# Impact of Listening Pedagogy on Mathematics Teacher Thinking During Lesson Study

Aneesah Latife
*National Institute of Education*
*Nanyang Technological University*
aneesah.latife@gmail.com

Listening is involved in daily school activities, but its importance is often overlooked and underestimated. Good teaching practices evolve from telling to listening in order to understand the needs of the student. In this paper, lesson study, a form of teacher professional development, is used as a contextual platform for developing the practice of listening pedagogy. The findings suggest that lesson study provided a conducive and favourable context for the learning of listening pedagogy. At the same time, it also allowed for rich teacher learning to take place which had an impact on teacher beliefs that contributed to the thinking of listening pedagogy.

Teaching is fundamentally built upon relationships. Listening encourages productive dialogue to occur between the teacher and students, when the teacher probes what the students know and understand as they share their ideas with each other and the class (Egan, 2009). The notion of listening is referred to throughout the Professional Standards for Teaching Mathematics document as part of the vision for mathematics teaching and learning (National Council of Teachers of Mathematics [NCTM], 1991). Specifically, listening appeared as one of the critical factors in both the teacher's and student's role in promoting classroom discourse (p. 35). However, listening is a more complex activity than described by these standards (Harkness & Wachenheim, 2008). Listening is more than hearing. While hearing is a physiological process, listening is a conscious process that requires one to be mentally attentive (Low & Sonntag, 2013). Listening pedagogy, centred on listening, has its roots in the Reggio Emilia approach in early childhood education and foregrounds the idea of respecting and understanding others (Rinaldi, 2006). It exemplifies listening to thought and what cannot be easily heard (Schultz, 2003). However, listening is often overlooked by teachers in the classrooms even though it is a necessary activity in schools and all learning environments (Fogelsong, 2016).

Research shows that teaching is still largely based on telling rather than listening (Duckworth, 1996; Hattie, 2012). To address these issues in the classroom, teachers should learn from one another, and possibly look at actual classroom scenarios, as part of their professional development engagements. Lesson study, a form of collaborative in-situ job-embedded professional development that focuses on the planning, implementation and reflection of lessons, provides a suitable context to cultivate listening pedagogy. In lesson study, teachers form a collaborative team and think deeply about teaching and learning that can change both the way they teach and the way they work with colleagues (Kusnick, 2008). Teachers are also able to share their expertise with each other while helping colleagues notice students' mathematical understandings (Stigler & Hiebert, 2016). Through this paper, I describe how listening pedagogy can serve as a critical enabler for effective teacher learning from lesson through a case study of Mdm. Dahlia, a primary school mathematics teacher.

## Theoretical Background

In this study, teaching is viewed as a goal-directed activity. Schoenfeld (2011) referred to three factors that influence decision-making in his theory of goal-directed activity: Resources, orientations and goals (ROG). Resources largely refer to the knowledge that the individual possesses and utilizes for decision-making. Goals can be short, medium or long-term goals.

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There are also subgoals which help to attain the main goals. Orientations would encompass an individual's dispositions, beliefs, values, tastes and preferences. Specifically, orientations give rise to goals and goals draw on resources which is similar to the relationship reported by Thomas and Yoon (2014). Analysing what teachers think of and believe about listening pedagogy can thus be useful to understand its impact on their learning and classroom practices.

The role of ROG in influencing how a teacher listens in class should not be underestimated as it influences what he or she wants to achieve in the classroom. For example, if a teacher believes that listening is about listening for the "right" answers (Davis, 1997), then it is more likely for the teacher to engage in "funnelling" type of questioning. When funnelling, teachers ask a series of closed questions designed to progressively constrain students' responses until they offer a particular desired response (Wood, 1994). According to Schultz (2003), listening occurs at three levels: social and communal level, classroom level and student level. These levels encompass the idea of listening to silence. Listening to silence involves listening to what is said between and beyond words through a stance of questioning. This includes understanding how and when students might choose to remain silent and how they communicate through gestures and various media (Schultz, 2010). Listening to silence also requires teachers to listen to their students' thinking to identify gaps in their understanding. This refers to how teachers pay attention to students' mathematical ideas as they work on a problem (Doerr, 2006; Kazemi et al., 2016). To do so, teachers draw on their mathematical knowledge for teaching to make sense of their student thinking, which are often expressed in writing, speaking, and other representations such as mathematical language and diagrams. Furthermore, teachers need to orchestrate mathematically productive discussions around mathematically worthwhile tasks to make students' thinking visible (Stein et al., 2008). This is challenging work and it begs the question: How can teachers develop their expertise to listen to this silence?

