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“JUST GO”: MATHEMATICS STUDENTS’ CRITICAL AWARENESS OF ROUTINE PROCEDURE

As part of my extended conversation with a high school mathematics class, I prompted the students daily to become ever more aware of their classroom language practices. This interaction showed how ‘critical language awareness’ conversations can draw out student perspectives on mathematics learning and demonstrated how language awareness can afford students new possibilities for living in their mathematics classroom discourse. Students worried that others would feel left behind if they did not understand what to do when the word ‘just’ was used to replace description of a mathematical procedure. Other students noted that ‘just’ helps a teacher or student highlight particular aspects of an explanation because the word can gloss over routine procedure. The teacher’s dilemma of deciding what to elaborate and what not to elaborate is an instance of the contentious nature of Grice’s conversation maxims.

“And you just change it to two square root five.” After a student said this in class, I asked her classmates, “What does that mean when she says *just*?” This exchange was part of a semester-long conversation in which I prompted the students daily to become ever more aware of their classroom language practices.

Our discussion about the word *just* showed how “critical language awareness” (elaborated later) conversations can draw out student perspectives on learning mathematics. The discussion also demonstrated how language awareness can afford students new possibilities for living in their mathematics classroom discourse. When the students and I disagreed over what the word *just* could mean, we became more aware of connections between how we use that word and the way we direct attention when we communicate mathematics.

Attending to School Mathematics Discourse

Since Pimm (1987) introduced discourse analysis to mathematics education scholarship, there has been growing interest in the nature and form of mathematics classroom discourse. Discourse can be approached in varying ways, many of which have been taken up in mathematics education scholarship. The general approach most relevant to my research focuses on lexical and grammatical features, and is well-represented in mathematics education (e.g. Rowland, 2000; Morgan, 1998; Weingrad, 1998; Bills, 2000; Gerofsky, 2004; Herbel-Eisenmann, in press). This work generally uses lexical and grammatical features of text from samples of mathematics learning discourses to describe the nature of the discourse.

I value this form of discourse analysis because I can use it to focus on both the nature of mathematics and on social situations (such as classrooms) in which mathematics is used. When the participants in a discipline, such as mathematics, make grammatical choices to form their utterances, these structural choices relate to their

understanding of the structure of the discipline and their position in it. Though most language choices are made subconsciously, it is useful in analysis to recognize that they are still choices that reflect the person's intentions in a particular context. Morgan (1998), in her analysis of mathematical text, and Kress (1993), in his more general work, both argued for the appropriateness of this type of analytical approach.

As we analyze discursive practice, which is an artefact of classroom culture and of individuals' participation in that culture, we discover how the participants see themselves in relation to the discursive system. This relationship has been recently analyzed in various ways (e.g. Evans, 2000; Fiori et al, 2004; Hannula et al, 2004), but not with discourse analysis.

Rowland's (2000) work on vagueness is most relevant to the particular conversation with students I describe in this article. He drew on Channell's (1994) general linguistic work on vagueness to consider how it works in mathematical conversations between teachers and students. He saw that hedges and other forms of modality (in which speakers try not to sound too confident) are necessary when someone wants to express conjecture. Though one feature of reported mathematics is clarity and confidence, it is necessary to first explore possibilities. Rowland describes this state of exploration as the 'zone of conjectural neutrality.'

Gerofsky's (2004) analysis of mathematical word problems is also relevant to the particular conversation described in this article. Using sample word problems covering a span of millennia, she argued that they constitute a unique genre. One of the marks of this genre is the creation of hypothetical situations in which certain aspects of reality are supposed to be ignored. She noted that this oddity flaunts a norm present in typical conversation and thus presents challenges for initiates to the genre. The conversation norms she used are Grice's maxims.¹ Grice suggested five principles as a set of overarching assumptions that guide the conduct of conversation. These maxims are said to be useful to identify powerful utterances, which occur when the maxims are flaunted. In the conversation described in this article, some students argued over the breach of these conversational norms.

