

The Structure of Mathematics Lessons in Australia*

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Jablonka, E. “The Structure of Mathematics Lessons in German Classrooms: Variations on a Theme.”

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Abstract

The utility of characterising a nation's or a teacher's classroom practice with a single lesson pattern or script is problematised as a result of the analysis of 30 lessons taught as three sequences of ten lessons by three Australian teachers. The intention was that comparison be made between US and Australian lessons on the premise that the USA and Australia shared certain cultural features and that this might be reflected in similarity of lesson structure. It does appear that classroom practice in the Australian lessons analysed shares certain common structural features. Despite the assumption of cultural similarity, there were significant structural differences between the Australian lessons analysed and the US lessons. It is my contention that these differences are not best revealed through comparison of a pattern or script, characteristic of every (or even most) lessons in either Australia or the USA. Such a representation is in error and unhelpful as a guide to the differences between the practices of teachers or nations. In this paper, I suggest that more useful comparisons can be made at the level of "lesson event." It is also possible that international differences in classroom and curricular practice could be expressed through the structure of a topic. Analysis of the Australian data suggests that it is in the idiosyncratic enactment of lesson events that a teacher's authorship is most evident. It is further suggested that the characterisation and analysis of lesson components is more useful in understanding differences between teachers' practices, whether between countries or within a particular country. Importantly, such comparative analyses presume that international comparison of lesson events can be made on the basis of common form but different function, and, possibly, on the basis of common function but different form. The analysis of one such lesson component ("Kikan-shido" or "Walking between desks") is presented as an illustration of the use of form and function as analytical tools for comparison.

Introduction

Typically of international comparative research (see Clarke, 2003a), the Australian lessons analysed in the Learner's Perspective Study (LPS) share some of the more obvious features with their overseas counterparts (such as the consistent use of periods during the lesson in which students 'practice' mathematical procedures), appear to differ significantly in others (such as the almost complete lack of student demonstrated solution to the whole class), and, at the level of intention and meaning, may involve apparently similar activities to those employed overseas, but which are predicated on entirely local pedagogical principles.

The picture of constrained variation of practice reported by Shimizu (2002) for the LPS Japanese data was also evident in the analysis of the Australian data. The acquisition and application pattern reported for Germany by Stigler and Hiebert could be detected but, as with the German LPS data, was variously employed. In line with the US lessons, group work on a thought-provoking problem was also used on occasions. Perhaps the most distinctive characteristics to emerge from comparison of the Australian lessons with their US, Japanese and German counterparts were the extremely high-levels of student-student

interaction as structural features of the mathematical activity of every lesson, and associated with these periods of student-student interaction, the thorough and extensive one-on-one interaction between the teacher and virtually every individual student at some point during such periods of individual or collaborative mathematical seatwork.

Earlier analyses of Australian mathematics classroom practice (Clarke, 2001) documented the extent to which student-student interaction was a major component of mathematics lessons and one which teachers tacitly or explicitly exploited in achieving their pedagogical goals. As will be seen in the following analyses, it would certainly be inappropriate to characterize the Australian mathematics lessons in the LPS data by a “simple, common pattern,” however there do appear to be pedagogical principles on which the Australian lessons are commonly predicated, and these implicit principles are likely to provide a better characterization of the cultural basis of Australian mathematics teaching than any particular lesson pattern or prevalent instructional activity. It is possible that the enactment of these principles is most evident in the priority attached by the Australian teachers to particular types of ‘lesson events,’ such as “Walking Between Desks” (or ‘Kikan-Shido’ as the Japanese call it), which directly address the problem of individual variation by the structural provision within each lesson of opportunities for the teacher to interact with each individual student.

Connecting the TIMSS and TIMSS-R Video and LPS projects

Based on the analysis of 80 single lessons, Stigler and Hiebert and their co-workers (Stigler & Hiebert, 1999; US Department of Education, 1999) reported that U.S. lessons could be characterized by four distinct classroom activities and that these activities, when placed in a particular sequence, formed the basis of a national lesson pattern. The lesson pattern for the United States was reported as:

- a) Reviewing previous material;
- b) Demonstrating how to solve problems for the day;
- c) Practicing; and
- d) Correcting seatwork and assigning homework.

(Stigler & Hiebert, 1999, p. 80)

This study has been supplemented recently by the TIMSS-R Video Survey, which utilised the same basic research design to address the question: “[Do] teachers in all countries whose students achieve well in mathematics teach the subject in a similar way” (Hiebert et. al., 2003, p. 119). This question is clearly predicated on the assumption, reported as a finding from the first TIMSS Video study (Stigler & Hiebert, 1999), that teachers within a single country teach mathematics in a similar way. International comparative research is principally concerned with the relationship between similarity and difference (Clarke, 2003a, and Clarke & Suri, 2003), since a postulated difference between the practices of two countries presumes a similarity in practice within each of those countries taken separately. The aspiration to compare at one level (international) implies an aspiration to typify at the other level (national). Either the choice of what is to be compared determines the choice of what to typify, or emergent typifications suggest those characteristics that might be compared. Both TIMSS Video Studies take ‘the lesson’ as the unit of comparison and therefore as the unit by which a nation’s practices will be typified. The LPS project examines the viability of the lesson as the unit of international comparison and national typification and considers alternative units of analysis.

The study design for the Learner's Perspective Study (LPS) (Clarke, 2002) (www.edfac.unimelb.edu.au/DSME/lps), also a classroom study of videotaped lessons, involved videotaping a considerable number of consecutive lessons in each school. This classroom video data was supplemented by the post-lesson reconstructive accounts of teachers and students, and by test and questionnaire data, and copies of student written material. In the United States, ten consecutive single lessons, each ranging in length from between 50 and 70 minutes, were videotaped in two schools. A third U.S. school was videotaped for five consecutive lessons; however, these lessons were each more than an hour and a half in length. The schools were in demographically different regions of the same major U.S. city. Similarly, lesson sequences were videotaped in three Australian schools in demographically different regions of the same major Australian city.

