

Using International Research to Contest Prevalent Oppositional Dichotomies

David Clarke, University of Melbourne
(Australia)

Abstract: *International comparative research has the capacity to problematise our most basic assumptions. Dichotomies such as teacher-centred versus student-centred classrooms, telling versus not-telling, speaking versus listening, and even teaching versus learning can restrict educators and educational theorists to a fragmented view of the classroom. Constructing such dichotomies as oppositional creates a set of false choices, sanctifying one alternative, while demonising the other. International research offers insight into possible explanatory frameworks within which such dichotomies are no longer oppositional, but instead can be seen as complementary and fundamentally interrelated. The acceptance of such complementarities is a first step towards an inclusive theory of classroom practice and learning.*

ZDM-Classification: D10, D20

1. Introduction

With the growing internationalisation of education, and as the education community gives higher priority to international research, it is timely to examine the insights that accrue from comparative analyses of classrooms that are situated in very different cultures. My contention in this article is that it is in the examination of classrooms across a variety of cultural settings and school systems that we find our educational assumptions most visible and open to challenge. The contrasts and unexpected similarities offered by research in such culturally-diverse settings reveal and challenge existing assumptions and theories and make essential a reconstruction of some of our most basic dichotomies as complementary elements in more inclusive theories.

This paper draws primarily upon analyses undertaken as part of the Learner's Perspective Study (Clarke, Keitel & Shimizu, 2006; Clarke, Emanuelsson, Jablonka & Mok, 2006), an

international research consortium concerned with studying the practices of well-taught mathematics classrooms around the world.

The inclination to integrate rather than segregate is at the heart of the Learner's Perspective Study (LPS), since it was intended from the project's inception that any documented differences in classroom practice be interpreted as local solutions to classroom situations and, as such, be viewed as complementary rather than necessarily oppositional alternatives, within a broadly international pedagogy, from which teachers in different countries might choose to draw in light of local contingencies. I am not challenging the need for categorisation, but there appears to be an inclination within the education community to dichotomise and an associated tendency to (i) ignore the connectedness of the dichotomous categories, and (ii) on occasion, to privilege one category while denigrating the other. This places the emphasis on the separate and oppositional application of the dichotomies, rather than on consideration of their complementarity and interrelatedness.

The diversity that we find in international studies of mathematics classrooms provides us with a base from which to interrogate our own practices and the assumptions on which those practices are predicated. Among the most central of these assumptions are various dichotomous categories that act to constrain our theorising about educational settings and the processes of interest there. This paper, addresses five of these dichotomies: Teaching and Learning; Abstract and Contextualised mathematical activity; Teacher-Centred and Student-Centred classrooms; the teacher's contemporary dilemma: to Tell or Not to Tell; and the related issue for students: to Listen or to Speak. Each of these dichotomies is falsely presented as a pair of distinct, mutually exclusive categories. The result is a misleading oversimplification of the craft of mathematics teaching as conformity to a set of prescriptive and restrictive principles, rather than as a process of sophisticated, strategic decision-making. It is my contention that unless we can integrate each pair of categories as interconnected elements of a more inclusive theoretical framework, we will remain unable to account for the diversity we find in international studies of classroom practice. It is precisely the growing body of data from such international studies that provides us with the diversity that we need if we are to interrogate and refine our current theoretical position with regard

to classroom practice. In the discussion that follows, I attempt to demonstrate the consequences of such an inclusive approach.

There are other dichotomies that I will not address here. It has already been argued persuasively by Cobb, Svard and others, that if we are to move forward, we must conceive of socio-cultural and constructivist theories of learning not as competing but as complementary. That they can be constructed so as to be in competition is evident. Each theoretical frame provides coherent accounts and explanations for particular forms of learning in particular settings. Any conception of either theory that precludes the other is arguably inadequate. The identification (construction) of a theory of learning compatible with a given situation may take the social or the individual as its starting point but ultimately will be obliged to make appeal to the other if a coherent account is to be constructed. As Jere Confrey has succinctly put it: "The self is both autonomous and communal" (Confrey, 1995). In this paper, I have chosen to focus on five specific dichotomies that I consider central to our theorising and to our advocacy in relation to mathematics classrooms.

