Talk for learning across the curriculum: Exploring its relationship to formative assessment

Summary

In the previous issue of the ELIS Research Digest, we examined how formative assessment had been implemented in Singapore classrooms, with a focus on English Language classrooms, including the challenges faced by teachers. In this issue, we explore the relationship between formative assessment and talk for learning across the curriculum. The focus of this issue is on talk for learning, what it is, what it looks like in the classroom, and its relationship with formative assessment. First, we present research on formative assessment which focuses on talk for learning. We then detail research on how subject teachers can build communicative classrooms where talk is used to deepen understanding of subject content.

Introduction

Highlighting the role of formative assessment in helping learners take responsibility for their learning, the Organisation for Economic Co-operation and Development (OECD) (2005) report on formative assessment stated that teachers used formative assessment approaches to 'guide students toward the development of their own "learning to learn" skills' (p. 22). Under the heading, 'Meeting goals for lifelong learning', the report also stated that such skills 'are increasingly necessary as knowledge is quickly outdated in the information society' (p. 22), recognising that formative assessment was a valuable practice to be carried out to help learning beyond the classroom.

Research has sought to deepen understanding of the role of classroom talk for student learning across different subjects and in so doing, bring together the fields of formative assessment and talk for learning.

This issue of the Research Digest explores research that has examined the role of classroom talk through the lens of formative assessment. Throughout the issue, we will draw on research which has sought to define and describe talk for learning and the role of talk in formative assessment. In addition, we will address research into efforts to prepare teachers to develop talk for learning across different subjects. In the context of this

issue, we will use the term *talk for learning* to describe classroom talk which is focused on deepening students' understanding of their subjects.

In their work on developing a theory of formative assessment, Black and Wiliam (2012) asserted that it was the teacher's responsibility 'to engineer situations in which the opportunities either for the learner to learn, and/or to develop learning autonomy, are maximised' (p. 220). The authors stated that the ultimate aim of the teacher was to develop effective learners, capable of learning and participating in the subject disciplines, each with their distinct learning contexts and types of interaction. The authors identified classroom talk as one of the four main activity types for the implementation of formative assessment (Black & Wiliam, 2012).

Defining formative assessment

Black and Wiliam (1998) observed that the term *formative assessment* 'does not have a tightly defined and widely accepted meaning' (p. 7). In their review, they offered a broad definition of formative assessment as 'encompassing all those activities undertaken by teachers, and/or by their students, which provide information to be used as feedback to modify the teaching and learning activities they are engaged in' (pp. 7-8). With a more explicit emphasis on interaction, the OECD (2005) report on formative assessment defined it as 'fre-

quent, interactive assessments of student progress and understanding to identify learning needs and adjust teaching appropriately' (p. 21), a definition also referenced in Sebba (2012). Sadler (1998) cautioned that teacher feedback should be given in language 'that is already known and understood by the learner' (p. 82), which would enable students to reflect 'with peers and their teachers on how to learn – not just what to learn' (Frey, Fisher, & Hattie, 2018, p. 48).

Bennett (2011) explained that the terms assessment *for* and assessment *of* learning had been used to replace *formative* and *summative assessment*. This choice in nomenclature was driven by those who felt the term *formative assessment* had lost its meaning due to it being used to describe instruments of assessment, which they felt did not reflect the important notion of formative assessment as a process (see K. Tan, 2017 for further discussion on the differences between the terms *formative assessment* and *assessment for learning*). Tan (2011) formulated three categories of assessment: assessment *of* learning, assessment *for* learning and assessment *as* learning, with the third category referring to 'assessment skills that are recognised as important forms of learning' (p. 95). Others, however, have not differentiated these terms; Leong (2015), for example, used the terms *formative assessment* to refer to assessment for learning and *summative assessment* to refer to assessment of learning. In this issue, rather than *assessment for learning*, the broad term *formative assessment* will be used.

Having discussed definitions of formative assessment and differences in terminology, we now describe research into talk for learning.

Talk for learning

Since the pioneering work of Barnes (1971), a wide range of research has examined the benefits of classroom talk for learning, with more recent examples being Mercer and Dawes (2014) in the United Kingdom and Resnick, Michaels, and O'Connor (2010) in the United States. Other research has outlined the positive implications of teachers supporting talk for learning, such as good speaking and listening skills, which have the potential to 'enhance pupils' learning of other subjects and personal effectiveness' (Goh, Zhang, Ng, & Koh, 2005, p. 146) and to build the core skills of citizenship,

personalisation and lifelong learning (Alexander, 2008b).