The data from the LPS allowed for analysis of lesson structure of single lessons as well as across a number of lessons. Indeed, design of the LPS, including the initial choice of participating countries, anticipated the comparison of the LPS analyses of videos of lesson sequences with Stigler and Hiebert's analyses of the videotapes of single lessons. The two-stage analysis of the LPS data, presented in this paper, suggests that there is a more complex view of the structure of US mathematics lessons than the lesson structure identified by Stigler and Hiebert's (1999) analysis of single lessons.

Stage One of the analysis found that typically, for all three teachers, the structure of a lesson differs from one lesson to the next. School 1 appeared the most variable in structure while School 3 appeared the most uniform in structure. There is evidence to suggest that a single lesson pattern:

- a) could not capture the essence and variety of lesson structure within an individual teacher's classroom capability and practice;
- b) nor describe the typical lesson structure of all three classrooms in a satisfactory manner.

Stage Two of the analysis helped distinguish the events in the lessons that had similar teacher functions but were enacted differently by the three teachers. In fact the second stage of the analysis, of a sequence of lessons, provides further evidence to support a complex view of lesson structure and oppose Stigler and Hiebert's (1999) claim of a national lesson pattern. The analysis also helped to establish the value of a sequence of consecutive lessons as the preferable unit of study than the single lesson.

Method of Analysis

By referring to the given descriptions of each activity by Stigler and Hiebert (1999), mixed videotaped footage of the practices of the classroom teacher and the whole class was observed for each of the three Australian classrooms. It was then determined which of the four activities best described the classroom behaviour for each minute of every lesson. Two researchers completed this task independently and the results were compared and discussed and a consensus coding constructed. The results reported in this paper combine the efforts of both researchers.

To simplify the process of coding and to compare individual lesson structures more easily, a representational system was devised whereby each activity was allocated a particular color.

| | |
|--|---|
| | Reviewing previous material |
| | Demonstrating how to solve problems for the day |
| | Practicing |
| | Correcting seatwork and assigning homework |

Figure 1. Allocation of color for coding purposes to each of the classroom activities found in Stigler & Hiebert's (1999) U.S. lesson pattern

Every lesson was visually represented as a single column with the number of rows equalling the number of minutes in that particular lesson. This visual representation of lesson structure allows the reader to gauge not only the sequence of activities in a lesson but also the duration of each activity and compare this information with other lessons within the school, or other schools, more easily. No indication of what proportion of the lesson would be usually allocated to each particular activity was given by Stigler and Hiebert (1999) for the US lesson pattern.

The process by which the Stigler and Hiebert US lesson pattern was applied to the LPS data is described at greater length in Mesiti, Clarke, and Lobato (2003).

Results

The activities that characterized US lessons in Stigler and Hiebert's account were accompanied by a description of what was considered the typical classroom practice. Stigler and Hiebert (1999) provided these descriptions to illustrate the conventional implementation of each of the activities as seen in the 80 single lessons of US teachers.

| | |
|--|--|
| | <p style="text-align: center;">Reviewing previous material</p> <p style="text-align: center;"><i>The lesson begins by checking homework or engaging in a warm-up activity. Mr Jones conducted a warm-up activity and then checked homework, an opening that is quite common.</i></p> |
| | <p style="text-align: center;">Demonstrating how to solve problems for the day</p> <p style="text-align: center;"><i>After homework is checked, the teacher introduces new material, or reviews previous material, by presenting a few sample problems and demonstrating how to solve them. Often the teacher engages the students in a step-by-step demonstration by asking short-answer questions along the way.</i></p> |
| | <p style="text-align: center;">Practicing</p> <p style="text-align: center;"><i>Seatwork is assigned, and students are asked to complete problems similar to those for which the solution method was demonstrated. Seatwork usually is done individually, although sometimes students work in small groups to compare answers and help one another.</i></p> |

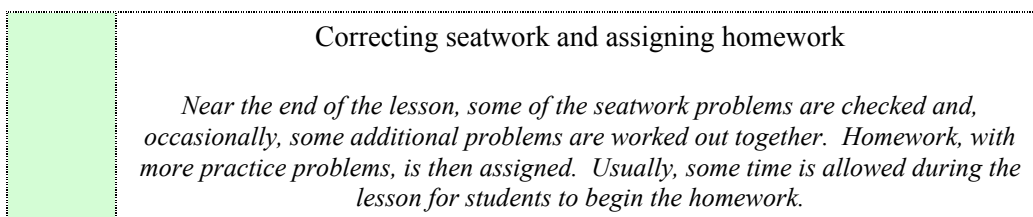


Figure 2. The classroom descriptions of each of the activities found in the U.S. lesson pattern (Stigler & Hiebert, 1999, p. 80)

Mesiti, Clarke and Lobato (2003) have applied these categories to 30 US lessons studied as part of the LPS project. Figure 3 shows the results for US School 1.