Morgan's (1998) lexico-grammatical analysis of mathematical writing is less applicable to the particular conversation I describe in this article, but it is relevant to the approach I took in my research. Morgan's linguistic approach drew on the linguistic tradition of 'critical discourse analysis' (CDA), which is unlike most linguistic scholarship because it is oriented less toward describing discourse and more toward considering possibilities participants may take up within their discourses. It has an explicit social agenda: it is meant to be empowering.

It is in this sense that I use the word *critical* in this article: not critical in the sense of pointing out flaws, but rather in the sense of considering a range of alternative possibilities for discourse participants. Chouliaraki and Fairclough (1999), who have constructed a framework for analyzing discourse for critical purposes, encourage the use of discourse analysis to identify "the range of what people can do in given structural conditions" (p. 65). CDA scholars do this by asking questions of 'normal' language practice to point out its oddities. Then they open up discussion about the nature of the discourse and possibilities for how it could change. Kress (1990) calls this process the 'denaturalization' of language.

Fairclough's application of CDA techniques in educational settings is a natural extension of CDA's emancipatory potential. He called this critical language awareness (CLA). Attempts to include CLA in school curricula typically involve language arts and language-acquisition classes. My research investigates the introduction of CLA in a

¹ As noted by Levinson (1983), these norms are only partially published by Grice having been given in a lecture, but they are widely described by others, including Gerofsky (2004) and Levinson.

mathematics classroom. Morgan (1998) concluded her analysis of mathematical writing with the claim that CLA is necessary to support the development of students' writing, but she has not yet attempted this formally.

Like Morgan (1998), I want both mathematics students and educators to benefit from increased language awareness. However, the focus of my research is on students because the focus of discourse-related scholarship in mathematics education seems to be oriented to helping teachers understand and manage their classroom environments. I ask: How can an individual student become more capable and comfortable in the classroom discourse? I believe students will benefit from exploring various ways they themselves can live within the discourse space they encounter daily: they can benefit by being invited to consider the range of possibilities available for them to participate in this space.

Furthermore, there is an opportunity for educators in CLA. While conversing with students about their language practice in mathematics class, a teacher or researcher can gain insight into the unique perspective students have on their classroom discourse. Thus there is value for formative assessment and for research.

With these interests in mind – raising student awareness of language and accessing student perspectives on their discourse – I set out to answer the following question: Considering the depth and breadth of students' mathematical experience, what is the effect of their mediated use of discourse analytic tools to explore the mathematics discourse that surrounds them? This question led to more specific questions as my exploration progressed. One question centred on the role of the word *just* and its implications for mathematics classroom discourse. Thus, this account of a particular research situation only begins to answer the primary question, which could not ever be fully answered in general.

During the research I sometimes wondered if it was frivolous to obsess about one word. The vehemence with which participant students asserted the significance of their concerns surrounding the word and their tenacity to sustain conversation about it over two months justified my attention to the word and their views on its use. Perhaps research questions too often arise out of the experiences of educators and thus ignore the questions raised by mathematics students. Why should we assume our questions are the same as the students' questions?

Introducing “Critical Language Awareness”

I spent a 19-week semester with a grade 11 mathematics class of students aiming for post-secondary education, co-teaching the course with the regular teacher and collecting video and audio records of classroom discourse every day. While the focus of our work in the classroom was generally to help students develop their mathematical understanding and procedural fluency, I tried daily to engage the students in some discussion about our language practices in the class by directing their attention to their own utterances. The form of my prompts varied, as I was continually responding to the participants. In addition to our classroom interaction about language, I interviewed participant students and asked them to write accounts of their experiences with language in their mathematics learning.

