

DISCREPANCIES IN PERCEPTIONS OF LESSON STRUCTURE BETWEEN THE TEACHER AND THE STUDENTS IN THE MATHEMATICS CLASSROOM

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Abstract

This paper reports some findings of the preliminary analysis of the videotaped sequence of ten consecutive mathematics lessons in a public school in Tokyo, which is a subset of the Japanese data in the Learner's Perspective Study. A particular attention is given to how the teacher intended to structure the lesson and how the students perceived classroom events within the lesson structure. First, the Japanese lesson pattern, as identified by the analysis of a set of single lessons in the TIMSS Videotape Classroom Study, is examined by comparing with the analysis of the videotaped sequences of ten consecutive mathematics lessons. The results suggest the need to identify an overarching feature of the "lesson structure in the sequence" as contrasted with the lesson pattern identified by the analysis of a set of single lessons. Second, based on the analysis of post-lesson interviews, discrepancies in perceptions of classroom events between the teacher and the students are described. Finally, some issues raised by the results are discussed.

Introduction

The video component of the Third International Mathematics and Science Study (TIMSS) was the first attempt ever made to collect and analyze videotapes from the classrooms of national probability samples of teacher at work (Stigler & Hiebert, 1999; Stigler et al., 1999). Focusing on the actions of teachers, it has provided a rich source of information regarding what goes on inside eighth-grade mathematics classes in Germany, Japan and the United States with certain contrasts among three countries. The findings of the study include aspects of mathematics lessons as identified with a strong resemblance between Germany and the United States with Japan seemingly unique. One of the sharp differences between the lessons in Japan and those in the other two countries relates to how lessons were structured and delivered by the teacher. The structure of Japanese lessons was characterized as "structured problem solving".

The Learner's Perspective Study (LPS), on the other hand, is a nine-country study of the practices and associated meanings in "well-taught" eighth-grade mathematics classrooms with a focus on learner practice (David, 2001a). In part, the study is motivated by the postulated cultural specificity of teacher and by a strongly felt belief that the characterization of the practices of the mathematics classroom must attend to learner practice with at least the same priority as that accorded to teacher practice. The data of this study includes videotaped classroom data for ten consecutive mathematics lessons and post-lesson video-stimulated interviews with the teacher and students in each of three participating eighth grade classes. The data set in the LPS has the potential to look closely into the lesson structure from the students' perspective.

This paper reports some findings of the preliminary analysis of the videotaped sequence of ten consecutive mathematics lessons in a public school in Tokyo, which is a subset of the Japanese

data in the Learner's Perspective Study. A particular attention is given to how the teacher intended to structure the lesson and how the students perceived classroom events within the lesson structure. First, the Japanese lesson pattern, as identified by the analysis of a set of single lessons in the TIMSS Videotape Classroom Study, is examined by comparing with the analysis of the videotaped sequences of ten consecutive mathematics lessons. The results suggest the need to identify an overarching feature of the "lesson structure in the sequence" as contrasted with the lesson pattern identified by the analysis of a set of single lessons. Second, based on the analysis of post-lesson interviews, discrepancies in perceptions of classroom events between the teacher and the students are described. Finally, some issues raised by the results are discussed.

A Focus on Lesson Structure

The Japanese Lesson Pattern

In the TIMSS Videotape Classroom Study, certain recurring features that typified many of the lessons within a country and distinguished the lessons among countries were identified as "lesson patterns". The following sequence of five activities has been described as the Japanese pattern: reviewing the previous lesson; presenting the problems for the day; students working individually or in groups; discussing solution methods; and, highlighting and summarizing the main point (Table 1). The study has shown that, to a significant extent, Japanese lessons can be characterized as structured problem solving. The teacher intends to have the students work on problem and then discuss solution methods, sharing important ideas found in both problem solving processes and the discussion.