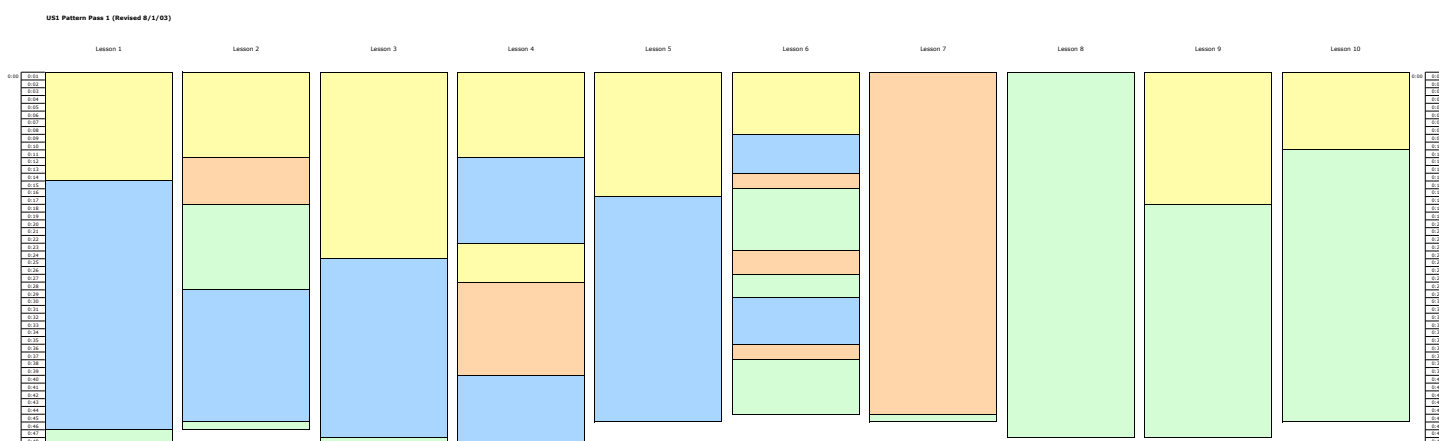


Figure 3. Stigler & Hiebert (1999) U.S. lesson pattern as applied to LPS U.S. School 1

The first question addressed by the analysis reported here concerned whether or not the lesson pattern and its constituent elements could be applied to the LPS Australian classroom data. The second question concerned whether or not the use of this coding scheme suggested either significant similarities or differences in the way the US and Australian lessons were structured.

Coding procedure for the Australian data

Lessons from each of Australian Schools 3 and 4 were selected for coding on the basis that they encompassed the range of practice evident within those classrooms. Two researchers then independently analyzed these lessons, applying the American pattern as liberally as had been done in the initial coding of the US lesson data. After this independent analysis, the resultant coded lessons were compared, the few differences discussed and resolved, and the coded lessons adjusted accordingly. These few discrepancies related mainly to timing and occurred at the end or the beginning of an activity and were resolved by a joint viewing of the video data. The consensus coding principles were then applied by one of the researchers (Nash) to six lessons from Australian School 1. The results of this coding process are displayed in Figures 4, 5, and 6.

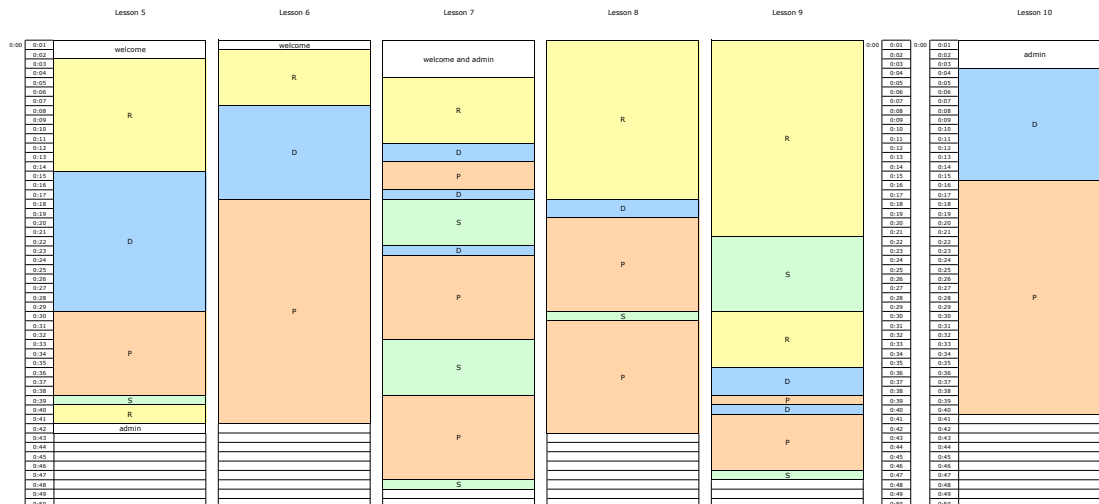


Figure 4. U.S. lesson pattern categories as applied to six lessons from Australian School 1.