Lesson study is one possible way to develop teachers' listening expertise. Lesson study requires long-term and cyclic teaching practices among the various professional development models and thus is effective in supporting the development of students' thinking because it is focused on students in each stage of instruction (Celik & Guzel, 2020). However, learning from lesson study is not a given (Lee & Choy, 2017) and experienced teachers need not necessarily learn from their participation in lesson study. For example, Akita and Sakamoto (2014) found that while novice teachers learnt from senior teachers, senior teachers did not learn from lesson study. The senior teachers only gave advice based on their knowledge. The focus of discussion during lesson study was mainly on test scores. So, in the case where the test scores of an experienced teacher's class remained high, he continued to teach using the same style with little input from the learning in lesson study. On the other hand, Bocala (2015) discovered that compared to novice teachers, experienced teachers participating in lesson study were less occupied with implementing the professional learning routine and more willing to experiment with the changes in their own thinking, their students' thinking, and their interactions with content that lesson study was designed to inculcate. They concentrated primarily on how they elicited and listened to students' thinking. Hence, the learning of experienced teachers from lesson study varies interestingly and is worth studying.

In this paper, I investigate an interesting case of Mdm. Dahlia who had developed more sophisticated notions of listening even though she was resistant to the ideas initially at the start of the study. By tracking the changes in her ROG, we can begin to unpack how adopting a listening pedagogy in the context of lesson study might offer a way to shift a teacher's instructional decisions from one that is more focused on listening for the right answers to one that is more focused on listening to students' thinking. The paper is framed by the following question: What are the changes in Mdm. Dahlia's resources, orientations, and goals about listening as she engaged in the processes of lesson study?

## Methods

The data presented is part of a larger study that took place in a Singapore government primary school over two years. This study adopted a qualitative single-case study design. The case teacher, Mdm. Dahlia, an experienced teacher, was selected as an interesting case as she was initially resistant to ideas of listening pedagogy. Thus, by concentrating on a single-case study, the interaction of significant factors characteristic of listening pedagogy can be uncovered more effectively compared to a multiple-case study. It will help to elicit the extent of teacher learning of an experienced teacher during lesson study. Furthermore, a single-case study served to present the case longitudinally where changes in the teacher's thinking of listening pedagogy were analysed over a period of two years to reveal how her thinking changed over the duration of study.

The sources of data consisted of planning meetings, research lessons, post-research lesson discussions, teacher interviews and student focus-group discussions. All sessions were audio and video-recorded, except for the interviews and student focus-group discussions which were audio-recorded only. They were then transcribed including a running record of time. Descriptive and reflective fieldnotes were recorded during observation of all sessions (Creswell, 2014). The interviews were conducted by the co-Principal Investigator (co-PI) (C1) and a project collaborator (C2). Lesson artefacts collected included the lesson plan, photos of student work as well as photos taken during the lesson. The multiple sources of data were used to triangulate the themes that emerged in examining the changes in what and how Mdm. Dahlia thought of listening pedagogy over the two years.

Data analysis was carried out in five stages. The first stage involved reading the transcripts in conjunction with the fieldnotes to familiarize with the data. The second stage involved reading the transcripts of the lesson study sessions, interviews and student focus-group discussions to identify key moments and critical incidents (Goodell, 2006). They were then organized using chronology as an organizing variable into Excel. Critical incidents are classroom events which have significance for the teachers, make them question their practice and seem to provide an entry for their better understanding of teaching-learning situations (Hole & McEntee, 1999). Thirdly, using Schoenfeld's (2011) factors that influence decision-making, the critical incidents were coded and classified under the categories of ROG. In the fourth stage, Schoenfeld's (2011) form of representation using columns to characterize each lesson segment or incident (pp. 64-65) was used to track the changes in teacher's thinking. To depict the changes in Mdm. Dahlia over time, the critical incidents were colour-coded according to the codes generated in columns in a single continuous Excel sheet to make visible her ROG at each point of occurrence. The fifth stage involved connecting the codes and identifying themes through a systematic thematic content analysis (Fereday & Muir-Cochrane, 2006).