Table 1
The Japanese Lesson Pattern (Stigler & Hiebert, 1999, pp.79-80)

Reviewing the previous lesson
Presenting the problems for the day
Students working individually or in groups
Discussing solution methods
Highlighting and summarizing the main point

While students are working on the problem, the teacher moves about to observe students' work. During this time period, the teacher gives suggestions or helps individually those who are having difficulty. She or he also watches for students who have good ideas, with the intention of calling on those students in a certain order in the subsequent discussion. Then, a whole-class discussion begins. In this discussion, students spend the majority of their time listening to the solutions proposed by their classmates, as well as presenting their own ideas. When discussing solutions to the problem, the teacher asks students to present alternative methods to solve the same problem. Presenting an idea, even a wrong one, is strongly encouraged and praised.

The Japanese lesson pattern identified by the TIMSS Videotape Classroom Study seems to fit quite naturally with such a typical framework for writing a lesson plan. A common framework, that has a similar structure to the typical pattern of organization described above, is usually used by teachers when they are writing lesson plans (see Fig. 1). Though they do not write lesson plans for their daily practice, Japanese teachers do have opportunities, at lesson study meetings, for example, for writing and reading lesson plan. Also, they can easily access a sample lesson plan for any particular topic that also includes expected students' responses to the problem to be posed. Actually, both the Ministry of Education and private textbook companies publish support materials for the teacher that include lesson plans. Experienced teachers and mathematics educators are invited to write sample plans for such support materials.

Steps	Main learning activities	Anticipated students' responses	Remarks on teaching
Posing a problem			
Students' problem solving on their own			
Whole-class Discussion			
Summing up (Exercise/ Extension)			

Fig 1: A common framework for writing lesson plans

An underlying assumption of using such a framework is that it enables a teacher to give students opportunities for working on problem by themselves, even by individual or in a group, and for communicating ideas with their classmate. It would be safe to say that one of the origins of the Japanese lesson pattern would be in the tradition of use of such a framework by Japanese teachers in planning and implementing lessons. Then, how does the lesson pattern as embedded in the sequence of lessons look like? How do the teacher and the students perceive lesson structure? To what extent do the teacher and the students sustain a mutually supportive relationship in the particular event in the classroom within the structure, and how? These questions are raised when we examine the Japanese lesson structure from a Japanese perspective.

Yamaba, Kikan-shido,...: The Key Pedagogical Ideas Shared by Teachers

Associated with the common framework for lesson planning, there are several key pedagogical terms shared by most Japanese teachers. Yamaba, for example, is the highlight or climax of the lesson as was mentioned above. Most teachers think that a lesson should have a highlight in order to be interesting. A lesson is regarded as a drama, which has a beginning and leads to a climax, among Japanese teachers. In fact, one of the characteristics of Japanese teachers' planning of lessons is the deliberate structuring of the lesson around a climax, or "Yamaba" in Japanese.

Kikan-shido, another pedagogical term shared by most Japanese teachers, means teacher's purposeful walking among the students' desks, looking at their work, giving some feedback, hints, questions for evaluation, deciding an order of responses for discussion, selecting students for the whole class discussion. Kikan-shido usually is located at a certain place in the entire lesson, based on the teacher's planning.

How does the pattern relate to the characteristic "climax" central to each Japanese lesson? How do the teacher and the students perceive lesson structure, and "yamaba", for example? In the Learner's Perspective Study, videotape and interview data were collected in relation to a sequence of ten lessons for each teacher studied. Analysis of the data has the potential to reveal both pattern and variation in the ways in which the teacher and students perceive the climax in each lesson.

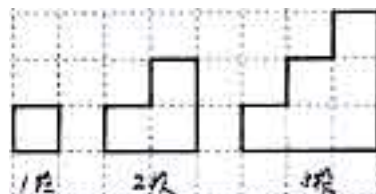
The Japanese Data in the Learner's Perspective Study

Data collection was conducted at the three public junior high schools in Tokyo. The teachers, one female and two males, roughly represented the population balance of mathematics teachers of the school level. The topic taught in each school corresponded to the three different content areas prescribed in the National Curriculum Guidelines.