This research was an investigation of possibility. Skovsmose and Borba's (2000) methodology for critical mathematics education research guided me: “[I]t is by no means a simple truth that research should deal with what *is*. [...] [D]oing *critical research* means (among other things) to research *what is not there* and *what is not actual*” (p. 5, emphases theirs). Skovsmose and Borba (2004) have expanded on their methodology by distinguishing between the *current situation*, the *arranged situation*, and the *imagined situation*. I saw the original current situation of the participant class as one that I wanted to see transformed. I imagined a situation in which students would notice aspects of their

language practice and through this noticing become more aware of the nature of mathematics and of possibilities for them to relate to the mathematics.

The primary data comprised transcripts of interviews and whole-class conversations about our classroom mathematics discourse. For these conversations I drew on a secondary set of data to prompt students to articulate their perspectives – transcripts and videotaped excerpts of the discourse that happened during the usual mathematics teaching in the class, which were also collected daily, and excerpts from the students' mathematical writing.

My agenda was not the same as the students' agenda for this class. I know that teachers cannot expect students to share their agendas completely, but this was especially true in this setting because I introduced substantial change to the discourse. Our agendas or imagined situations kept changing as we responded to each other, accepting and resisting aspects of each other's agendas. I could not expect the classroom developments to follow my plan. Instead, I had not only to expect disruption, but to welcome it. Valero and Vithal (1998) illustrated the importance of disruption in research settings and argued against typical research methodologies that assume and promote stability. Just as Valero and Vithal realized from the research they reported, I am realizing that the times when I felt most resisted were frequently the most generative times, both for me and for the participant students. It was only when students actively resisted my interpretations of their classroom language practices that I could be sure that they were expressing their own perspectives. In their resistance, they were compelled to justify their perspectives, just as I was compelled to justify mine.

Critical Language Awareness in Action

During the course of the semester-long conversation, I tried various ways of directing attention to language, with varying degrees of success. I was the least successful on days that I planned to rely on serendipity – I hoped I would notice an interesting language phenomenon and then direct students to consider alternative ways of languaging. Even with my strong interest in language, I found it difficult to attend critically to language while attending to mathematics and the students' learning. Ironically, this serendipitous approach was the one I had predicted would be the most fruitful.

The most engaging conversations I had with students began when I showed the class excerpts from transcripts or video that had interesting language variation. I would usually introduce these artefacts near the end of a class. I would ask the students to tell me what they noticed in the given text. They sometimes asked me what I noticed. Most of these prompts did not spark engaged dialogue, but the ones that did carried on for many weeks. Although I varied the form and context of my prompts for classroom discussions throughout the semester, I did not find a strategy that I would consider generally successful for raising language awareness. I cannot identify general characteristics of the issues that caught students' attention with the notable exception of the positive effect of the teacher being interested in what the students say about their observations, which may explain the students' eagerness to carry forward topics of conversation for a long time.

It seemed that the students in this research resisted my attempts to raise their awareness of language. I characterize their general lack of engagement as *passive resistance* because their response to my prompts could not be described as outright rebellion. Rather, they typically responded to my prompts either with literal silence or with answers that were shallow and indifferent, but still compliant.

At the end of the semester, I asked the students to comment on their silence and their indifferent responses. Some of them noted that in any given situation they would have engaged if they had noticed something interesting in the discourse. I am not surprised that they usually found nothing significant. It is a challenge for anyone to attend to language critically, and it is especially challenging for novice language analyzers.

Even with my own special research interest in language practice, I had the same trouble the students had. To question the normalcy of our language practices is central to critical discourse analysis (cf. Kress, 1990), but this proved to be hard work.

While the participant students' resistance was significant in itself, it became especially important as a context in which to view the exceptions to their passivity. When the students became engaged and persistent, I saw their real concerns about the mathematics classroom discourse that had been a part of their daily lives for the past eleven years.

One of these times related to the use of the word *just* in our class discourse. This stream of our ongoing conversation exemplifies a possibility opened up to mathematics teachers and learners when critical attention is directed to language practice.² After I describe the relevant events from the researched classroom, I will consider a connection between mathematics practice and the use of the word *just*.