Illustrating the positive impact of talk for learning on other skills, Martin and Rose (2007) and Alexander (2008a) detailed how it could improve students' reading and writing skills. Despite these reported benefits of talk for learning, it should be noted that Davies and Meissel (2016) did not show the same impact of talk for learning on writing. Mercer (2008) reported that many learners had limited opportunities out of school for such talk, which made the role of the teacher especially critical. In a study of over 200 Singapore schools, Kwek, Albright and Kramer-Dhal (2007) found that classroom talk was dominated by the teacher.

Formative assessment and talk for learning

Alexander (2008b) and Black and Wiliam (2009) identified the similarities between talk for learning and formative assessment. Ford-Connors, Robertson, and Paratore (2016); Irons (2008); and Nicol and Macfarlane-Dick (2006) also examined the connection between formative assessment and the roles of the teacher and students in classroom talk. The role of the learner was emphasised by Leung and Rea-Dickins (2007), who found that students interacting together and taking a greater role in their learning were central to effective formative assessment processes. Hawe and Parr (2014) offered peer feedback as one example of student to student interaction and students taking control of their own learning, defining it as:

> a dialogic process where students work together … to clarify the goal(s) of learning and what counts as successful achievement, compare works in progress with expected performance, identify strategies to move current performance closer to what is expected and make adjustments on the basis of information generated. (p. 217)

Talk for learning has also been identified as a way to help mitigate the challenges teachers faced when trying to gauge learner understanding in contexts where learners offered only short responses to teacher questions (Barnes, 2008). In an examination of teachers' pedagogy and assessment practices at primary and secondary levels across Singapore, Towndrow, Kwek, and Chan (2015) suggested enhancing 'collaborative group

work and dialogic talk focused on understanding' (p. 2) as a way to improve these practices, thus stressing the role of talk for learning.

Teacher questions

Teacher questions are one of the most common forms of teacher-student interaction. Ritchhart (2012) stated that questions could thus be understood as 'culture builders' (p. 9) which could 'drive learning and elicit deep thinking' (p. 11). Highlighting the receptive skills teachers needed in carrying out formative assessment, Leung (2004) elaborated that teachers were interested in hearing reasons and justifications students gave in deciding on their particular answers. Analysing a sample of 1,000 questions asked by primary teachers, Wragg and Brown (2001) identified 57% of these questions as 'managerial' (based on managing the lesson), 35% as 'information/data' (involving the recall of information), and 8% as 'higher order' (requiring learners to 'analyse, make generalisations or infer' (p. 9)). The dominance of questions eliciting the recall of information and fewer questions eliciting higher-order thinking skills was also reported in Black and Wiliam (1998).

Promisingly, Sellan (2017) reported research in two Singapore secondary schools where English language teachers found that broadening the range of questions they asked to include critical thinking questions had value for conducting formal and informal assessments. Chin (2006); Roth (1996); and Van Zee, Iwasyki, Kurose, Simpson, and Wild, (2001) have all reported positive aspects of teacher questioning in science classrooms.

Classroom culture

An important facet of talk for learning is classroom culture. Illustrating the importance of talk, the OECD (2005) report on formative assessment drew on findings from all OECD member countries to identify the 'establishment of a classroom culture that encourages interaction and the use of assessment tools' (p. 44) as a critical element for formative assessment. Other studies have elaborated on factors that contribute to positive classroom culture, such as the role of teachers in helping students feel safe about trying again (Leong, 2015), being comfortable about taking risks and making mistakes (Barnes, 2008), and feeling valued and re-

spected (Heritage, 2007). In sum, positive classroom culture seems likely to facilitate students expressing what they do not understand.

Talk for learning and formative assessment across the curriculum

Sadler (1998) made explicit reference to the 'content areas, knowledge and skill types, and levels of education' (p. 77) in his definition of formative assessment. Affirming the importance of talk for learning across the content areas, Fisher and Frey (2014) argued that 'access to complex ideas…requires oral rather than written input' (p. 64). The authors proposed that oral language development should continue beyond early education in order to address the gap between listening and reading comprehension in middle school, an argument also proposed by Resnick et al. (2010). Other research on formative assessment, which reported a positive impact that 'extended beyond the particular subject in which the programme was implemented' (Black & Wiliam, 2009, p. 18), stressed that 'students must learn through dialogue with others' (p. 19).

