in classroom interaction. *Recherches en Didactique des Mathematiques*, 6, 69-118.
- Sarapat, W. & Changsri, N. (2022). Sociomathematical norms in Mathematics Classroom using Lesson Study incorporated with Open Approach. In M. Inprasitha, (Editor), *The second decade of transforming learning processes towards higher-order thinking competencies: TLSOA, National Conference on Research in Mathematics Education* (pp. 161-171). Thailand Society of Mathematics Education.
- Yackel, E. Cobb, P. & Wood, T. (1991). Small-Group interactions as a Source of Learning Opportunities in Second-Grade Mathematics. *Research in Mathematics Education*, 22,