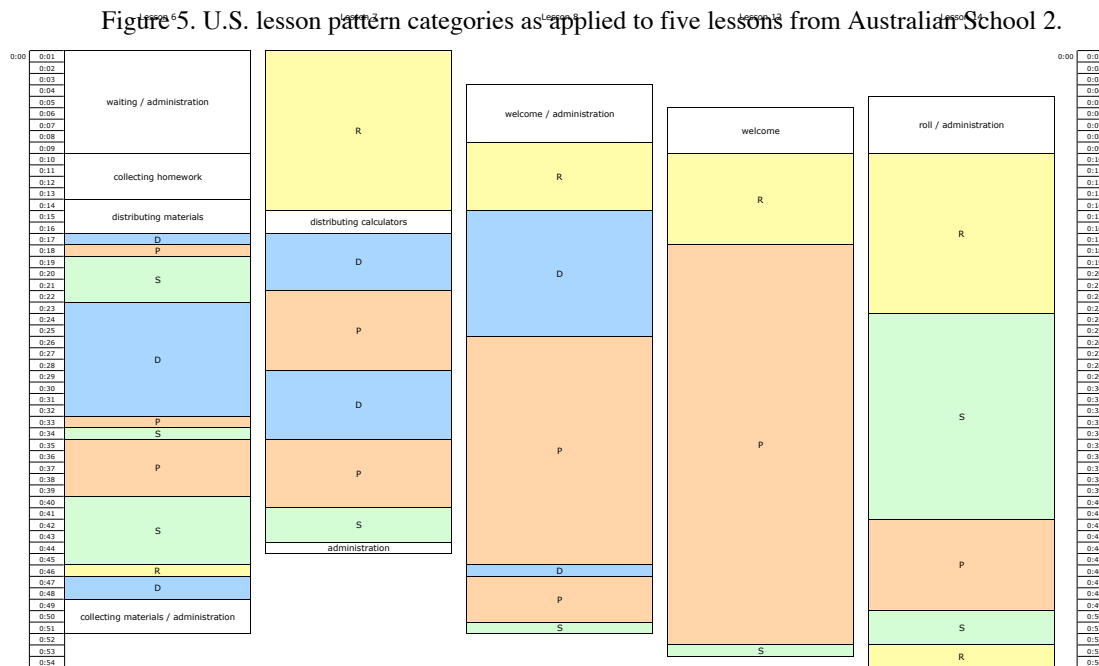


Figure 5. U.S. lesson pattern categories as applied to five lessons from Australian School 2.

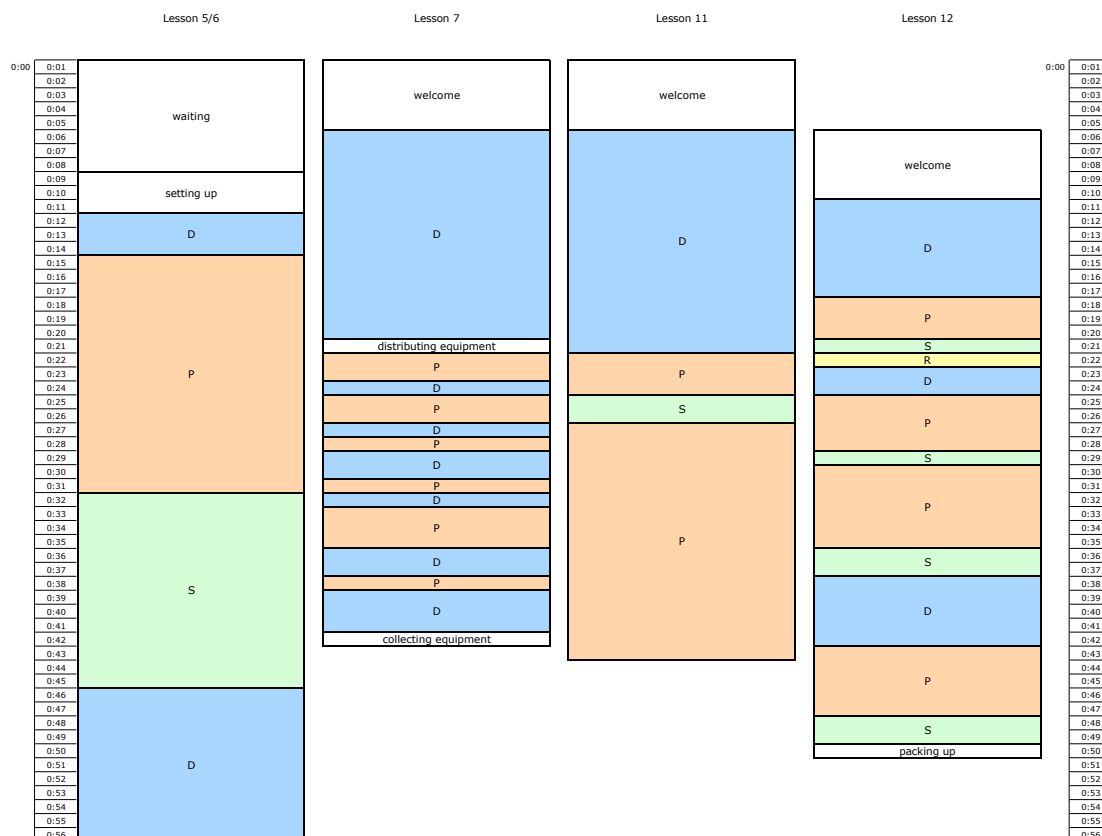


Figure 6. U.S. lesson pattern categories as applied to four lessons from Australian School 3.

Figures 4, 5 and 6 suggest that the answers to the preceding questions are:

- (i) The individual US lesson pattern constituent categories were only an imprecise fit to the Australian data and, in several instances did not correspond to Australian classroom practice, even with extremely liberal interpretation,
- (ii) The US lesson pattern itself did not appear to match any of the Australian lessons, and
- (iii) Nonetheless, there did appear to be significant structural differences between the US and Australian lessons analysed.

The occurrence of rapid alternation of activity types evident in the Australian classrooms was one of the most visible structural differences between the Australian and U.S. lessons. Australian School 3, Lesson 7, provides a good example of this, in which the teacher alternates short ‘bursts’ of demonstration and practice. This alternating activity, although apparently composed of two of the U.S. activity types, is probably better characterised as a specific ‘lesson event’ in its own right. The point I am making is that even the liberal application of the U.S. activity ‘codes’ to Australian lessons fails to capture important structurally distinctive features of those lessons. This raises the question as to what more useful analytical unit might be employed other than the individual lesson, if we are to gain insight into the differences between the practices of U.S. and Australian teachers that our data suggest exist.

A further point, already posited as underlying any such international comparisons, is that the appearance of difference between the U.S. lessons and the Australian lessons, also implies some level of similarity within the U.S. lessons and within the Australian lessons. Stigler and Hiebert (1999) reported a similar observation:

When we watched only U.S. lessons, we tended to notice the differences among them . . . When we watched a lesson from another country, we suddenly saw something different. Now we were struck by the similarity among the U.S. lessons and by how different they were from the other country's lessons.