2. Data Collection in the Learner's Perspective Study

All the points made in this article are a direct consequence of analyses undertaken as part of the Learner's Perspective Study (LPS). Data collection used a three-camera approach (Teacher camera, Student camera, Whole Class camera) that included the onsite mixing of the Teacher and Student camera images into a picture-in-picture video record (see Fig. 1, teacher in top right-hand corner) that was then used in post-lesson interviews to stimulate participant reconstructive accounts of classroom events. These data were collected for sequences of at least ten consecutive lessons occurring in the "well-taught" eighth grade mathematics classrooms of teachers in Australia, the Czech Republic, Germany, Hong Kong and mainland China, Israel, Japan, Korea, The Philippines, Singapore, South Africa, Sweden and the USA. This combination of countries gives good representation to European and Asian educational traditions, affluent and less affluent school systems, and mono-cultural and multi-cultural societies.

Each participating country used the same research design to collect videotaped classroom data for at least ten consecutive mathematics

lessons and post-lesson video-stimulated interviews with at least twenty students in each of three participating 8th grade classrooms. The three mathematics teachers in each country were identified for their locally-defined 'teaching competence' and for their situation in demographically diverse government schools in major urban settings. Rather than attempt to apply the same definition of teaching competence across a dozen countries, which would have required teachers in Uppsala and Shanghai, for instance, to meet the same eligibility criteria, teacher selection was made by each local research group according to local criteria. These local criteria included such things as status within the profession, respect of peers or the school community, or visibility in presenting at teacher conferences or contributing to teacher professional development programs. As a result, the diverse enactment of teaching competence is one of the most interesting aspects of the project.



Fig. 1 Picture-in-picture video display

In the key element of the post-lesson student interviews, in which a picture-in-picture video record was used as stimulus for student reconstructions of classroom events (see Fig. 1), students were given control of the video replay and asked to identify and comment upon classroom events of personal importance. The post-lesson student interviews were conducted as individual interviews in all countries except Germany, Israel and South Africa, where student preference for group interviews was sufficiently strong to make that approach essential. Each teacher was interviewed at least three times using a similar protocol.

With regard to both classroom videotaping and the post-lesson interviews, the principles governing data collection were the minimization of atypical classroom activity (caused by the data

collection activity) and the maximization of respondent control in the interview context. To achieve this, each videotaped lesson sequence was preceded by a one-week familiarization period in which all aspects of data collection were carried out until the teacher indicated that the class was functioning as normally as might reasonably be expected.

In interviews, the location of control of the video player with the student ensured that the reconstructive accounts focused primarily on the student's parsing of the lesson. Only after the student's selection of significant events had been exhausted did the interviewer ask for reconstructive accounts of other events of interest to the research team. Documentation of the participant's perspective (learner or teacher) remained the priority.

In the picture-in-picture video record generated on-site in the classroom (Fig. 1), students could see both their actions and the actions of those students around them, and, in the inset (top right-hand corner), the actions of the teacher at that time. This combined video record captured the classroom world of the student. The video record captured through the whole-class camera allowed the actions of the focus students to be seen in relation to the actions of the rest of the class.

The classroom video data (three independent video records plus the combined picture in picture record) and the post-lesson video-stimulated interview data were supplemented by additional data in the form of teacher questionnaires (before and after the lesson sequence and after each individual lesson), scanned written and text material used or generated by the focus students or the teacher, classroom test material and a test of student mathematical achievement administered after the completion of videotaping.

3. The Reification of Fundamental Dichotomies: Teaching and Learning

Our theories are framed in language that inevitably constrains both the identification and the description of certain relationships. Learning and teaching represent the most fundamental and pervasive dichotomy around which our understandings of classroom practice have been constructed. Stepping outside the constraints of culture and language, we find that this central distinction is conceived very differently by different communities. In fact, the distinction

between teaching and learning is very much an artefact of language.

Previous research, and much of our theorizing, has tended to dichotomise teaching and learning as discrete activities sharing a common context. I have argued elsewhere (Clarke, 2001) that this dichotomisation is a particularly insidious consequence of the constraints that language (and the English language, in particular) imposes on our theorizing and that such dichotomisation misrepresents both teaching and learning and the classroom settings in which these most frequently occur.

As has been discussed elsewhere, this is particularly evident in the various translations of Vygotsky, in which the Russian word 'obuchenie' has been represented as either teaching or learning in different translations (Clarke, 2001). The integration of teaching and learning as components of a jointly enacted single activity also occurs in several other languages, including Chinese, Japanese and Dutch.