Highlighting the differences in talk across the subjects, Resnick et al. (2010) stressed that 'each discipline has its own genre of talk' (p. 172), a position also adopted by Black and Wiliam (2009) when clarifying that a 'good explanation' would be different in mathematics and history. However, the authors expected there would be some commonalities as well. Drawing on research in English, science and mathematics classrooms, Black and Wiliam (2012) made explicit the differences in the types of classroom interaction for each subject. The authors stated that, in science and mathematics, 'there is a body of subject matter that teachers regard as giving the subject unique and objectively defined aims' (p. 221). As a result, the authors claimed that 'it is possible to "deliver" the subject matter rather than to help students to learn it with understanding, and even where help with understanding is given a priority, this help may be designed solely to ensure that every student achieves the "correct" answer' (p. 221).

To equip learners with the ability to communicate across the subjects, Love (2009) argued that all content teachers should have *literacy pedagogical content knowledge*. This type of knowledge involved:

knowledge about how spoken and written language can be best structured for effective learning; recognition that subject areas have their own characteristic language forms and … distinctive literacy practices; and capacity to design learning and teaching strategies that account for subject-specific literacies and language practices. (p. 541)

The author recognised the challenges teachers faced and suggested that they undertook formal training in the literacy demands of their disciplines. The author proposed that teachers develop an awareness of 'not only the regulatory function of teacher talk but also of the fundamental relationship between spoken interaction and the development of advanced academic knowledge in the secondary disciplines' (p. 558). The author reported that teachers examined transcripts of their classroom interactions, an approach which the teachers found valuable for their learning.

> *The findings identified student-initiated interactions as most beneficial, leading 'to more critical and evaluative thinking in students' (p. 3).*

In the Singapore context, engaging students in pair and group talk is aligned with the Ministry of Education's policy of encouraging learner-centred approaches to teaching with the longer term goal of developing self-directed learners equipped with critical and creative thinking skills (Kadir, 2017; Ministry of Education, 2013; C. Tan, 2017). C. Tan (2017) stated that group learning involving talk was not only pedagogically sound but also culturally compatible with the Singapore context.

So far we have provided a broad description of research focusing on talk for learning and formative assessment. The next two sections will examine research on these areas in the humanities and, subsequently, in mathematics and the sciences.

Formative assessment through talk in the humanities

In English and geography classrooms, Davies, Kiemer, and Meissel (2017) and Davies and Meissel (2016) examined the impact of a talk intervention for teacher professional development. The authors reported that although there was little change in teacher questioning, the teachers had taught their students to ask one another effective questions and to listen intently, resulting in students having extended dialogic exchanges. Such resulting student behaviour appears to reflect the qualities required for the effective assessment processes defined by Leung and Rea-Dickins (2007) and Alexander (2008a) above.

Lim (2018) analysed the impact of talk for learning in geography classrooms in the Singapore context. The findings identified student-initiated interactions as most beneficial, leading 'to more critical and evaluative thinking in students' (p. 3). The author also revealed that talk initiated by the teacher 'generally produced sequences that were authoritative in nature' (p. 4), which resulted in a limited range of discussion. The author suggested that teachers intentionally set up student-initiated talk in classrooms to engage students in learning and to build critical thinking skills. The author claimed the reasons for enabling the students to initiate talk was because they 'are seen to be more receptive to feedback given by peers and are more responsive to the comments made in class' (p. 10) and that 'student-initiated talk… allows for spontaneity in asking questions in an organic manner' (p. 10).

Meskill (2010) detailed a talk for learning formative assessment strategy in history classrooms, which involved the teacher assessing moment-by-moment the individual's growth in English and historical content knowledge while guiding students towards increased comprehension and oral production through asking questions in extended conversations. Also with a focus on history, Hall and Burke (2003) reviewed research at primary level, identifying how historical thinking could be developed through 'discussion, questioning, attending to pupils' prior knowledge of other historical contexts and by linking the period under study to pupils' own lives' (p. 109). The authors also argued that the success criteria in history needed to be communicated to the learners so that they understood their level of learning and then 'know what to do to make further progress' (p. 110). Black and Wiliam (2012) found that making success criteria explicit to learners was also an important element of formative assessment.