## Findings

Here, a snapshot of Mdm. Dahlia is first presented by highlighting her background and inferring about her initial cluster of ROG. Her initial ROG about listening pedagogy is illustrated by describing a teaching episode in which she was the research teacher. Finally, the changes in Mdm. Dahlia's thinking about listening pedagogy after her participation in the lesson study at the end of the second year are highlighted.

### *Mdm. Dahlia's Initial ROG: "Not a Math Person"*

Mdm. Dahlia is an experienced mathematics teacher with 22 years of teaching experience (R1) (see Table 1). She holds a Diploma in Education and is formally certified to teach English language, mathematics, and science. She has been teaching students from the foundation stream

for the past 17 years and had recently made the shift to teach standard stream students, as she did not want to "stagnate" herself in the foundation stream. At the same time, Mdm. Dahlia described herself as "not a math person" and "not very quick with numbers and concepts," which pointed to her conception of her own mathematical capability (R2). Mdm. Dahlia had the goal that all students should be happy in the classroom (G1) and look forward to learning. She also had the goal that students should learn the big idea from the activity (G2).

Table 1
*Mdm. Dahlia's Initial Resources, Orientations and Goals*

| Resources | Orientations | Goals |
|---|---|---|
| R1: Rich teaching experience | O1: Beliefs about listening pedagogy – "Just a pedagogy" | G1: Students should be happy in the classroom |
| R2: Limited mathematical capability | | G2: Students to learn the big idea |

When asked about listening pedagogy in the first year, Mdm. Dahlia (D) viewed it as "just a pedagogy" and a "culture" (O1) and did not seem convinced of its effect in the classroom, as seen in the following excerpt:

> C2: Do you have anything else to share? Regarding your experiences so far? About listening pedagogy, about collaborative learning.
>
> D: I mean nothing much… it's just one pedagogy, it's not even a pedagogy I think it's just a culture- Yeah. It is a, you know, classroom culture, behavioural, it's a norm.

She thought that listening pedagogy does not bring about much changes in the classroom in terms of student performance, which she said would depend on "other factors" too. She also believed that listening routines were already in place in her classroom and did not view the idea of listening pedagogy as potentially resulting in a change in the way she would conduct lessons. She was thus seen resistant to ideas of listening pedagogy during the first year.

Mdm. Dahlia referred to listening as understanding what the person is trying to say, and then being able to echo it. She believed this will bring in fun to the learning as "it's fun to be able to understand, it's fun to be able to learn something new," relating to her G1. However, it was salient that Mdm. Dahlia's ideas of listening pedagogy were largely at the surface level, focusing mainly on students' responses, giving them opportunities to be heard by their peers as well as building onto students' responses. This would constitute of physical listening routines, similar to hearing.

### *Mdm. Dahlia's Teaching Practices: Listening for Answers and Telling*

Although Mdm. Dahlia said that listening includes listening to students' thinking during the first interview, she was more concerned about listening for the right answers in her lesson. One of the things that she mentioned was that she "strives for accuracy" in her students' work. During the research lesson in Year 1, Mdm. Dahlia faced challenges to address student misconceptions. The topic for the research lesson was 'Area of Rectangles.' In her lesson plan, Mdm. Dahlia had considered her Year 4 (Primary 4) students' anticipated responses. The following task was planned for the lesson, which students were to discuss and present in groups:

> *Task: A rectangle has an area of 36 cm². What can be its length and breadth? Think of as many combinations of lengths and breadths, that will give the area 36 cm².*