It is not my intention to challenge the separate integrity of "teacher" and "learner" as labels for individuals engaged in particular practices or discourse modes. It is just that classrooms are understood more effectively as sites for bodies of mutually-sustaining practice that in combination characterize a process we might call (in English) "teaching/learning".

What Brousseau (1986) has brought to our attention is the reciprocity of the construction of classroom practice. Learners (in this case, students) engage in practices that afford and constrain teacher actions and the actions of their classmates. Social interaction by an individual within the classroom presumes that the individual has a model of the other classroom participants and can, to some extent, anticipate their capabilities, their needs, their expectations and their responses. What is clear is the extent to which classroom practice is a jointly constituted body of negotiative social interactions that is best investigated and understood in terms of the mutuality and reciprocity of its constituent activities and of its co-construction as Teaching/Learning.

Empirically, the integration of Teaching and Learning has been addressed in analyses of patterns of participation in mathematics classrooms in a variety of countries as part of the Learner's Perspective Study (LPS). In particular, the classroom practice referred to as "Kikan-Shido" (or "Between-Desks-Instruction") has

provided a powerful example of a “whole class pattern of participation” (Clarke, 2004, and O’Keefe, Xu & Clarke, 2006; and see also Greeno, 1997, on patterns of participation). In making the claim that Kikan-Shido could be so described, it was necessary to demonstrate that it had a recurrent form, recognisable to those participating in it. This is not to say that the meanings attributed to the activity by those participating in it were correspondent. Individuals can participate in a practice whilst being positioned differently within it, and whilst attributing different characteristics to the activity. That is, without being identical, the participants’ descriptions of the activity make it clear that they are talking about essentially the same form, but they may attribute quite different functions to that form. The other essential element in this argument is the need to demonstrate that all participants can shape the particular body of practice signified by Kikan-Shido; that is, that the pattern of participation is co-constructed.

The discourse of the classroom acts to position participants in ways that afford and constrain certain practices. The discourse of educational research acts to position participants in ways that afford and constrain certain interpretations. The adoption of a theory of learning in social situations will inevitably find its reflection in the manner in which those situations are researched. Without reproducing the argument in full here, any theory of classroom practice must conceive of the activities in the classroom as co-constructed (O’Keefe, Xu & Clarke, 2006). The participants in the classroom, teacher and students, are complicit (co-conspirators) in this collaborative improvisation. Acceptance of this point has implications for the manner in which we construct and articulate our theories of learning and for the research designs by which we study the activities occurring in classroom settings.

4. Dichotomies of Task: Context and the “Relevance Paradox”

Suppose that one society seeks to develop understanding and proficiency in mathematical proof, attaching significance to the development of those forms of reasoning and argumentation idiosyncratic to mathematics, while another attaches greater priority to equipping its people with an understanding of mathematical procedures and proficiency in utilising these in everyday practical situations, while a third society

emphasises (and rewards) concept development, mathematical creativity and collaborative problem solving. There is no reason why these goals are incompatible or mutually exclusive, but they do reflect a valuing of different aspects of mathematical activity, and a curriculum that prioritised one such goal would not necessarily resemble a curriculum that prioritised another. The evaluative comparison of the consequences of such differently targeted curricula (as in international studies of student achievement) is a problematic exercise, whereas the comparative study of the methods and success of each society in addressing its local curricular goals has the potential to be mutually enriching as one community learns from the practices of the other and adopts and adapts some of its goals and methods for local use.

Many countries, especially Korea and the Netherlands, emphasised solving problems ... Japan, Sweden, and the United States emphasized ‘recalling’ mathematical information, and Hong Kong and Israel emphasized ‘justification and proof’ (Schmidt, McKnight, Valverde, Houang, & Wiley, 1997, p. 136)

In particular, it appears that a common curricular trend in the West is the “contextualisation” of mathematics in the interest of facilitating engagement, motivation, meaningfulness, relevance and/or transfer.

Virtually everywhere, the curriculum is becoming more practical (Atkin & Black, 1997)

This statement may well be true of Western curricula, but is questionable if “everywhere” were intended to include China or Korea.

The TIMSS-99 Video Study (Hiebert et al., 2003) reported significant variation in “real-life connections” in classroom tasks in mathematics. Japan and Hong Kong used the highest proportions of abstract mathematical tasks. Clarke and Helme (1998) identified the importance of recognising context as a social construction, and distinguished the ‘Figurative Context’ invoked by the task from the ‘Social Context’ in which the task was undertaken. Differences in the use of abstract and contextualised tasks seem strongly connected to a perceived need in Western classrooms to present mathematics as relevant to students.