Formative assessment through talk in mathematics and the sciences

Inoue (2010) trialled a communicative lesson design translated from a Japanese approach to an American school context. The approach involved discussions in pairs and small groups around a big question at the opening of the lesson. Following this, the students gave presentations of their ideas guided by the teacher for the class to deepen their learning through collective problem solving, including group discussions at various stages of the lesson.

In the Singapore context, Seto (2002) explored the role of talking to learn in primary mathematics. As an alternative approach to assessment, the author engaged the students in giving oral presentations based on a mathematical task. The students were given 10 minutes to discuss in groups of four, and follow up with a two-minute presentation. The presentations served to inform the teacher of the students' level of knowledge, which could then be used to shape the teaching after the presentations as well as gauge the quality of the instruction on the knowledge being acquired by the students. The author highlighted the need for the teacher to be a careful listener and have the ability to encourage the learners to share ideas and listen to others. Despite the reported successes, the author noted that some learners found oral presentations to be unfair as those who presented later had the benefit of hearing earlier presentations. Also, students were reported to have become restless after listening to multiple presentations.

Talk for learning has also been implemented to enhance knowledge of scientific practices and content in chemistry and physics at secondary level. Murphy, Firetto, and Greene (2017) focused on developing relational reasoning about scientific phenomena, and the use of analogy, anomaly, antinomy and antithesis, which was achieved through teacher-student interaction. For primary science, Mercer, Dawes, and Staarman (2009) advocated professional development for teachers to deepen their understanding of 'the effective use of talk for learning' (p. 16).

Keeley (2016) proposed formative assessment probes in the form of discussion prompts (also referred to as *talk moves*) that science teachers could use to 'foster productive science discussions in which students make their thinking visible to their peers, and the teacher' (p. 24). The talk moves were given as

The students

- re-voice, restating other learners' ideas; and
- apply their own reasoning to others' reasoning.

The teacher

- prompts learners for further participation;
- asks learners to explicate their reasoning; and
- uses wait time.

McGlynn and Kelly (2018) described another type of talk for learning approach in science, with students contributing to discussions by demonstrating original thinking in responses that would consist of 'two or more sentences and include academic vocabulary, rather than just one or two words' (p. 28). The authors proposed using prompts to develop a set of discourse skills: clarifying, paraphrasing, disagreeing, building on, agreeing and summarising. The reasoning behind using these prompts was to engage students in appropriate forms of scientific talk. The prompts would also enable students to make their thinking visible so that the teacher could gauge their level of understanding and address their learning needs in the lesson, and for following lessons.

In a study in the United Kingdom, Gioka (2007) highlighted the value of student-generated questions for formative assessment in secondary level science, stating such questions 'are the best source of their current level of understanding' (p. 114). However, the author reported that the students had rarely asked such questions during the study.

In the Singapore context, Chin and Teou (2010) researched the role of talk in primary science classrooms with an emphasis on scaffolding the students' talk through the use of a discussion template comprising sentence starters to articulate their ideas, and to maintain focus and productivity. The authors then used the students' drawings, writing and group discussions to enable 'their ideas to be made explicit while at the same time enabling alternative conceptions to be diagnosed' (p. 112).

Having looked at research detailing the benefits of talk for learning, both for deepening understanding and for formative assessment, we will now discuss research which has explored how to promote talk for learning in classrooms.

How teachers can develop talk for learning

A range of terms have been created to refer to talk for learning in school contexts, such as *academic conversations* (Zwiers & Crawford, 2011) *exploratory talk* (Barnes, 2008; Mercer, 2008) and *learning talk* (Alexander, 2008a).

In addressing talk for learning across all subjects, Zwiers and Crawford (2011) outlined five core skills of academic conversation, which the authors stated would 'make conversations more academic'

* *elaborate and clarify;*
* *support ideas with examples;*
* *build on and/or challenge a partner's idea;*
* *paraphrase; and*
* *synthesize conversation points.* (p. 31)

Zwiers and Crawford (2011) also presented activities and other resources for teachers to develop talk for learning in literature, history and science classrooms. The authors outlined key thinking skills required for the different subjects and offered sample teacher prompts and student responses for each skill.