During the lesson, Mdm. Dahlia reminded students to have their "eyes on the speaker" and "body facing the speaker" when their peers were speaking, referring to listening routines. During the group presentations, one group came up with 6 cm × 6 cm = 36 cm² as a possible solution. However, another student in the class thought that it was an incorrect solution. Mdm. Dahlia acknowledged it but continued and moved on to discuss the next group's solutions. It seemed that she did not expect to receive that solution although it was highlighted as a special case in the lesson plan. She struggled to address it immediately which could be attributed to her R2. Another group of students explicitly stated in their task sheet that 6 × 6 cannot be a combination as the question involves a rectangle:

> Describe the strategy that our group has chosen: *Find the factors of 36. Since it is a rectangle, 6 × 6 cannot be the correct answer.*

At the end of the group presentations, Mdm. Dahlia took the opportunity to address 6 × 6 as a possible solution by telling them it is a correct solution. However, most of the students disagreed that a square is a rectangle. When such confusion arose, Mdm. Dahlia found it difficult to convince them as she seemed rather unprepared in having anticipated the response. At this point, she faced difficulty in listening to the silence present in her class and thus her students' mathematical thinking.

> D: 6 times 6 cannot be the correct answer because 6 times 6 is a square. Is it? How many of you agree? Cannot be. That means a square is not a rectangle, cannot be an answer. It is not a rectangle. Square is not a rectangle. How many of you agree? How many of you disagree? Those of you who disagree stand up. You disagree, that means you say square is a rectangle. Eh, how come nobody stand up?... You have to have an opinion. Okay, let's refresh back. Square, what do you know about squares?

This was reflected in the way she turned the table around to question the students why they thought square is not a rectangle (see excerpt above). She adopted the approach of asking the students to convince her otherwise. After which, during the interview, Mdm. Dahlia expressed disappointment in being unable to convince the students during the lesson.

### *Changes in Mdm. Dahlia's ROG: Listening to Student Thinking*

The impact of listening pedagogy was largely seen in Mdm. Dahlia when she was a lesson study participant in Year 2. Due to the structure of the lesson study in the school, Mdm. Dahlia was not selected as a research lesson teacher in the second year as other teachers were given a chance. At the beginning of the year, teachers were asked to share their thoughts on listening pedagogy thus far. Mdm. Dahlia stated that it was not the case that she has "never" used listening strategies before, but that she was clearer about listening pedagogy and more mindful about making it evident in the classroom now. One of the key changes in how Mdm. Dahlia listened was through her increased awareness of mathematical ideas shared during the planning meetings. For example, during one of the meetings, Mdm. Dahlia wondered about the use of the term 'units' or 'parts' for part-whole concept of fractions where there was a discussion of mathematical conventions. She seemed more sensitive to mathematical ideas shared by the teachers and the co-PI who was also the knowledgeable other. She also demonstrated increased confidence in sharing her own ideas about mathematics. Mdm. Dahlia displayed eagerness to learn, constantly asking questions and seeking clarifications. Consequently, there were several snippets of deep conversations pertaining to subject matter facilitated by the knowledgeable other. In another instance, she enthusiastically related from her teaching of Year 6 (Primary 6 or P6) students during one of the discussions, in relating the definition of a turn to the space around it. This was at a point when other teachers were struggling to provide a response to the definition even after multiple prompts by the knowledgeable other. This is seen in the excerpt that follows:

C1: How would you define a turn?

D: Prof, am I allowed to think in terms of angles now? I'm teaching P6 this year.

C1: Yes you can, you can add whatever you think. Ok yes so what's the missing part?

D: Because at P6, I mean if I'm a P6 kid this would translate to 360 degrees... Because they already learn angles, which is the space around.

Such instances helped shape her new Goal 3 (G3) of understanding and relating to students' thinking process. This change in Mdm. Dahlia could be attributed to the planning meetings which provided her a safe space where teachers discussed about their common problems faced in the classroom. This concurs with previous findings that lesson study offers a community for teachers to freely discuss their ideas without scrutiny (Cheng & Lee, 2011; Lee, 2008). Through her participation in the meetings, Mdm. Dahlia developed an improved conception of listening pedagogy. Since she had a strong belief in Orchestrating Productive Mathematical Discussions (OMD) (Stein et al., 2008) since the beginning as part of her G2, she began to assimilate ideas of listening into her orchestration which led her to appreciate listening pedagogy as part of OMD, rather than independently. In her second interview, she linked listening pedagogy to the five core conversational skills of restate, revoice, reason, questioning, and non-verbal communication. By aligning listening pedagogy to the five talk moves, she was more cognizant of the various aspects of listening. Through each move, Mdm. Dahlia took the opportunity to practice listening pedagogy. This pointed to a state of learning that was occurring within Mdm. Dahlia such that she was now listening more intently to her students rather than just hearing.