In her analysis of LPS data from Sweden and China, Katja Svan examined the “Relevance

Paradox” postulated by Mogens Niss (1994), in which the objective relevance of mathematics in society was contrasted with its subjective irrelevance as perceived by many students. Svan was not comparing ‘mathematics teaching’ in Sweden and China, but rather looking at the beliefs and values communicated and held in two very different classrooms: one in Shanghai and one in Uppsala. Both classrooms were addressing the same mathematics topic (coordinate systems and graphing linear functions).

Svan’s analysis contrasted the Chinese and Swedish mathematics classrooms from the perspective of the emphasis given by the teacher and the students to the real-world relevance of the mathematics being learned. In the Swedish classroom, the students demanded that the teacher justify the relevance of what was being taught, and the teacher provided lengthy justifications on several occasions. It was clear that the Swedish teacher felt that the demonstration of relevance was a reasonable expectation and accepted responsibility for providing this. Despite the teacher’s efforts, students were outspoken in their lack of belief in the relevance of the mathematics they were studying. Both the Swedish classroom data and post-lesson interview data seemed to provide a powerful illustration of Niss’s relevance paradox.

By contrast, in the classroom in Shanghai, mathematics tasks tended to be very abstract in character and the teacher made no effort to demonstrate or argue for the real world applicability of the mathematics being studied, and the Chinese students did not appear, either during the lesson or in interview, to require this sort of justification of the content being studied. However, in the post-lesson interviews, the Chinese students consistently expressed strong beliefs in the utility of mathematics in general and in relation to the specific mathematics they were studying. One Chinese student said:

I think basically, I should grasp the fundamental points that are necessary for students and also I have to use these points in my everyday life (Shanghai School 1, Lesson 4, post-lesson student interview).

Svan concluded that analysis of the interviews with 15 of the Chinese students showed that there was a shared belief that mathematics was useful not only in future work and study, but also in their current everyday lives.

Svan has christened this the “Expanded Relevance Paradox” (Svan & Clarke, in preparation) and means, by this term, to refer to the paradoxical character of application-oriented mathematics teaching associated with subjective irrelevance and pure mathematics-oriented mathematics teaching associated with subjective relevance.

There is a recent commitment in South Africa to contextualising the curriculum around themes of societal significance, such as substance abuse or HIV-AIDS. Analysis of student-student interactions in the South African classrooms studied in the LPS project, led Sethole, Adler and Vithal (2002) to conclude:

The context AIDS, is not understood as a ‘vener’ to mask the mathematical intentions of the lesson but a genuine context to be engaged. To this end, and drawing from Skovsmose’s notion on critical mathematics, the new practice may be seen as an inescapable consequence of blurring the boundary between the mathematics and the everyday (Sethole, Adler, & Vithal, 2002, p. 11).

The Relevance Paradox proposed by Niss (1994) is based on a dichotomisation of the function of mathematics in society and in the classroom, and postulates a dislocation between these two contexts that is experienced by students as a lack of connection (subjective irrelevance). LPS data problematises this schism in two startling ways: firstly, Chinese students appear to have constructed the missing connection independent of explicit classroom modelling or advocacy by the teacher; and, secondly, the South African initiative removes the need for connection by dissolving the distinction between the classroom and the everyday.

Bourdieu (1990) argued that it is a mistake to see individuals as somehow located in a social structure that is external to them. Rather, they are a part of that structure, and the structure is part of them. Mathematical tasks are a constituent element of the social activity in which students engage. Attempts to increase the ‘relevance’ of these tasks through a figurative contextualisation may be counter-productive if these efforts are perceived by students to be artificial and are interpreted as reifying the very distinctions they seek to dissolve. Resolution of this dilemma may come from instructional approaches that require students to generate their own connections rather

than to impose these through pre-fabricated contexts determined by the teacher or the text.

In the terms employed by Clarke and Helme, the distinction between the figurative and the social, always tentative, has been effectively dissolved in China, through a perspective in which the significance of classroom activity derives from its situation in a broader cultural context that does not require re-fabrication at the local level of the classroom, and also in South Africa, where the minutiae of mathematical content are subordinated to a macro-social agenda that reconstructs the nature and purpose of classroom activity in socio-cultural rather than solely mathematical terms.