'Just' and Simplicity

Our attention to the word *just* seemed to emerge from nowhere, but in reality it was our ongoing attention to language that opened up the possibility for the question to emerge. A few months into our conversation about language practice, the students and I were considering a transcript that related to the student-identified phenomenon of having a clear mathematical idea but no words to describe it. After we discussed the transcript, I asked students if they found anything else interesting in it. They said they did not. I then moved to a secondary mode of prompting and tried to provoke a reaction by making a contentious assertion. I drew attention to a particular utterance that I had transcribed – "...the square root of twenty. And you just change it to two square root five, right?" Jessye³, the student who had said this, was absent that day. Her absence gave the rest of us an opportunity to explore the *effect* of her language choices because she was not there to tell us her intended meaning. We had the unique opportunity to consider various interpretations and implications of utterances.

I circled the word *just* in the transcript that we were considering and asked, "What does that mean when she says *just*?" In the interchange that followed, Gary paraphrased his classmate's utterance and I prompted him further ("DW" refers to me):

Gary: "You simply change it."

DW: Oh. So, in other words, it's a simple thing to do.

Gary: Well, I guess. I don't know. Well, I guess that's what it's implying.

DW: It makes it sound easy. Yeah, I was just wondering. I found this interesting because we teachers sometimes say the word *just*. Do you think it kind of is insulting to students? When you say, "Well you just do this, and"?

[*many students say things all at once*]

Gary: Well, because you guys have done it for so long. You guys, like, it's not really like, I don't know. It's not that big a deal, but it's kind of implied that we, like, should get it right away, that it should make sense automatically. [*turning slightly to acknowledge Joey's long and clear thumbs up.*]

DW: You're agreeing, Joey? [*Joey nods yes*]

Many of Gary's classmates agreed with him. They agreed that teachers should not use the word *just* in the sense we discussed – to suggest that a procedure is simple.

² Another stream of my conversation with the participant students, which also demonstrates potential for critical language awareness in mathematics classrooms, is described in Wagner (2007).

³ Jessye is a pseudonym, as are all other names of participants in this article.

Sometime in our subsequent conversations about the word *just*, Gary wrote a note to himself in his workbook: “Just is ok for students to use. Teachers shouldn’t use just. Teachers’s JUST shouldn’t do it” (Figure 1). While he displayed significant self-confidence, both in mathematics and in discussions about mathematical language practices, Gary worried about the sense of inferiority a teacher’s use of *just* might invoke in others. None of the students in this class said that they themselves felt insulted. Rather, they seemed to be worried that others would feel insulted. Their concern was pedagogical.

Just is ok for students to use
Teachers shouldn't use just
Teachers's JUST shouldn't do it

Figure 1. Gary’s note to himself about the use of the word *just*

In this discussion and others before it, the students already displayed awareness of language, but I wanted more from them. My agenda was not only to note or describe language practice, but also to explore a range of possibilities within the language framework. *Critical* awareness demands an exploration of a range of possibilities, but the students seemed to be fixated on *one* account of the effects of teachers using the word *just*. Their fixation was understandable because of the connection to their feelings about mathematics learning. However, this kind of situation exemplifies the value of critical exploration: as participants in a discourse consider alternative explanations or new ways of participating in the discourse, they are equipped to change their experience of, and feelings about, the discourse.

In addition to this pedagogical concern for educating their critical language awareness, I wanted to draw out the students’ unique perspective on their discourse. I will show how this stream of conversation illustrates the difficulty researchers face when they try to draw out student perspectives.

Understanding Students’ Perspectives

There are a number of challenges associated with understanding students’ perspectives. First, we only have access to what they say about their perspectives, which is different from the perspectives themselves. Second, like any conversation, the conversation about their perspectives is dialogical (cf. Bakhtin, 1975/1981). The students’ perspectives change as we talk about them.

Relating to the first of these challenges, critical discourse analysis puts the focus on language, which we can access, rather than on meaning or intention. Nevertheless, in discussing ranges of language practice it is inevitable that we will speculate on meanings and effects associated with various forms. In this research, our conversation about *just* focussed intensely on implications because we were discussing different possible implications for one language form.