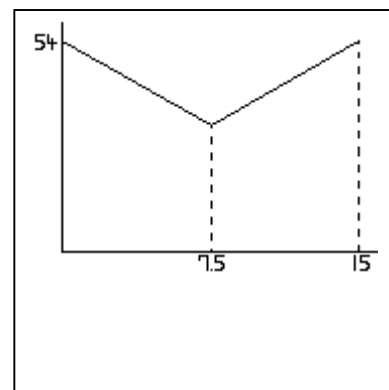
The first school is located in the old downtown Tokyo. The teacher, Ms. K, who has been teaching mathematics for more than twenty-five years, taught the 8th grade class of thirty-two students. The content taught was “linear function”. The teacher intended to achieve the goals of the entire unit. Namely she tried to have the students learn about the change among diagram, graph, and formula, think about the domain of change, determine an independent variable against an dependent variable, learn the concept of the rate of change, and so on.

She had started her lesson with the following problem situation. The students explored these questions posed by the teacher in the first three lessons.

Draw the figure of the fourth and fifth steps.
 What is changing as the step becomes larger?
 Explore the relationship between the numbers of steps and the perimeters.
 Explore the relationship between the numbers of steps and the numbers of right angles.



Then, in the fourth lesson, she posed a new problem as follows. The teacher showed to fold into a rectangle with length twelve centimeters and width fifteen centimeters to ask the students to examine what happened when she folded the paper like that. She asked the students to think about what changed when she changed the location of the folds. The students came up with the following ideas, the color, the sides, the shape, the area, and the perimeter. Then the class had decided to explore the relationship between the location of the folds and the perimeter. Teacher intended to have her students to present their graphs on the chalkboard and to lead a whole class discussion on the “seven point five matter”, that means to examine what is happening on the graph at the point of $x=7.5$.



Lesson Structure Reconsidered

The Advantage of Data Collection Technique in the LPS

The technique for undertaking the LPS involved the development of complex “integrated data sets” that combined split-screen video records of teacher and students with transcripts of post-lesson interviews and copies of relevant printed or written material. Building upon the methodological precedent (Clarke, 2001b), this project integrates complementary analyses of the substantial international data set generated through the combined efforts of the participating researchers. Each participating country in the Learner’s Perspective Study used the same research design to collect videotaped classroom data for ten consecutive math lessons and post-lesson video-stimulated interviews with at least twenty students in each of three participating 8th grade classrooms.

Data collection involved videotaping classroom and individual interview data, using the Complementary Accounts Methodology (Clarke, 1998). Images from two video cameras were mixed on-site to provide a split-screen record of both teacher and student actions in the classroom. Students interviewed after each lesson, using the video record as stimulus for their reconstruction of classroom event, were given control of the video replay and asked to identify and comment upon classroom events of personal importance. Among the methodologically most interesting aspects of the study has been the collaborative negotiation of the study design, the method of data collection, the general and local analyses, and the process whereby the various complementary accounts can be

integrated into a rich and useful portrayal of mathematics classrooms internationally.

Among the most interesting analyses afforded by the data collected in the Learner's Perspective Study are those related to lesson structure. The following sections focus on the analyses related to two aspects of lesson structure. First, a preliminary analysis of the Japanese data reveals a difference of lesson structures between the one identified by the TIMSS Videotape Classroom Study and the one in our data. By the analysis of videotaped sequences of ten consecutive mathematics lessons, we explore the "lesson structure in the sequence" as compared with the lesson pattern identified by the analysis of a set of single lessons. Second, while Japanese teachers may devote considerable effort into the planning and structuring of their lessons, these structures may not be perceived by the students. Discrepancies in perceptions of lesson structures between the teacher and the students will be explored through the analysis of post-lesson interviews with both of them.