5. Deconstructing the Teacher-Centred/Student-Centred Dichotomy

Popular in recent educational literature as descriptors of classroom practice are the terms 'teacher-centred' and 'student-centred.' These terms vary in definition and in use, but they represent a key dichotomy driving much of contemporary Western educational (particularly pedagogical) reform. From one perspective, they appear to offer mutually exclusive alternatives with regard to the location of agency in the classroom. Western educational reform advocates student-centred classrooms, and research in Western settings confirms the value of practices associated with these classrooms (Chazan & Ball, 1997; Clarke, 2001).

By contrast, Asian classrooms have been typified as teacher-centred by both Western and Asian researchers, and this categorisation has been used pejoratively to place Asian classrooms in opposition to the student-centred classrooms of the Western reform agenda. Yet the students in these classrooms are highly successful in international studies of student achievement ('The Asian Learner Paradox') (Leung, 2001). Recent research in Chinese classrooms suggests that classroom practice is misrepresented by such a dichotomy (Huang, 2002) and that a theoretical framework is needed by which the 'teacher-centred' and 'student-centred' characteristics of classrooms can be more usefully characterised and investigated, without the assumption of an absolute dichotomy.

How can teacher dominance and student-centeredness coexist and work well in Chinese mathematics classrooms? (Huang, 2002, p. 226).

There is a general assumption in most of the educational literature that classroom discourse encompasses any form of interaction that takes place in a classroom. Nevertheless, research involving classroom interactions has tended to focus on either the teacher's talk (Wilson, 1999; Young and Nguyen, 2002) or teacher-students' interactions in either whole class (e.g., Klaassen and Lijinse, 1996, and Seah, 2004) or group discussion (e.g., Knuth and Peressini, 2001). There have been very few studies, if any, that took into account the role of student-student private interactions in generating knowledge in the classroom. Clarke and Seah (2005) adopted a more integrated and comprehensive approach, by analysing, within a subset of the LPS data, both public interactions in the form of whole class discussion and interpersonal interactions that took place between teacher and student and between student and student.

Analysis was carried out by Clarke and Seah (2005) on a selection of video and post-lesson interview data related to mathematics lessons in Hong Kong, Melbourne, Shanghai and San Diego. All teacher classroom utterances and all statements by focus students, together with post-lesson interviews with teacher and students were transcribed and translated into English. The classroom transcript of each lesson was scanned for terms or phrases that expressed, represented, illustrated or explained mathematical concepts or understandings. These terms or phrases were referred to as "math-related terms". These might take the form of conventional mathematical terms such as 'gradient' or everyday expressions such as 'slope' or 'steepness'.

The occurrence of each term was then displayed in a tabular form analogous to the resource utilization planning charts of engineers. If these math-related terms are thought of as resources drawn upon during the collaborative process of classroom knowledge construction, then the analogy is not inappropriate. Recent elaboration of this analytical approach by Clarke and Xu suggests that distributed cognition may provide a useful analytical frame within which to describe teachers' and students' utilisation of conceptual resources framed in particular technical terms.

Of particular interest was the 'permeability' of the public-private interface. That is, in what situations and with what frequency was a term, initiated in public discussion, subsequently employed by students in interpersonal

conversations. Equally, evidence was sought of terms, originating in student interpersonal conversation, that were subsequently voiced (and possibly revoiced) publicly.

The capacity of this analytical approach to distinguish between classrooms was most evident in a comparison of eighth-grade mathematics classrooms in Shanghai and Hong Kong, since both sets of classrooms could be described as being embedded in a Confucian-heritage culture. The style of teaching in the Shanghai schools analysed was such that the teachers generally provided the scaffold needed for students to reach the solution to the mathematical problems without “telling” them everything. Hence, one could find quite a few math-related terms, which the teacher had not taught, that were introduced by the students during public discussion.

Students in the Hong Kong classes studied were generally not given the same opportunities to contribute during lessons, in comparison with classes in the other three cities studied in this analysis (Shanghai, Melbourne and San Diego). The three Hong Kong teachers generally stated very explicitly every step for solving the mathematical problems discussed. In other words, students were guided through the steps for each problem type with very little opportunity for original thought or input into class discussion. There were, however, math-related terms that occurred for the first time in interpersonal conversation between students, but were not subsequently voiced in the public arena.