(Stigler & Hiebert, 1999, pp. 76-77)

The challenge is to find an analytical framework capable of revealing these international differences and national similarities, while remaining sensitive to the extent of variation of practice within the national lesson sets. Stigler and Hiebert (1999) chose the lesson as their unit of analysis for the purpose of international comparison. Even in the more recent TIMSS-R Video Study we find reference to “the method of teaching seen in the Japanese videotapes”(Hiebert et al., 2003, p. 119), that is, to a single national method of teaching.

Anderson-Levitt (2002, p. 20) juxtaposed the statement by LeTendre et al. that “Japanese, German and U.S. teachers all appear to be working from a very similar ‘cultural script’” (2001, p. 9) with the conclusions of Stigler and Hiebert (1999) that U.S. and Japanese teachers use different cultural scripts for running lessons. The apparent conflict is usefully (if partially) resolved by noting with Anderson, Ryan and Shapiro (1989) that both U.S. and Japanese teachers draw on the same small repertoire of “whole-class, lecture-recitation and seatwork lessons conducted by one teacher with a group of children isolated in a classroom” (Anderson-Levitt, 2002, p.21), but they utilise their options within this repertoire differently. These similarities that become differences when we change the unit of analysis has been identified as a characteristic of international comparative research (Clarke, 2003a, and Clarke & Suri, 2003).

The dynamic between the levels of analysis at which similarities and differences appear was hinted at by Stigler and Hiebert (1999).

The three [lesson] patterns share some basic features: the class reviewing previous material, the teacher presenting problems for the day, and students solving problems at their desks. Apparently, there is some international agreement about the importance of these activities. On closer inspection, however, it becomes clear that these activities play different roles.

(Stigler & Hiebert, 1999, p. 81).

Researchers in the LPS project are currently exploring the viability and utility of ‘lesson events’ as a distinguishing characteristic, capable of reflecting local variation, national similarity and international difference.

‘Lesson Events’ – Distinguishing Form and Function

An alternative approach to the characterisation of practice by a lesson pattern or script is the identification of a specific classroom event type and the practices through which it is constituted, such that, while not necessarily a consistent element of every or even most of the lessons being analysed, the particular type of lesson event is frequent in occurrence, takes a consistent general form, but may be enacted with some variation at the level of actual classroom practices. The term “lesson event” is used rather than “activity” because

“activity” could be interpreted at several different analytical levels. For example, both “whole class discussion” and “student-initiated question” could be classed as forms of activity, even though one activity could occur as a component of the other. A Lesson Event is intended to connote a form of classroom interaction occurring within a lesson, but at a level of social complexity greater than just a statement or action taken by an individual. Central to the analysis undertaken by LPS research team members was the emergent character accorded to the identified ‘lesson events.’ The identification of a ‘lesson event’ type assumed some regularity of form and some evidence of recurrence across the set of lessons from a particular country. Mesiti, Clarke, and Lobato (2003) have posited “Guided Development” as a lesson event type observed in the U.S. lessons analysed as part of the Learner’s Perspective Study. In the case of the LPS Australian data, one such lesson event type was what the Japanese call “Kikan-Shido” or “Walking Between Desks.” This particular lesson event type provides a useful example of what appears to be a widespread component of Australian lessons, similar in form to a lesson event found in Japanese classrooms (and elsewhere), but possibly serving a qualitatively different and idiosyncratic function in Australian classrooms.

“Walking between desks (Kikan-shido)”

Form: While the students are engaged in “practice”, either individually or in groups, the teacher walks around the classroom, observing students at work, and may or may not speak or otherwise interact with the students.

Function (specific to Australian data): In the Australian LPS data, all three teachers make extensive use of “walking between desks” in every lesson, and commonly for extended periods of many minutes. During this time, the Australian teachers monitored the students’ current activities and, sometimes, whether or not homework had been completed. While walking around the classroom, the Australian teachers frequently conversed with the students: Questioning, prompting, and generally scaffolding the students’ activity. The scaffolding activity was much more likely to involve questioning students than simply telling them an answer or a procedure to use.

For the Australian teachers, the activity of “walking between desks” appeared to have at least three principal functions: (i) monitoring and encouraging current on-task activity, (ii) actively scaffolding this on-task activity, and, sometimes, (iii) monitoring the completion of homework. On many occasions teachers would kneel or sit beside a student (or students) and engage them in conversation about the task they were attempting.

One aspect of this event type that varies even within the Australian data is what the other students are doing during this activity, particularly while the teacher is ‘tutoring’ a particular student. This (what the others are doing) may be one of the more useful characteristics that distinguishes one teacher’s implementation of kikan-shido from another’s.

The three examples included in the Appendix to this paper show how each of the three Australian teachers engaged in the activity of “Walking Between Desks” – the three examples were chosen to illustrate the diversity of practice evident within the Australian data.

Each Australian teacher attached a high level of significance to the opportunity to interact with every student on a one-to-one basis at some time during the lesson. The perceived need to provide this form of personalised scaffolding in every lesson was evident in both the classroom video material and in the teacher interviews. It is a reasonable inference from the teacher interview data that the priority attached to this practice by the Australian teachers stemmed from a pedagogical principle that whole class explanation and discussion alone would not meet the particular needs of individual students and, further, would not provide the teacher with adequate knowledge of each student's progress and understanding of the mathematical content being covered.

A corollary of this principle was the related belief that students could usefully support each other's learning. As a consequence, widespread student-student interaction was a feature of class activity during the time that the teacher was engaged in Walking Between Desks. The tacit or explicit encouragement of student-student interaction and the associated distribution of responsibility for the scaffolding of learning suggest a network of interconnected beliefs and consequent practices. Students clearly adjusted their classroom practice in anticipation of Walking Between Desks (see Clarke, 2003b). Teachers' utilisation of Walking Between Desks and the associated student-student interactions suggested a relative relocation of the agency for knowledge generation in the direction of the students that may well distinguish Australian classrooms from classrooms in other countries. It is perhaps only through the international comparison of practice that such potentially national characteristics become evident.