Mercer (2008) described how teachers developed exploratory talk in their classrooms by giving explicit guidance and modelling such talk 'for example, by asking "why" questions, giving reasons for their views, and encouraging children to give reasons to support their own opinions and suggestions' (p. 63). The author also stated the importance in establishing a set of ground rules developed by the teacher to enable exploratory talk.

Alexander (2008a) presented six broad categories of talk, which he suggested schools should offer learners 'to empower and support everyday interaction' (p. 185)

* transactional talk: to manage a wide range of social encounters, and to convey and exchange meaning and intention;
* expository talk: to expound, narrate and explain;
* interrogatory talk: to ask a variety of questions in diverse contexts;
* exploratory talk: to explore ideas and probe other's thinking;
* expressive talk: to articulate feelings and personal responses; and
* evaluative talk: to deliver opinions and make judgements (p. 185).

With these types of learner talk, students can experience and ultimately master the types of expression and interaction they need to 'gain the full potential of talking to others' (p. 112).

Listening for learning

An essential skill for the teacher to facilitate effective talk is the ability to listen. Wragg and Brown (2001, p. 34) described four types of listening which teachers carry out when listening to their students' replies. Other than skim listening, which involved the most basic level of the teacher's awareness that a student was talking, the authors presented the following types of listening

* survey listening: the teacher builds a mental map of what the student is talking about by filtering out extraneous material and identifying key points or misunderstandings;
* search listening: the teacher searches actively for specific information to an answer, taking care not to overlook other answers or responses that may reveal more than the original teacher question did; and
* study listening: the teacher carries out a blend of search and survey listening, going beyond the words the students use to their underlying meaning and uncertainties.

The authors suggested that, while it was not possible for teachers to engage in study listening all the time, it was important for teachers to be aware of the type of listening they were doing at any given time in class.

Having detailed categories of talk teachers can offer their students and listening skills the teacher can engage in to monitor their students' talk, we will now turn our attention to research which has uncovered features of talk for learning.

Features of talk for learning

Zwiers and Crawford (2011) outlined the following features of what they defined as effective academic conversations

- all partners talk;
- all students engage in critical and creative thinking;
- students use controversies and conflict as opportunities to talk;
- students recognise ambiguity and strive to reduce it;
- students are encouraged to think based on the principles and approaches of the subject;
- students create opportunities for the transfer of knowledge and skills; and
- students have choice and ownership.

Mercer (2008), presented some characteristics of talk for learning identified by primary teachers

- all members participate and on topic;
- all students have opportunities and are encouraged to speak
- students share all the relevant information they possess;
- students show they are willing to take in new ideas;
- students ask a question if something is not clear;
- students show their respect and value other's opinions and feelings through talk and body language;
- students are comfortable to challenge something they hear if they believe they have a good reason to do so;
- students explain their ideas clearly and provide reasons for their views; and
- students resolve disagreements through accepting the best reasons (and not the loudest voices).

Davies and Meissel (2016) developed a talk for learning approach from a meta-analysis of 42 quantitative studies in primary classrooms that identified discussion-based approaches 'where the teacher had control over the text and topic, but the students had the majority of control over interpretive authority and turn-taking' (p. 342). The authors presented the key features of learner talk, which if present, would likely reflect an increased level of complexity in their talk including 'reasoning words and elaborated explanations' (p. 343)

- authentic questions;
- uptake questions;
- high-level questions, which include generalisation, speculative and analytical questions;
- reasoning words; and
- elaborated explanations.

What is required of learners

Alexander (2008a) listed the abilities below that he considered vital for learners to reach their full potential when talking to others. Learners must be able to

- listen;
- be receptive to alternative viewpoints;
- think about what they hear; and
- give others time to think.

Evident in this list is the importance of listening for talking to learn.

Of the different types of talk described in Alexander (2008a), certain types of talk for learning would likely be more common in specific subjects, as evident in the skills required of students as defined in the subject syllabus documents. For example, the Singapore Primary Science and Secondary Science syllabi identify 'predicting', 'comparing' and 'inferring' as skills in science that students need to develop (Curriculum Planning and Development Division, 2013a, 2013b).

Examining the Common Core State Standards (National Governors Association Center for Best Practices and Council of Chief State School Officers, 2010), Fisher and Frey (2014) summarised four demands students needed to fulfil to meet the requirements for the speaking and listening domain.

Students should

- be prepared for discussion;
- interact with a wide range of people, not just those whom they choose to interact with such as friends;
- continually build on one another's ideas to maintain the discussion; and
- express ideas clearly and persuasively.