Lesson Structure as Embedded in the Sequence of Lessons

As was mentioned above, a significant distinguishing characteristic of this study is its documentation of the teaching of sequences of lessons, rather than just single lessons. A preliminary analysis for exploring the Japanese lesson structure in the sequence was conducted with the transcriptions of ten consecutive lessons from a public school in Tokyo, that is one of the three public schools selected for the data collection in the LPS.

Transcriptions of ten lessons were coded by three persons independently, using the following thirteen coding categories which had derived from the descriptors for the lesson pattern of the three countries (Stigler, & Hiebert, 1999). For example, "Checking Homework (CH)" is the category that was the descriptor for both the German pattern and the US pattern. An earlier version of the coding system was developed by examining the descriptors of lesson pattern in each country, being applied to the transcriptions of the first four lessons in the data set. The current thirteen coding categories were developed as the result of some modifications of them (Table 2).

Table 2
The Thirteen Categories for Analyzing Lesson Pattern

Reviewing the Previous Lesson (RP)
Checking Homework (CH)
Presenting the Topic (PT)
Formulating the Problem for the Day (FP)
Presenting the Problems for the Day (PP)
Working on Sub-problem (WS)
Working on the Problem Individually or in Groups (WP)
Presentation by Students (PS)
Discussing Solution Methods (DS)
Practicing (P)
Highlighting and Summarizing the Main Point (HS)
Assigning Homework (AH)
Announcement of the Next Topic (AN)

Table 3 shows the lesson patterns found in the first data set of the LPS. In general, each lesson includes "reviewing the previous lesson" and "presenting the problems for the day" in the earlier parts, followed by such activities like "students working individually or in groups" and "discussing solution methods". As the result shows, both the lesson J1-3 and J1-6, for example, have a similar pattern identified in the TIMSS Videotape Classroom Study.

Table 3
Lesson Patterns in Ten Lessons from the First Data

Lesson	Categories
J1-1	CH, (FP), PP, WP, PS, DS, AN, AH
J1-2	CH, (RP), (PS), (WP), PS, DS
J1-3	RP, PP, (WP), (PS), DS, WP, (PS), HS, P, AN
J1-4	PT, FP, PP, WP, PS, AH
J1-5	RP, WP, PS, DS, AH
J1-6	CH, RP, (PP), WP, WS, (DS), (HS), P
J1-7	RP, (PP), (PS), (DS), (HS)
J1-8	RP, PT, (PP), PS, DS, (P), AH
J1-9	PT, WP, PS, (DS), HS, HS, DS
J1-10	P, WP, PS, DS, HS, P, WP, PS, AN

Note: Categories with the full agreement among all the three coders are shown without parenthesis. Categories with the agreement of two coders are shown with parenthesis.

On the other hand, the analysis of the first data also reveals a difference of lesson structures between the one identified by the first TIMSS Videotape Classroom Study and the one found in our data. For instance, “checking homework” and “assigning homework”, which were regarded as typical activities in both the German and the US lessons, were often found in the LPS Japanese data with a slightly different style. In such cases, homework tasks were treated as important building blocks for the next lesson, or even as the main topic of entire lesson. Also, we can see four “Assigning Homework” and three “Announcement of the Next Topic”, both of which were not included in the Japanese pattern.

Another remarkable characteristic was in the process of formulating problem, Formulating the Problem for the Day (FP), before the presentation of the problem for the day. In the lesson J1-1 and J1-4, teacher started with problem situations asking her students to think about what are changing and to determine an independent variable against the dependent variable.

Discrepancies in Perceptions of Lesson Structure between the Teacher and the Students Elements in the Lesson Felt to be Significant

While Japanese teachers may devote considerable effort into the planning and structuring of their lessons around a “yamaba”, these structures may be perceived differently, or even may not be perceived, by the students. The methodology employed in the Learner’s Perspective Study offered students the opportunity in post-lesson video-stimulated interviews to “parse” the lesson they had just experienced. That is, the students were requested to identify for the interviewer those elements in the lesson that they felt to be significant. It is clearly possible that students identify as significant classroom events quite different from those intended by the teachers.