Within the sets of lessons analysed for each city, significant variation was evident from the perspective of the distribution of responsibility for knowledge generation. The practices of the classroom in Shanghai School 2 provided some powerful supporting evidence for the contention by Huang (2002) and Mok and Ko (2000) that the characterization of Confucian-heritage mathematics classrooms as teacher-centred conceals important pedagogical characteristics related to the agency accorded to students; albeit an agency orchestrated and mediated by the teacher.

A unique teaching strategy consisting of both teacher’s control and students’ engagement in the learning process emerges in Chinese classrooms (Huang, 2002, p. 227).

Once the distribution of responsibility for knowledge generation is adopted as a suitable analytical framework to situate cognitive activity in terms of social agency, supplemented by

distributed cognition to accommodate the utilisation of the conceptual resources of technical language, the oppositional dichotomisation of teacher-centred and student-centred classrooms can be reconceived. The deconstruction of the teacher-centred/student-centred dichotomy has specific consequences for teacher practice. In particular, one of the most contentious entailments of this dichotomy can be revisited; the legitimacy of teacher “telling.”

6. To Tell or Not To Tell: Dichotomies of Teacher Practice

One common interpretation of the constructivist manifesto (i.e., that “knowledge is the result of a learner’s activity rather than of the passive reception of information or instruction,” von Glasersfeld, 1991, p. xiv) has been that it became no longer legitimate for teachers to “tell” students anything. This position is not a logical consequence of adherence to constructivist learning theory, which suggests that students inevitably construct their own mathematics, whatever the classroom situation (Cobb, 1995). However, Telling or Not-Telling have been constructed oppositionally with such success that publications on contemporary pedagogy (such as Wood, Nelson, & Warfield, 2001), while usefully discussing many pedagogical strategies, see no need to address any strategies that might be construed as analogous to “telling” and even articles that purport to address the issue (such as Chazan and Ball, 1999) offer teachers little insight into how (and, as importantly, when) their mathematical knowledge might be articulated explicitly to the benefit of their students.

Definitions of “telling” have been based on the form (i.e., whether or not the teacher is making a declarative statement or other type of assertion) rather than on the function of the teacher’s action. A teacher’s communicative act must be addressed from the related perspectives of the teacher’s intention, the nature of the act, and the interpretations of the act by the recipients or audience. By focusing on function (intention, action, and interpretation) rather than form, we overcome some of the difficulties experienced in analyzing the efficacy of teacher practices from a constructivist perspective. Constructivist learning theory has been extrapolated to the domain of teaching practice, and “constructivist teaching” has been set up in opposition to “transmissive teaching” (Richardson, 2001, for example).

Criticism of transmissive teaching has an extensive history and has sometimes led to simplistic exhortations to avoid “telling” without serious discussion of those teaching actions that involve introducing new ideas directly.

Clarke and Lobato (2002) (and subsequently Lobato, Clarke & Ellis, 2005) have proposed a theoretical reformulation of teachers’ communicative acts in terms of function rather than form. This reformulation is founded on the distinction between “eliciting” and “initiating.”

The distinction between eliciting and initiating as teacher actions offers a language in which to frame the devolution of the responsibility for knowledge generation from the teacher to the student, or, alternatively, the concentration of that responsibility in the teacher. For example, teacher acts that take the form of a question but have the function of telling can be identified and the responsibility for the initiation of a new mathematical idea can be correctly located with the teacher rather than the responding student. Equally, as has been argued above, the capacity of the student to contribute to the generation of knowledge can be recognized, and classrooms can be compared according to the extent to which the student is accorded the opportunity to make this contribution. The fundamental consideration is the distribution of responsibility for knowledge generation.

Clarke and Lobato (2002) asserted the importance of interweaving the two “functions” initiating and eliciting. Both categories of action are necessary and their use is interrelated. Elicitation occurs when the teacher wants to learn more about students’ images, ideas, strategies, conjectures, conceptions, and ways of viewing mathematical situations. When the teacher’s communicative act functions to facilitate the expression of the student’s mathematics, then this constitutes “eliciting.” In order to provide experiences that might challenge students to reorganize their thinking, teachers need to develop models of their students’ mathematical realities (Simon, 1995; Steffe & Thompson, 2000). The adequacy of these models will depend on the teacher’s ability to elicit the students’ mathematics.