Concluding Remarks

In the logic of international comparative research: The aspiration to compare at one level (international) implies an aspiration to typify at another level (national). Methodologically, either the choice of what is to be compared determines the choice of what to typify, or the researcher looks for emergent typifications that suggest those characteristics that might be compared. In the analysis reported in this paper, I have attempted to examine the viability of the lesson as the unit of international comparison and national typification and also to consider an alternative unit.

The lesson pattern and constituent activity types proposed by Stigler and Hiebert (1999) as characterising mathematics lessons in the U.S. were used to analyse Australian mathematics lessons documented as part of the Learner's Perspective Study (LPS). The rationale behind this analysis arose from the postulated cultural similarity between Australia and the U.S.A. Several points can be made as a result of this analysis:

1. The U.S. activity types are an imprecise fit to the activities occurring in Australian classrooms.
2. The U.S. lesson pattern reported by Stigler and Hiebert (1999) was not evident in any of the Australian lessons analysed.
3. There was significant variation in structure and practice within the Australian lessons analysed, both for the national set of lessons and for each teacher.
4. Analysis of the lessons from the LPS Australian data show sufficient variation to suggest that it is neither productive nor correct to characterise Australia's mathematics lessons with a single lesson pattern or script. That is, national typification at the level of lesson seems problematic.

5. Typification of Australian classroom practice is suggested, however, at the level of the ‘lesson event.’ This suggestion must be viewed as tentative. The three sequences of ten lessons (taught by three different Australian mathematics teachers) showed sufficient diversity to accord any recurrent features with possibly ‘typical’ status. Such claims to national typicality can be ‘tested’ by comparison with the features of mathematics lessons in other countries.
6. The distinction between form and function is suggested as an appropriate basis on which to undertake international comparative research. Specifically, the example has been provided of the lesson event ‘Walking Between Desks,’ which is known to take a similar recognisable form in classrooms in several countries, but which is postulated to serve distinctly different functions in the mathematics classrooms of each country.

In the writings of Stigler, Hiebert and their co-workers, we find an interesting shift from discussion (and advocacy) of “lesson scripts” (Stigler & Hiebert, 1998) to “lesson patterns” (Stigler & Hiebert, 1999) and via “hypothesised country models” to “lesson signatures” (Hiebert et al., 2003) as the means by which the classroom practices of countries might be usefully compared. This trend signifies an increasing recognition that meaningful comparison of teaching practice across an international sample requires a multi-dimensional framework and a greater sensitivity to variation than is possible within the confines of a ‘lesson script.’

Certainly, based on the analyses reported by Mesiti, Clarke and Lobato (2003) and those reported in this paper, it seems likely that, in attempting to accommodate the variation evident in a national sample of lessons, the resultant lesson structure and its constituent codes must be so inclusive as to sacrifice the details that might otherwise have facilitated meaningful comparison and informed practice.

To summarise: Despite the demonstrable variation in the structure of lessons taught by an individual teacher or by several teachers from the same country, there do appear to be recognisable structural differences in practice between mathematics classrooms in different countries; even when these countries are as superficially similar in culture as Australia and the U.S.A. These differences were evident when the analysis of the Australian lessons reported in this paper was compared with the American lessons analysed by Mesiti, Clarke and Lobato (2003, in this symposium). By implication, this suggests that there must be similarities across each national set of lessons. Perhaps these similarities in the lessons of a particular country are only evident (or, at least, most evident) through comparison with the lessons of another country. The challenge for researchers conducting such international comparative studies is to find a framework and a unit of analysis conducive to fruitful comparison. Significant and potentially useful differences do seem to exist in the practices by which teachers in Australia and the U.S. implement particular lesson components (‘lesson events’).

As has been said elsewhere:

Under this alternative approach, the unit of analysis is no longer the lesson, it is the events through which lessons are constituted, which have their own integrity and character and which a teacher may employ differently within the various lessons that in combination constitute a content “topic” or “unit.” One hypothesis suggested by our analysis is that the deployment and specific form of enactment of such lesson

events is a more distinctive, revealing, and useful characteristic of mathematics lessons in a particular school system, country, or culture, than the lesson itself.

(Mesiti, Clarke, Lobato, 2003, p. 13)

The value of international comparative research in this context lies in the heightened diversity of practice afforded by an international sample. This diversity of practice both demonstrates the degree of variation possible with regard to a particular practice (lesson event) and highlights the significance of any similarities that might emerge.

Acknowledgements

The work of Melanie Nash in coding the Australian lessons is gratefully acknowledged.

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Appendix

Three examples of “Walking Between Desks” taken from the Australian data

The following three examples show how each of the three Australian teachers engaged in the activity of “Walking between desks” – the three examples were chosen to illustrate the diversity of practice evident within the Australian data.