Moreover, she was more receptive to gathering students' responses in her classroom practice in order to achieve the planned learning outcomes, in line with her G3. This was reflected in her interview:

C1: So, it seems that you have kind of weaved some of these ideas into your own lessons. So, what are some changes that you see in your own teaching over the last one to two years?

D: So I think it (listening pedagogy) has helped me to be more receptive to… getting an array of responses. I think the takeaway is to get all their responses first and then worry about, you know getting them to see what we want them to see.

She also valued the different types of thinking that students have in the pursuit of achieving the big idea (G2).

D: Every child has got valuable thinking... that we can you know, benefit and learn from. So, I think that is the takeaway I want from my math lesson. And then at the end, having all the kids to… learn the big idea from the activity.

She believed that experienced teachers can tweak the structure of the lesson skilfully. Thus, she did not find implementing listening pedagogy challenging (R1). She was making her classroom more student-centred by paying attention to their thinking process via listening pedagogy. The changes in her ROG are depicted in Table 2:

Table 2
*Changes in Mdm. Dahlia's Resources, Orientations and Goals*

| Resources | Orientations | Goals |
|---|---|---|
| R1: Rich teaching experience | O1: Beliefs about listening pedagogy – *Listening as part of OMD* | G1: Students should be happy in the classroom |
| *R2: Increased awareness of mathematical ideas* | | G2: Students to learn the big idea |
| | | *G3: To understand students' thinking process* |

We can say that Mdm. Dahlia had become a better listener attentive not just to the voices and actions of her own students but also to her colleagues and the students participating in the lesson study. It was important that she realized that listening to one another is a collective action, not a technique or strategy, both in the classroom and in the professional development activity of planning meetings.

## Discussion and Implications

Mdm. Dahlia predominantly held a product-oriented perspective towards listening where she displayed a disposition in the form of asking students various questions to check their comprehension of the responses shared in class and having them repeat the content. This initial understanding of Mdm. Dahlia was similar to that found in Nazari's (2020) study involving the impact of a listening instruction course on teachers' cognitions about listening. It took time for Mdm. Dahlia to understand the ideas of listening pedagogy in-depth and for them to be revealed in her thinking. Mdm. Dahlia's initial resistance to ideas of listening pedagogy gradually reduced as she took part in several cycles of lesson study which were collaborative in nature, providing a safe environment that aided in learning. While it was not possible to see large changes in teacher views of listening pedagogy within a period of two years, the study indicated the beginning of a positive change. Further research would be needed to determine the causes of teacher resistance to learning and how to address them effectively. Through her increased awareness of mathematical ideas, Mdm. Dahlia was displaying a hermeneutic listening approach to mathematics teaching (Davis, 1997) which enables teachers to bring the insights of constructivism into meaningful dialogue with the challenges of various critical accounts. The most promising change noted was reflected in her new goal of understanding students' thinking. This is consistent with findings from Suurtamm and Vezina (2010) which reported that changes in teachers' classroom practices, changes in teachers' understanding of mathematics, and changes in students' understanding of mathematics were mostly connected to listening to student thinking.

Through the findings, this paper has shown that lesson study provided an impetus for Mdm. Dahlia to change her ROG, particularly in her thinking of listening pedagogy. This change influenced her learning from lesson study in Year 2. Thus, there exists a dialogic relationship between listening pedagogy and lesson study which enhanced the teacher learning process. By adopting a listening pedagogy in the classroom, the relationship between the teacher and student can present new teaching and learning outcomes. The notion of teaching as listening rather than telling needs to be deeply embedded in mathematics classrooms, so that teachers can provide a more holistic support for students in their learning.

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