Initiating involves the insertion of new ideas into the conversation, ideas that the teacher assumes will be interpreted in many different ways rather than passively received. Once the teacher engages in initiation, she then steps back and elicits to see what the students did with that

information. Both actions have their function within the teacher’s promotion of student conceptual development. The mutuality and complicit nature of these interactions bring us back to the co-constructed nature of teaching/learning.

Where do we see the purposeful alternation of elicitation and initiation most clearly? One example can be found in the classroom in Shanghai, already referred to above. In the post-lesson interview, the teacher said: “I was not afraid that students had all sorts of questions. I just let them appear . . . Sometimes if you restrict them from doing this or that, their problems won’t appear, right? But the problems will appear tomorrow, even if they didn’t today, right?”

This is an articulate summary of the heart of the contemporary reform agenda in Western education and demonstrates a commitment to the purposeful elicitation of the students’ mathematics. For cultural reasons, the opportunities for student discussion of the content were provided in a teacher-led whole class approach. As was evident in the analysis of the distribution of responsibility for knowledge generation in this classroom, the responsibility was shared between teacher and students and, in so far as the teacher’s intentions could be put into effect, the classroom discourse was a purposeful alternation of initiation and elicitation.

It is in this manner that the distribution of responsibility for knowledge generation provides an explanatory framework that problematises teacher-centred and student-centred characterisations of the classroom and resolves the false opposition of dichotomous practices by replacing them with a conception of the purposeful alternation of interrelated (and fundamentally complementary) forms of classroom practice.

7. To Listen or To Speak: Dichotomies of Student Practice

It is worth considering one final dichotomy that revisits the same classroom situations from the perspective of the student. This is the decision by the student to listen or to speak. It has already been noted that in several of the LPS classrooms (notably in Shanghai and Tokyo) students seldom spoke directly to each other. By contrast, students in the mathematics classrooms in Melbourne, San Diego, Berlin and Uppsala frequently spoke directly to each other without teacher mediation. Students in these classrooms, and in Hong Kong,

would also make self-initiated contributions to public discussion. In this diversity, we can see that the student decision to speak was variously enacted and variously constrained in the different classrooms.

Student listening was more difficult to identify from the video record, although inferences of student attentiveness could be made wherever one student made explicit reference to a previous statement by the teacher or by a classmate. The value and significance accorded to the act of listening was a feature of many interviews with Chinese and Japanese students. Students in Berlin, Melbourne, San Diego and Uppsala were much less likely to stress the importance of attentive listening to the teacher or to their classmates.

Recent educational innovations, such as Problem-Based Learning (PBL), use small group collaborative learning and the discussion of 'authentic' problems to promote deep learning approaches (Lloyd-Jones, Margetson & Bligh, 1998). PBL has been described as a 'student-centred' approach, with a major emphasis on student development of self-directed learning skills (Whitehill, Stokes & MacKinnon, 1997). Rather than carrying the responsibility for disseminating content knowledge to students, PBL teachers or tutors have a role in facilitating student engagement with the PBL process.

The dialogic nature of small group collaborative learning is well recognized, and collaborative learning models such as problem-based learning (PBL) require verbal contributions from students to progress individual and group learning. Remedios and her colleagues have argued that in such settings speaking is often privileged over listening as a collaborative act. An imbalance in these values can become embedded in the classroom culture. For example, listening, as a core collaborative skill has not been foregrounded in the PBL literature. In the "student-centred" classrooms central to the advocacy of the Western reform agenda, "just listening" can be trivialized and its value as a collaborative learning tool can be lost (Remedios, Clarke & Hawthorne, 2006).

The dialogic character of Problem-Based Learning has been shown to pose significant challenges for students from some Asian countries (Remedios, 2005). However, these same analyses have demonstrated the possibility of over-emphasising speaking at the expense of attentive listening (Remedios, Clarke, & Hawthorne, 2006). It is possible that the optimisation of pedagogical

innovations such as PBL may be best achieved by purposefully exploiting the attentive listening skills so evident in some classrooms, in combination with the skills of student-initiated articulation evident in other classrooms. Anecdotal evidence suggests that some teachers, of course, already promote the importance of both speaking and listening, particularly in some Western primary school settings.