Example 1: A1-L8 (0:33:47 to 0:36:26) [Country, School, Lesson Number, Start and End Times]

Example 2: A3-L8 (0:27:59 to 0:31:52)

Example 3: A4-L12 (0:31:18 to 0:33:27)

EXAMPLE 1: A1-L8 (0:33:47 to 0:36:26) – Guided Questioning – Non-Routine Task

| | | |
|---|------|--|
| 0:33:47 | T | [to Joe et al.] How're we going? How are we going? |
| <i>Teacher walking around surveying students' work.</i> | | |
| 0:33:50 | T | [to Joe] What, why aren't you working... |
| 0:33:54 | Joe | [To T] I don't know, I... |
| <i>Teacher sits with student discusses progress</i> | | |
| 0:33:54 | T | ... as hard as you normally work? |
| 0:33:55 | Joe | [to T] I don't like this sh... I don't get it. It's, well, I don't know if they're corners, I don't know if they're... |
| 0:34:00 | T | All right. He's [referring to Leon?] on the right track. They're not corners, you're going to get a... |
| 0:34:03 | Joe | A circle, a circle... |
| <i>Teacher gestures to help student visualize the circles arc.</i> | | |
| 0:34:05 | T | You're going to get a quarter circle, you're going to get a, an arc, that's a quarter circle. All right? |
| 0:34:09 | Joe | With a two centimeter diameter. |
| 0:34:11 | T | Yes. Radius. |
| 0:34:12 | Joe | Oh, O.K. |
| 0:34:13 | T | [to ?] He, he won't be able to tell what you've done. All right. Does that help you? |
| 0:34:16 | Joe | Can I have my calculator? |
| 0:34:20 | T | [to Martin] What have we got? |
| <i>Teacher moves along same bench group positioning herself between two students. She then assists the group of students at that bench.</i> | | |
| 0:34:22 | Mart | I got one hundred and twelve point five six [laughs] No I didn't. |
| 0:34:26 | T | One hundred and twelve point five six. No, they're not necessarily right. Now, tell me why two hundred first of all. |
| 0:34:32 | Mart | Well... |
| 0:34:32 | Mart | No, I got one hundred and eight to start off with because I got two centimeters and I put it there and I added on to that which was twenty seven and then I just did it like that. |

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| 0:34:45 | T | Well we've got this, we've got this square, right, and then we've got this, this circle that's traveling, right, that's traveling around. And when it gets to a corner it's doing that. [Points to board] |
| <i>Teacher draws on students note paper/book drawing the problem.</i> | | |
| 0:34:58 | Joe | [to T] one hundred and twenty five point five |
| 0:35:01 | T | How'd you get that? |
| 0:35:02 | Joe | I worked out the corners and then added everything on. |
| 0:35:06 | T | How'd you work out the corners? |
| 0:35:08 | Joe | Well I ... two times pi times four . |
| 0:35:10 | Leon | It's wrong, It's wrong! |
| 0:35:13 | T | four ...which is? |
| 0:35:14 | Joe | For four corners, and plus one hundred , well twenty five... |
| 0:35:14 | Leon | [to ?] Hey, you don't know which way the coin's going to go? |
| 0:35:16 | T | two times pi times four ? This is where you're getting a bit confused. You've got the, you've got all these distances. Do you know what they are? |
| <i>Teacher explains the next part of the problem in students book.</i> | | |
| 0:35:26 | Leon | Ow! Ow! |
| 0:35:26 | Joe | The length? |
| 0:35:27 | T | Yeah, which is? How much? |
| 0:35:29 | Joe | twenty five |
| 0:35:30 | T | All right, they're each twenty-five, so you're on the right track to start with. |
| 0:35:33 | Joe | That's what we had from before. |
| 0:35:35 | T | Yeah, that's what you had [points to Martin], you had [points to Carl], no you had first [points at Martin] |
| 0:35:38 | Mart | Yeah |
| 0:35:39 | T | Right, now the interesting thing is what the coin does when it gets towards the end. Now it doesn't just drop. The coin is rolling so the centre... Or does it drop? I'm confusing myself now. |
| 0:35:52 | T | No 'cause the arm... You imagine... The circle's rolling... It would have to be. |
| <i>Teacher uses arm to demonstrate the action of the coin and the arc of the corner.</i> | | |
| 0:36:00 | T | So, you've got this happening [moves arm in a curve], and you know that's a quarter circle. |
| 0:36:06 | T | So you have to find out what the distance of that line is. How could you do that? |
| 0:36:13 | Mart | Um, I dunno. |
| 0:36:15 | T | Yeah you do. |
| 0:36:15 | Carl | That's two cms, that's twocms |
| 0:36:17 | T | What's? Yes good, so how would you find out what I've drawn in dark blue...? |
| 0:36:22 | Mart | I'd do what you did there. [Points to board] |
| 0:36:24 | T | Yes, can you do that? |
| 0:36:26 | Mart | Oh yeah. |

EXAMPLE 2: A3-L8 (0:27:59 to 0:31:52) – Guided Questioning – Routine Task

| | | |
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| 0:27:59 | T | Of course you can. Not a problem. Okay, That's fine. How we going here girls? |
| <i>Teacher goes to end of row and sits down with group of students.</i> | | |
| 0:28:07 | Robyn | Good. |
| 0:28:08 | T | Good? [...]Yeah, good. |
| <i>Teacher points to example in book.</i> | | |
| 0:28:10 | Robyn | I don't actually know where I'm up to [...] |
| 0:28:11 | T | Because you haven't got your book. Had you done, you hadn't done question four yet have you. |
| 0:28:19 | Robyn | Nuh. |
| 0:28:21 | T | Okay, let's do that. Because this is what we did the last time we were together, okay, so let's do this together. |
| 0:28:36 | T | Good. [...] Mmmhm. [...] What are you going to do with that one? |
| <i>Teacher focuses on one girl.</i> | | |
| 0:28:46 | Robyn | Twenty-five over four. |
| 0:28:51 | T | One of them is cents and one of them is in dollars. Remember I want them to be the same. |
| 0:28:57 | Robyn | Twenty-five... |
| 0:29:03 | T | Over... |
| 0:29:03 | Robyn | Four. |
| 0:29:05 | T | Twenty-five cents over four dollars. But can I mix up cents and dollars? |
| 0:29:14 | Robyn | Yep. |
| 0:29:16 | T | Well I can if I've got normal money. |
| 0:29:23 | Robyn | What am I doing, twenty-five over? |
| 0:29:38 | T | Good, now, way to go. Stephen are you writing the setting out down as well, thank you, not just answers. Listen up. |
| 0:29:54 | Robyn | Two thousand five hundred. |
| 0:29:57 | T | Ooh does that sound anything like it? I've got cents and I've got dollars mixed up. |
| 0:30:01 | S | Can you change the... |
| 0:30:03 | T | Listen up Robyn, listen here. |
| <i>Teacher draws girls attention to suggestion raised by a student who has come to the desk.</i> | | |
| 0:30:06 | ? | Can you change the dollars to cents? |
| 0:30:08 | T | Yeah course I can. Ooh what was his suggestion? |
| 0:30:13 | Robyn | To change the four dollars into cents. |
| 0:30:16 | T | Was that a good suggestion? |
| 0:30:17 | Robyn | Yes. |
| 0:30:18 | T | Will they have the same units then? |
| 0:30:19 | Robyn | Yes. |
| 0:30:20 | T | Ah, very good. That was handy that he came along, wasn't it? |
| 0:30:23 | Roslyn | Miss? |