In addition to these requirements, Fisher and Frey (2014) emphasised that students needed to have frequent opportunities to engage in speaking and listening, even if this required the teacher to make changes to the instructional environment.

Engaging students in talk for learning

This section details approaches for developing talk for learning in the classroom. Davies et al. (2017) pointed out that, although there had been an increase in research on talk for learning, most of it had been conducted at the primary school level. Drawing on this research, the authors listed discouragement of open participation and test-driven instruction as reasons for the failure of more approaches being developed to build communicative classrooms.

Alexander (2008b) outlined five categories of classroom talk in which teachers commonly engaged their learners, identifying categories four to five as most likely to be effective in talk for learning

1. rote: drilling through constant repetition;
2. recitation: accumulating knowledge through questions to test knowledge, or encourage recall or to guide students to derive at the answer through providing clues in the question;
3. instruction/exposition: informing learners what to do or explaining;
4. discussion: exchanging ideas to share information and solve problems; and
5. dialogue: using structured, cumulative questioning and discussion to gain a common understanding.

Alexander (2008b) defined categories one to three as a basic repertoire and observed that categories four and five occurred less frequently. The author found, from research conducted across a range of countries, that recitation was the most commonly used category of teaching talk. While not expecting teachers to abandon using the first three categories of talk altogether, he stressed that 'teaching which confines itself to the first three kinds of talk… is unlikely to offer the kinds of cognitive challenge which children need or which a broad and balanced curriculum requires' (p. 31). In conclusion, the author stated that 'all five kinds of talk have

their place, provided that each is appropriately and sensitively used' (p. 31).

One broad approach which explicitly involved talk for learning across the curriculum was the Reading to Learn programme (Martin & Rose, 2007), which was trialled in Europe, the United States, Hong Kong and Australia (Rose, 2017). The programme featured a set of activities to develop reading and writing through a high level of classroom interaction around the classroom texts being taught. The teacher took a leading role at the front of the class to engage learners by foregrounding the language features and the subject content of the texts with a range of questions, thus building an extended dialogue. The set of activities were

Fisher and Frey (2014) emphasised that students needed to have frequent opportunities to engage in speaking and listening, even if this required the teacher to make changes to the instructional environment.

- preparing for reading: The teacher uses questions to identify the context, text type and draws on the learners' prior knowledge;
- detailed reading: The teacher guides the learners to examine the model text from the whole to parts through reading the text out loud with the learners, pausing to examine particular language and text features;
- intensive strategies: The teacher prepares exercises targeting specific language issues. An example task involves the teacher printing and cutting up target sentences on paper into words or phrases, which the learners use to reconstruct the sentences;
- joint rewriting: The teacher guides the class to write new texts using the same language features based on the model text. Such features are written on the whiteboard, and the activity can be done in groups or individually depending on the learner needs; and
- joint construction: The teacher guides the learners in writing new texts of the same type and structure but in a different context.

Teacher strategies

Fisher and Frey (2014) offered suggestions to ensure that students across the grades and content areas could have opportunities to practise their speaking and listening skills. Foremost among these strategies, the authors stated, was that teachers needed to dedicate time every day for

students to engage in talk using academic language with their peers. The authors suggested about 50% of the instructional time in content area learning be given for such talk.

Fisher and Frey (2014) recommended evidence-based strategies which had been applied across different subjects

- readers' theatre – students practise reading and then present to the rest of the class while others listen;
- presentations – students research a topic and present the findings to peers, who can also provide feedback about their presentation skills, in large or small groups;
- listening stations – students listen to digital recordings of their teacher reading complex information, then discuss based on the questions posed by the teacher; and
- reciprocal teaching – students read sections of a given text then engage in comprehension activities such as predicting, questioning and summarising. Students also take notes to ensure that they are listening to one another.

Heritage (2007) detailed two formative assessment strategies for evidence gathering which illustrated the role of talk in class: on-the-fly assessment, in which 'a teacher listening to group discussions hears students expressing misconceptions'; and planned-for interaction, where 'teachers plan the questions they will ask during the course of the lesson in order to enable students to explore ideas' (p. 141).