Once again, the explicit promotion of student speaking in Western reform classrooms and the dominance of student listening in Asian classrooms gives the appearance of a dichotomisation of student classroom practice into an emphasis on either speaking or listening. Similarly, analyses of teacher practice reveal significant differences in teacher time devoted to speaking or listening. It is essential that the debate shift from the separate optimisation of speaking or listening to recognition of their essential interconnectedness and the role of both in any theory of teaching/learning. Consistent with the theme of this article, an inclusive approach is advocated that acknowledges the value and essential connectedness of both student activities. Acceptance of the potential value of such a synthesis, has the effect of shifting the debate from the separate optimisation of either speaking or listening, to the recognition of the essential interconnectedness of speaking and listening and the more challenging goal of identifying the criteria for the optimisation of the negotiation of meaning in classroom settings (Clarke, 2001), in which the role of listening is seen as integral to the dialogic process of negotiation. The sites for experimentation and the optimisation of student speaking and listening will be the ever-increasing number of multi-cultural classrooms in schools and universities around the world.

8. Concluding Remarks: Alternatives to Oppositional Dichotomisation

International research is frequently conducted from a 'Western' perspective and evaluates the practices it studies by 'Western' criteria. A notable and most welcome exception is the recent "insider's perspective" on Chinese mathematics teaching and learning (Fan, Wong, Cai, & Li, 2004) and the LPS project has attempted to give voice to this "insider's perspective" on an international scale (Clarke, Keitel, & Shimizu, 2006). Once we have achieved more equitable representation of all interested nations in

international research programs, we need to ensure that the perspectives of all participating cultures inform the design and analytical frameworks employed, and that the voices of all participating cultures are evident in the reports that arise from such research. This is not only a question of equity. I have attempted to argue in this article that research that is conducted, analysed, and reported from a single cultural position is constrained by language and by a predisposition to judge certain situations, phenomena and actions as salient.

One important consideration in relation to cultural authorship is the situatedness of our advocacy of any particular classroom practice. Hatano and Inagaki (1998) remind us that the adaptation of pedagogical practice requires consideration of both the practicality of technical implementation and the extent to which the beliefs underlying the adapted practice are in harmony with local cultural values. Fuller and Clarke (1994) made a related point:

The next generation of [research] questions pertains to how these tools are culturally situated and understood in the eyes of teachers and pupils, including how these tools help to structure the classroom's social rules (Fuller & Clarke, 1994, p. 144).

The cultural positioning of pedagogical practice is an essential precursor to its adaptation and application in other settings. The implicit cultural framing of theory is more profound in its influence, since it determines not only what is reported and constructed, but even what is visible to the researcher.

Oppositional dichotomies such as teacher-centred versus student-centred classrooms, real-world versus abstract tasks, telling versus not-telling, and listening versus speaking offer mathematics educators falsely exclusive choices, sanctifying one alternative while demonising the other. International research has the potential to create tensions among privileged practices and culturally-situated readings of classroom phenomena. Recognition of these tensions can provide insight into possible explanatory frameworks within which such choices are no longer oppositional, but rather can be seen as reflecting strategic and interrelated pedagogical decisions, dependent on purpose and context.

This article has attempted to demonstrate the capacity of international classroom research to problematise and deconstruct some of our most

fundamental dichotomies and their frequent construction as oppositional. In each case, the alternative that is being offered to the prevalent segregated practice is an integrative perspective in which such alternatives are seen as complementary and interrelated aspects of a broader conception. Further, research, in applying such inclusive frameworks, must employ similarly inclusive methodologies.

International comparative research challenges existing oppositional dichotomies by demonstrating the viability of less favoured approaches in the classrooms of competent teachers in different cultural settings. As importantly, cross-cultural research provides a diversity of educational settings sufficient to contest the assumed disjunction of teaching and learning, and to demonstrate individual teachers' effective alternation of telling and not-telling. Only by problematising our existing constructs: teaching, learning, telling, real-world, abstract, teacher-centred, student-centred, speaking and listening, will we be led to develop more inclusive (non-oppositional) constructs such as eliciting, initiating, and the distribution of responsibility for knowledge generation. Educational theories that employ such constructs will be more likely to support the development of more sophisticated, hybrid pedagogies, adapted to the demands of each classroom setting, but less constrained by culture or convention.

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Author

David Clarke
 International Centre for Classroom Research
 Faculty of Education
 University of Melbourne
 109 Barry Street
 Carlton, VIC 3053
 AUSTRALIA
 Email: d.clarke@unimelb.edu.au