| | | |
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| <i>Teacher looks over to other student.</i> | | |
| 0:30:25 | T | Yes. |
| 0:30:27 | Roslyn | Where's Ahmet at? |
| <i>Teacher gets up and goes to Ahmet's desk. She leans over then sits on desk to check Ahmet's progress.</i> | | |
| 0:30:31 | T | Now, Ahmet did these last time. Ahmet, can you do your conversions? Can you do your kilometers into metres and... |
| 0:30:40 | Ahmet | Yeah. |
| 0:30:44 | T | I think you probably can. Yeah, so these ones down here. He was doing a really good job with them last time, weren't you? Yeah, doing really well. Will, come on, let's go love. Yeah. Okay, good. |
| <i>Teacher goes back to girls' table and continues to help with the problem.</i> | | |
| 0:31:05 | Viv | Oh. |
| 0:31:08 | T | Oh, something missing. Yeah, certainly is, that looks better. Good. Ah does that sound better? It does, does it? |
| 0:31:28 | Robyn | Yeah. |
| 0:31:29 | T | Certainly looks a whole lot better to me. |
| 0:31:32 | Kevin | Miss, now what do we do? |
| <i>Teacher now moves to assist other students on the same table.</i> | | |
| 0:31:36 | T | Finished those? Okay. Eighty kilograms to eighty thousand. Do your answers look, sound right, do you think? |
| 0:31:42 | Kevin | Yes. |
| 0:31:43 | T | Oh, very confident. Okay. I like confidence. All right. I'll put the questions up. I want you to look at some of the worded questions. |
| 0:31:52 | Kevin | Alright. |

EXAMPLE 3: A4-L12 (0:31:18 to 0:33:27) – Explicit Teacher Demonstration

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| 0:31:18 | Dwayne | I really don't get it. |
| <i>Teacher goes to students' desk and kneels down.</i> | | |
| 0:31:19 | Tom | One twenty we got for the six-sided hexagon. |
| 0:31:23 | T | Let's have a look. Ah, it all seemed so simple before. |
| <i>Teacher looks at students' triangles.</i> | | |
| 0:31:26 | Tom | It did. |
| 0:31:27 | T | Alright. So there's our triangle. |
| 0:31:27 | Dwayne | Yep. |
| 0:31:28 | T | Right. Tear, tear, tear. We get the pointy ends in together, and that gave us a hundred and eighty. Straight line. |
| <i>Teacher actually makes his own set of triangles to demonstrate the activity.</i> | | |
| 0:31:45 | Dwayne | Oh. |
| 0:31:46 | T | One hundred and eighty. |
| 0:31:46 | Dwayne | Yeah, yeah, yeah, yeah. |
| 0:31:47 | T | O.K? Now we take the four-sided shape. Have you wrecked that yet? |
| 0:31:49 | Dwayne | No. |
| 0:31:53 | T | Alright. Four-sided shape. |

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| <i>Teacher uses the triangle to demonstrate the measurement of angles in a square.</i> | | |
| 0:32:07 | T | [to Scott] Scott, how we going there? |
| 0:32:09 | Scott | I have a shape. |
| 0:32:11 | T | Four-sided shape. |
| 0:32:15 | T | [to Tom and Dwayne] What do you reckon that is? Angle? |
| 0:32:17 | Dwayne | Three hundred and sixty. |
| 0:32:18 | T | Excellent. Five-sided shape. |
| 0:32:20 | Tom | How much was that? Hundred and sixty? |
| 0:32:21 | T | Three sixty. |
| 0:32:22 | Tom | Three sixty. |
| 0:32:26 | Darr | I'll just go with this one. |
| 0:32:27 | T | What is that? Five-sided shape. |
| 0:32:29 | Tom | Hey look at this ... I did mine one four five? |
| 0:32:30 | Darr | [...] |
| 0:32:32 | T | Excellent. |
| 0:32:32 | Darr | So you go, rip off the side... |
| 0:32:36 | T | O.K. |
| 0:32:39 | Tom | You're putting one eighty on all the time. |
| 0:32:41 | T | Oh, Tom. |
| 0:32:44 | T | [to Dwayne] What's happening? |
| 0:32:49 | T | Oh. |
| 0:32:55 | T | [to Dwayne] Yeah. Put it in there. Alright. So keep pointing them into there. |
| <i>Teacher helps student to position his triangles in a shape.</i> | | |
| 0:33:00 | Darr | Oh. O.K. |
| 0:33:02 | Tom | Next one will be...four fifty or something. Wait a minute, five fifty. |
| 0:33:16 | T | [to Tom] So, what are you saying. Put on another one eighty? |
| 0:33:20 | Tom | Yep. |
| 0:33:21 | T | O.Alright- So what's three sixty plus one eighty? |
| 0:33:22 | Tom | Um...five fifty, five forty. |
| 0:33:27 | T | Ah ha. It is. |