Data collection involved videotaping classroom and individual interview data, using the video record as stimulus for their reconstruction of classroom event. The teacher and the students interviewed after lessons, were given control of the video replay and asked to identify and comment upon classroom events of personal importance.

In the post-lesson interview of the lesson J1-5, the teacher identified nine elements in the lesson to be significant, while each of two students interviewed identified eight and seven elements respectively (See Appendix). Although the numbers of elements identified as felt to be significant are similar between the teacher and two students, their places in the entire lesson were different.

Only four elements were identical among three of them. As for the lesson J1-7, the teacher identified twelve elements in the lesson to be significant, while one of the two students identified only three elements and the other student did eight. In this case, the numbers of elements were quite different among three of them.

Table 4
Elements in the Lessons Felt to Be Significant

Lesson	Teacher	Student 1	Student 2
J1-5	9	8	7
J1-7	12	8	3

A Closer Look at the Participants' Perception of Classroom Events.

When we look into our data more closely, we can see both conformities and discrepancies in perceptions of classroom events of personal importance between the teacher and the students. The following excerpts from lesson J1-5 are examined as the elements in the lesson felt to be significant to all three of them.

The teacher who identified the element at fourteen minutes from the start, where the class had started group works, made comments as follows.

Ms. K (14:00)

K *Can I just pause for a moment?*

INT *Okay. Here. Um, fourteen minutes, the scene of group discussion.*

K *Well, this class is comparatively quiet, so I haven't let their desk in groups until today. But I thought it might be useful for students to complete the graph along with the discussion. They can help one another by thinking together, and it allows everyone to see other students' work. Maybe some of them can understand where they couldn't do by themselves.*

On the other hand, the two students identified the same event as the one of personal significance and commented on the event as follows.

Student 1 (14:25)

NI *Here.*

INT *Here, right. Fourteen minutes twenty-five seconds. Where you started group work. Ok. Why here?*

NI *Discussing the graph and the chart in groups and finishing it up.*

INT *This scene, right? Ok, about this scene.*

NI *Here, I can share what I thought and what others thought, the answers I thought I had made a mistake on, could actually be right, not a mistake, my mistakes could actually be the answer. Huh?*

INT *What you thought was a mistake, might actually be correct.*

NI *Right. What I thought couldn't be incorrect, could actually be a mistake. I can compare my answers with other people and talk it over, so it's nice.*

Student 2 (14:22)

TA *Here, in groups.*

INT *Yes, uh, fourteen minutes and twenty-two seconds, the scene where group learning has started. Ok. What did you think here?*

.....

INT *Where you thought was important.*

TA *Yes.*

INT *Important in today's class.*

TA *In today's class, yes.*

INT *Um, what were you doing uh, then, together?*

TA *Oh, together, we first compared the part of the homework I did, and the part my friend did, and we discussed the parts that were different and shouldn't it be this, and such. Then, after that, there was a part we didn't understand and it was the same part, so we were asking each other how we were suppose to solve it, and so we asked the teacher.*

Though students 2 were not explicit than both the teacher and students 1, three of them seemed to share such a belief that they can help one another by thinking together, and to understand what they couldn't do by each of themselves only. In this event, then, the teacher's intention and what the students wanted to do at the moment were not different.

The discrepancies in perceptions of classroom events of personal importance between the teacher and the students became clear when the students realized that the teacher did not understand their solution to the problem and when the teacher did not. The two students who had worked together made similar comments as follows.