Inoue (2010) presented key strategies for mathematics teachers to guide students in building consensus through discussion

- be very clear about the specific lesson/mathematical goal;
- anticipate and respond to the wide range of responses to maintain the discussion;
- refrain from correcting students' points and enable other participants to discuss and explain their points;
- support learner explanations through:
  - asking students to repeat or paraphrase their point;
  - using guiding questions to guide students in elaborating;
  - facilitating smaller group or pair discussions to build understanding and exposure to talk; and

- generalise the mathematical principles to different cases so that students can see the value of their discussion or develop a new question for the following lesson.

There is a range of evidence-based teacher resources for developing talk for learning in mathematics and science, such as the video resources in Anderson, Chapin, and O'Connor (2011) and the five practices for facilitating productive discussions identified by Smith and Stein (2011).

With a range of approaches and strategies identified in research, we now draw our attention to the challenges both teachers and learners face.

Teacher and learner challenges

Dixon, Hawe, and Parr (2011) identified the challenges teachers faced when integrating formative assessment strategies into their classroom practice. Black and Wiliam (2009) highlighted the complexities of engaging students in discussions with their peers compared to dealing with individual students. To mitigate the challenges of carrying out effective peer discussions, Black and Wiliam (2009) suggested that teachers model how students should interact with one another. Nystrand and Gamoran (1997) stressed that for interactional strategies such as group work to be effective, teachers needed to use these strategies with specific instructional goals and assign serious epistemic roles to students so that the students could find value in the activities.

Sadler (1998) detailed challenges in changing the school culture for effective formative assessment, foregrounding the need for teachers to undertake pre-service and in-service professional development to learn how to develop learners to become effective in self- and peer-assessment. Hawe and Parr (2014) cautioned that, for formative assessment to be effective, teachers had to be careful that their practices did not follow the letter and instead focused on the spirit of formative assessment. In essence, the authors stressed that the quality of the implementation of strategies was important, not merely their occurrence in a 'scripted and ritualistic' form (p. 231).

In the Singapore context, C. Tan (2017) detailed challenges which might inhibit learners from speaking up. These were the predominantly hierarchical environment of Singapore schools, where

learners were reluctant to disagree with the teacher, and the potential interpretation of critical thinking as being an adversarial practice. The author proposed a more collegial approach to critical thinking to mitigate the latter issue, one involving the affirmation of all learners' ideas through discussions in varied group sizes.

Summary

This issue of the ELIS Research Digest has sought to draw on research in order to define talk for learning in the context of formative assessment, describe the features of talk for learning in subject classrooms and present some approaches to formative assessment used by teachers and researchers to deepen student learning. The discussion of literature in this issue has surfaced the dual role of talk for learning in subject classrooms: to deepen students' understanding of subject content and to allow the teacher to gauge the level of students' understanding. Although these two broad roles of talk appear distinct, they serve the same goal of improving learning outcomes.

The issue also covered some characteristic features present in classrooms where talk for learning can thrive. At the heart of such supportive environments is a classroom culture where students engage in extended talk with one another in pairs and groups of sizes. The teacher establishes and maintains a positive classroom culture where students have regular opportunities to talk. The teacher's direct actions, in the form of strategies and questions, help focus and guide the talk as it develops. Research also highlighted that it was the teacher's role to facilitate talk for learning rather than lead

the talk, thus resulting in more student-initiated discussion and peer interaction.

Evident from this review of research is the critical role of the teacher in enabling effective learning. Nystrand and Gamoran (1997) foregrounded the teacher's role in building effective talk in class, stating that effective learning depended on 'the extent to which instruction requires students to think, not just to report someone else's thinking' (p. 72). Similarly, Black and Wiliam (1998) stressed that any changes in formative assessment practices would be pivoted on the quality of teacher-student and student-student interactions. The authors cautioned, however, that it would be difficult to 'separate out the particular contribution of the formative feedback to any learning gains' (p. 16).

Teachers could also engage in talk with their peers, as a way to deepen and improve their assessment practices, and change their beliefs regarding how to improve learner achievement (Annan, Lai, & Viviane, 2003). Ritchhart (2008) also emphasised that teachers needed opportunities for rich discussions among their peers on the topics of teaching and learning, grounded in learner evidence, as this provided 'the foundation for nurturing thinking and learning in the classroom' (p. 58). As Black and Wiliam (2012) stressed, there is a need to 'look more deeply at the place of learning aims in the design for, and in the control of, learning dialogues, and at the balance between these aims and those that are central to the teaching of individual school subjects' (p. 226).

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