We were able to talk about Jessye’s intentions because of her absence. However, even if she had been present, she would have had to reconstruct her intentions. As noted by many scholars (including Sfard, 2001, in the mathematics classroom context), we never really have access to people’s intentions. It is even problematic to understand our own intentions (Ellsworth, 1997). However, in most of our conversations we normally assume that we know a person’s intentions.

For example, Valero (2004) drew attention to the flawed assumption that school children want to learn mathematics. I would add that research reporting that refers to participants as *students* betrays such an assumption. For example, when I refer to my research participants as students, I am implying that they intended to learn the prescribed curriculum. This is only partially true. I also resist calling these participants *children*, because that word carries other baggage (including the implication that these people do not have anything to offer adults, an idea that I am challenging in this article).

From the actions of the participants, it was clear to me that other intentions often eclipsed their desire to learn the required mathematics. Some students' contributions to class discussion seemed to serve to position themselves amongst their peers – to flirt, for example – than to develop mathematical understanding or competence. Furthermore, from the participants' accounts of their goals in this particular mathematics course, they, like the boys in Valero's account, were more interested in achieving a satisfactory grade that would earn them passage to a desirable future and less interested in the mathematics itself. Even when students want to learn mathematics, they may intend different things – to be able to perform an algorithm, to understand, or to be able to communicate.

The challenge of reading students' meaning is further complicated by the reality that their perspectives, like their intentions, are not completely their own. This relates to Bhaktin's (1953/1986) observation that language is shared: no utterance belongs completely to the person who is saying it. The way I revoiced Gary's utterance made the interpretation more complicated, but it also added to the depth of the data. In the initial conversation, which is partly detailed in the above transcript, I initiated the worry students felt about the word *just*, a vein of concern that became increasingly obvious as our conversation continued over the coming weeks. In my revoicing, I deliberately stretched my interpretation of Gary's intentions, saying "Oh, so in other words it's a simple thing to do," and suggesting that such an insinuation may be insulting. This manner of responding had a number of effects, which included verifying my interpretation and provoking further discussion. O'Connor and Michaels (1996), who investigated more traditional classroom interactions, have shown how teacher revoicing prompts a participant framework in which students converse with each other. They said revoicing that pits student ideas against each other really gets them talking. My revoicing cast Gary in the role of a judge speaking against Jessye's intentions. I pushed this role further by applying his interpretation to a teacher's use of the word *just*, in effect casting him as a judge with the freedom to speak in support of or against the teacher's warrant to orchestrate and control classroom relationships.

My revoicing, like any teacher (or student) revoicing, changed the way the people in the conversation thought. When Gary said *just* was synonymous with *simply*, he did not say that Jessye's utterance implied simplicity. I said that. However, when I asked him, he seemed to agree that the implication was present in his utterance, though he was hesitant at first – "Well, I guess." This hesitancy disappeared as the conversation continued in the coming weeks. Gary became obsessed with this interpretation, sometimes annoying his classmates with it.

It is reasonable for teachers to be interested in changing the way their students think by using revoicing or other techniques. However, researchers have different intentions. (Teachers sometimes share typical researcher intentions as they try to understand their students.) I had told the students that one of my intentions in this research would be to listen to their voices. I claimed this same intention in the introduction to this paper. How can I claim to have been listening to student voices when I was putting words into their mouths? On the other hand, how can *any* question be asked or response be prompted without using words that could seed the response? The answer to both these questions is the same – any prompt influences the nature and content of its response. We researchers have to be careful about the extent to which we give

participants the words to speak their ideas. And we need to be aware of the way the wording of a prompt influences the participants' understanding. I felt that I needed to explore my influence on the students' responses in various ways in order to verify my interpretations.

In the months leading up to this stream of conversation, I found that the students tended either to say nothing or to make such brief utterances that they could be interpreted in many ways. If I wanted them to say something more substantial, at times it seemed that they needed to be provoked into speaking. Once provoked, they might begin to speak more freely.