Student 1 (37:45)

NI *Here, right here.*

INT *Uh, thirty-seven minutes forty-five seconds. Uh, where she went on to the explanation about the graph, Ni-san, right?*

NI *The teacher, what the teacher was thinking, and what me and Ta-san were thinking were different, so, we were both trying to explain but the teacher didn't really understand us, and finally, after a while, she understood.*

INT *The teacher, she wrote down a graph but it was different, right? From what you and Ta-san got, and there was a gap between what you were thinking and what she was thinking, right?*

Student 2 (37:26)

TA *Yes.*

INT *The scene where Ni-san comments on the graph. Thirty-seven minutes twenty-six seconds.*

TA *Uh, this, the teacher mistook what I said or something and Ni-san pointed out her mistake, but the teacher made mistakes once in a while so it would be nice if someone could say the correct answers in situations like this.*

INT *Ohh. So, you felt to the teacher, the teacher that your ideas were being interpreted differently, so you were trying somehow to say this to her. Uh, actually she said this for you.*

TA *Said this for me. Yes.*

.....

INT *That's important. So, then, Ta-san, anything you felt, or rather, thought?*

TA *Feel ?*

INT *If you got across what you wanted to say.*

TA *Oh, what I wanted to get across? I was explaining but Ms. K misunderstood again so*

what I wanted to say didn't really get across to her but there's a scene after this where I explain something else again.

INT Yes.

TA And, there, uh, I think Ms. Ka understood the correct answer.

INT Yes, where you went up to the chalkboard. The scene where you're explaining, the teacher understood you correctly.

TA Yes.

On the other hand, Ms. K did not realized until the final part of the lesson, that she understood differently the explanation made by two students during the Kikan-shido as well as in the whole class discussion. All the three of them identified the element around sixteen to seventeen minute from the start, where the teacher was doing Kikan-shido at their desks, as felt to be significant. At this moment, the teacher intended to assess what these two students were doing and she gave a hint to think about. The students commented in the interviews on the importance of Kikan-shido in the current lesson and appreciated the teacher's help.

In the later part of the lesson, however, the students realized that the teacher understood their explanation differently. So, two students identified the events where student 1 presented (S1: 37:45, S2: 37:26) and student 2 presented (S1: 34:30) to explain again in response to her question in the public talk in the discussion. Ms. K, on the other hand, identified only one of the two events (K: 33:30) based on her original intention of having Yamaba around the interpreting "seven point five matter", that means to examine what is happening on the graph at the point of $x=7.5$.

In the post-lesson interview, she answered to the question, "what your goals were in today's lesson", as follows. This comment directly connected to the "yamaba" in the lesson form her perspective. Yamama, the highlight of the lesson, from the teacher's perspective seemed to be the whole class discussion of students' solutions around the "seven point five matter".

K *All right, um, talking about this lesson plan, it was one of our goals to learn about the change among diagram, graph, and formula. Also, to think about the domain of change. And, um, we had the point that how we determine an independent variable against an dependent variable. So, as our plan is along all of these factors, I know students were confused at several points. But for today, we could complete drawing a graph, and made a consideration when seven point five was given, in other words, we thought about the area between the dot and another dot. It was an introduction to regard a graph as an aggregation of dots. So, I wanted to make today's lesson as an entrance to the examination of general graph that will be shown in the lessons from now on. And also, there was another thing that today's class was aiming at unifying a graph and rate of change, not studying each one separately. So, um, the main point of the lesson was to be able to look for the answer of y to the number seven point five, I mean to the change of zero point five.*

She answered to the question, "what do you think is a good lesson?", as follows.

K *Um, it depends on what kind of teaching materials you are using, but if we use this type of teaching materials about function, I would say, "the class having multiple perspectives in considering one phenomenon".*

INT *Multiple perspectives from the students?*

K Yes.

So, she wanted to have multiple perspectives from the students on the interpretation of the “seven point five matter”. Thus, Yamama, the highlight of the lesson, from the teacher’s perspective seemed to be the whole class discussion of students’ solutions around the “*seven point five matter*”. On the other hand, for the two students interviewed the event in the lesson felt to be significant was more specifically focused on teacher’s understanding of their own solution.