With my heavy verbal prompting, I felt responsible for initiating the students' worry about mathematics teachers suggesting simplicity by using the word *just*. Though I felt responsible for their concern, I resisted their complaint. The participant teacher and I continued to use the word *just* when we taught. We became aware of the habitual nature with which we used the word, but we also felt that its use was justifiable. In order to convince the students of another more positive perspective on the use of the word, I wrote a 600-word essay for them, referring to the adverbs *just* and *simply* as "diminutives" because they suggest that the actions they describe are unimportant or trivial. (The adverbs *just* and *simply* are not technically diminutives but they serve a similar function.) This essay marked the beginning of a time when the students disagreed with me and when their clear voice emerged.

Diminutives like *just* can be used for pointing, I said in the essay. The de-emphasis of one procedure can emphasize another procedure or another aspect of the reasoning. With such emphasis and de-emphasis, we point attention to the important ideas we are talking about. Besides using adverbs like *just* and *simply* to de-emphasize, one can use the verbs *do* and *go* to do the same thing. When I talk through my mathematics for others, I might show my calculations and say, "and you go 'root twenty' and 'two root five'." In this case I am not saying what I am doing or how I am doing it. I am saying to my audience, "you too can go down this path, a path which should be obvious." When I say, "just go," it is a double diminutive, suggesting that a procedure is more than obvious, that it does not need attention or explanation. It merely requires performance – "just go two root five," or, "just do it." By presenting this reasoning in my essay, I thought I had made a clear point about a positive way in which teachers or students could use diminutives. The students were not convinced, though some showed later that they were.

In response to my essay, some of the students continued to express their concern that diminutives can be insulting, that these adverbs suggest a procedure is obvious when it may not be obvious to students. Though I considered their interest in this pedagogical issue a significant revelation, I felt frustrated that they seemed uninterested in my suggestion that teachers and students use diminutives as pointers in mathematics communication. Although their resistance to the alternative possibilities implied a possibility for further critical language awareness, it was obvious that the concern they expressed was important to them. Their resistance verified the role critical language awareness can play in drawing out the authentic voice of students, the articulation of their unique perspective on mathematics classroom discourse.

'Just' and Vagueness

A few weeks after our initial discussion of *just*, on a day when Gary was absent, I resurrected the stream of conversation. I moderated a mock panel interview in which students played the part of a teacher and a student debating the merits of using the word *just* in mathematics classrooms. During this role-play, it became clear that many students no longer shared Gary's concern about the language practice in question. His classmates said that he alone had this concern, and that he still held it strongly. Apparently he talked

about it outside of class too. However, it would soon become clear that Gary was not alone in his concerns.

One of Gary's classmates, Jocelyn, expressed another related concern during this discussion: "[W]hen [teachers] use *just* it's kind of an aggressive word. It's kind of like they just use *just* because they don't want to explain why it is. They just say, 'It's just that'." Her tone made it clear that she resented it when her teachers glossed over any aspect of their mathematics in an explanation.

Her concern pointed to another aspect of the language practice in question. When the words *just* or *simply* are used to indicate simplicity, they actually replace a more careful explanation of the procedure. For example, when a teacher says, "and we just solve that," the adverb *just* suggests that the solving is straightforward and unremarkable. The teacher is de-emphasizing the solving procedure in order to draw attention to something else. The teacher has the option to describe the solving procedure in great detail, but chooses not to do this. She may be writing a solution on the board for all to see, so she is still communicating mathematics but chooses not to elaborate using speech. Mathematical publications do not share this problem. Authors can choose not to elaborate without drawing attention to the void with silence or with words like *just*.