She reflected on her understanding of students’ understanding as follows.

Ms. K (33:30)

INT *Okay. Um, let me just say the count. Thirty-three minutes and thirty seconds, the third female student, Ta-san, is doing the presentation.*

K *Um, here, I had already decided that I would center that seven point five matter, but I still wanted to make sure that every student had understood about another diagram. So, I let them do the presentation. But, my perception and their perception of perimeter were different. Um, I mean, students understood that part better than me. Um, I have just taught another class now, and I noticed that my point of view and students’ point of view were different. I always explain the question by looking at the perimeter, but for those students like Ta-san, they take the colored part as y . I think it is interesting as they take an independent variable as fifteen, fourteen, and thirteen when they drew a graph after this scene. That is, they took an independent variable in decreasing direction, so their graph was shaped in lower right direction. I thought it was very different from mine, but actually it was not a big problem. So, I felt that I could just leave it on because I understood it as a different way of making sense.*

INT *Your perception of the wrong answer and the actual perception of those students had were somewhat different.*

K *That’s right.*

INT *Okay. So, did you notice that through this presenter, Ta-san’s presentation ?*

K *Um, no/*

INT *No?*

K *No, well, I had this feeling,*

INT *You felt it was rather different.*

K *Yeah, I felt so. And, it became clear when zero was given, I mean, when they spoke up their opinion toward my question that why it would become twenty-six when one was given. That was the time I thought, well, I had better treat it in next class. Um, I thought I could use their thoughts for next lesson of rate of change.*

The excerpts for the interview data suggest that the students perceive lesson structure differently from their teacher. As was mentioned earlier, one of the characteristics of Japanese teachers’ planning of lessons is the deliberate structuring of the lesson around a climax within a structure. The students in Japanese classrooms can be unaware of the occurrence of these climactic points or their intended significance. The teacher, in turn, cannot be aware of what students think as their importance.

Discussion

Lesson Structure as Embedded in the Sequence of Lessons

In the TIMSS Videotape Classroom Study the concept of “lesson script” was proposed as commonly accepted and predictable way of structuring a classroom session and sequencing its instructional activities. “The difference in the scripts undoubtedly follow from different

instructional goals and are probably based on different assumptions about the nature of mathematics, the ways in which students learn, the appropriate role of the teacher” (Stigler & Hiebert, 1997, P.18). As the preliminary analysis of LPS data suggests, a different script may be used by the teachers depending on their intention at each phase of the entire unit.

U.S. and German lessons which were analyzed in the TIMSS Videotape Classroom Study tended to have two phases: an initial acquisition phase and a subsequent application phase. In the acquisition phase, the teacher demonstrates and/or explains how to solve an example problem. In the application phase, students practice solving examples on their own while the teacher helps individual students who are experiencing difficulty. Japanese lessons appear to follow a different script. The cultural script for Japanese lesson was described in the study as follows. First, teacher poses a complex, thought-provoking problem. Then, students struggle with the problem. Various students present ideas or solutions to the class. The teacher summarizes the class’ conclusions. Students practice similar problems (Stigler et al., 1999, P.136).

On the other hand, our analysis of the Japanese data in the LPS suggests that an experienced teacher may be more flexible in following the lesson pattern, depending on the phase of the entire unit or on the states of students’ understanding of the topic taught. The teacher in our data seemed to be able to follow the lesson pattern of structured problem solving, as was the case in both lesson J1-3 and J1-6. She could also “break” the structure in order to incorporate homework as the main point or a building block for the next lesson (J1-5, for example).

The lesson pattern in the sequence of the lessons clearly relates to the connections constructed by teachers between lessons and to the structure of each actual lesson itself. The lesson pattern can be varied within the entire unit of topic, depending on the phase of sequence of lessons. In other words, the lesson at the introductory phase of the entire unit can be in the structured problem solving mode, whereas the lesson at the final phase of the unit can be focused on practicing what the students have learned. In this sense, a multi-dimensional, or overarching structure within a sequence of lessons can exist. The analysis of videotaped sequences of ten consecutive mathematics lessons suggests the need to explore the “lesson structure in the sequence of lesson” in more details, as compared with the lesson pattern identified by the analysis of a set of single lessons in the TIMSS Videotape Classroom Study.

The lesson pattern relates to the connections constructed by teachers between lessons and to the structuring of the actual lesson sequence itself. Such patterns of connection and sequence may well be culturally specific, and, pending comparative analysis of the data from the other participant countries, this is one hypothesis suggested by our data. Does a cultural script in the sequence of lessons exist? Is there any overarching structure in the sequence of the lessons? These questions should be explored in a further analysis of our data.

Discrepancies in Perceptions of Classroom Events between the Teacher and the Students

The comparison of perceived events to be felt significant by the teacher and the students clearly shows that there are similarities and difference between them. When we look into the interview data closely, the difference can be understood as discrepancies in perceptions of classroom events between the Teacher and the Students.

The excerpts for the interview data suggest that the students perceive lesson structure differently from their teacher. As was mentioned earlier, one of the characteristics of Japanese teachers’ planning of lessons is the deliberate structuring of the lesson around a climax within a structure. The students in Japanese classrooms can be unaware of the occurrence of these climactic points or their intended significance. The teacher, in turn, cannot be aware of what students think as their importance.

It is of interest in this study whether the learner practices observed in one country show

consistency of form and purpose such as to suggest a culturally-specific character. Whether or not such identifiable learner characteristics exist as cultural traits, this study is predicated on a belief that international comparative studies are likely to reveal patterns of practice less evident in studies limited to a single country or community. They might share the beliefs about learning mathematics in the classroom and be constructing different meanings associated to the same events. Issues raised by the results should be explored in a further analysis. A further analysis of the LPS data is needed to clarify the discrepancies and associated meanings.

Final remarks

In this paper a preliminary analysis of the Japanese data in the Learner's Perspective Study was presented. A particular attention was given to how the teacher intended to structure the lesson and how the students perceived classroom events within the lesson structure.

The results of the analysis of the videotaped sequences of ten consecutive mathematics lessons suggest the need to identify an overarching feature of the "lesson structure in the sequence" as contrasted with the lesson pattern identified by the analysis of a set of single lessons. Also, based on the analysis of post-lesson interviews, discrepancies in perceptions of classroom events between the teacher and the students were described. They might share the beliefs about learning mathematics in the classroom and be constructing different meanings associated to the same events. Issues raised by the results should be explored in a further analysis.

The analysis described in this paper reveals the richness and potentials of the collected data in the Learner's Perspective Study. When we recast the results in the light of international comparison, a culturally-specific character found in mathematics classroom will become clearer.

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APPENDIX

Elements in the Lesson Felt to be Significant by the Teacher and the Students: J1-5

Teacher (9 elements)	S 1(Ni) (8 elements)	S 2 (Ta) (7 elements)
3.50 Reviewing the previous topic		
		6.00 Discussion on the problem
9.29 Two students presenting	9.23 Checking the table	
14.00 Group work	14.25 Group work	14.22 Group work
16.50 Taught at the students' desks	16.00 Discussion in pair and the teacher came to their desks	17.30 The teacher came to their desks
28.00 Student (No) presenting	27.09 Student (No) presenting	24.44 Student (No) presenting
29.30 Student (No) presenting		
32.26 Student (Um) presenting		
33.30 Student (Ta) presenting	34.30 Student (Ta) presenting	
	37.45 Herself presenting	37.26 Student (Ni) presenting
		40.00 Student (Ta) explaining
42.50 Student (Um) explaining	42.55 Student (Um) explaining	43.02 Two graphs were compared (Student (Um) explaining)
	45.20 Student (No) explaining	