Jocelyn expressed her contempt for teachers who are vague – when they use the word *just* and other instances of vagueness. Tharshini, who was normally shy but had recently been empowered by another significant language discussion that she and her friend instigated, suggested that Jocelyn should not complain, given the time constraints teachers face: "Maybe they don't have time to explain." Just as Gary adamantly refused to give ground when faced with my resistance to his interpretation, Jocelyn argued with Tharshini, cutting off all her utterances. This time Tharshini helped Jocelyn clarify her passionate commitment to her interpretation of why teachers use the word *just*. This critical attention to language afforded me the opportunity to hear the students' unique perspectives on their discourse. Clearly, they had a range of perspectives on the issue of vagueness.

Vagueness is an important aspect of language, but it appears that linguists and educators have overlooked the role of adverbs like *just* in expressing vagueness. Even Channell (1994), in her extensive study of vagueness in general language practice, and Rowland (2000), in his extensive study of vagueness in mathematics learning discourse, did not consider the significance of this particular language form, though Rowland's exemplar transcripts often include the word *just*.

It does not surprise me that Jocelyn and Tharshini had very different perspectives on the word *just*. Jocelyn's concern is an example of the discursive authority of Grice's maxims. The maxim of Quantity states that in normal conversation people follow these rules: "[M]ake your contribution as informative as is required for the current purposes of the exchange" and "do not make your contribution more informative than is required" (Levinson, 1983, p. 101).

It appears that Jocelyn was upset with teachers who had not always, in her opinion, made their oral contributions as informative as required for her purposes. Though her concern is justifiable, Tharshini and other classmates may have "required" a smaller degree of elaboration. When a teacher addresses a class of thirty, it is unlikely that all the students have the same requirements for explanation. Tharshini's responses to Jocelyn's concern correspond to the second part of the Gricean maxim – the teacher should not elaborate more than necessary. The disagreement between Jocelyn and Tharshini illustrates how the Gricean principles are most evident when they seem not to be followed.

Directing Attention

Teachers confront this problem every day – different students want and need different degrees of explanation and vagueness. Even teachers who think they explain

their mathematical examples fully cannot possibly do so. Any mathematics relies on other mathematics or on assumptions that might be questioned. It is impossible for anyone to attend to everything at once, and it is the teacher's role to direct student attention appropriately (c.f. Hewitt, 2001).

A particular case of this problem of where to direct attention is especially relevant to this research. Adler (2001) illustrated some dilemmas that are faced by all mathematics teachers, but that are particularly noticeable in multilingual classrooms. She called one the "dilemma of transparency," which recognizes that sometimes a degree of explicit attention to language is warranted, while at other times it is best to use language without attending to it, as though it is transparent. The classroom experience that I describe here supports Adler's claim that language practice is especially noticeable to the multilingual student. The students most engaged by our critical language awareness discussions were multilingual and most of the students in this group were born outside Canada.

The dilemma of transparency is the tension between stressing content while ignoring the medium of the content, and stressing the medium while ignoring content. Gattegno (1984) asserted that every circumstance of life involves stressing and ignoring, and that this process is especially important in mathematics education because it is the process of abstraction. In mathematics, the ignoring is layered with each level of abstraction: "[I]t is possible to constitute a cascade (or hierarchy) of abstractions by stressing attributes or properties and ignoring others in already-stressed items" (p. 34).

For example, when the participant teacher in this research glossed over the factorization of $3x^2 + x - 2$ and said "we go three x minus two, x plus one," she used one form of the English language (the word *go*) to draw attention *away* from the process by which she did the factoring and to draw attention *to* ways of solving quadratic equations. She was stressing equation solving by ignoring the mechanics of factoring. If she were to have stressed the mechanics of factoring, she might have used an algebraic algorithm or a procedure that uses rectangular tiles as icons that represent the terms in the polynomial. Stressing aspects of either of these approaches to factoring could involve ignoring the mechanics and meaning of addition, subtraction, and multiplication. The layers of ignoring continue. To stress the meaning of these operations is likely to ignore the principles of counting. And counting itself is a process that requires us to stress certain similarities between objects and to ignore certain differences.

This process of stressing and ignoring, which is fundamental to mathematics, speaks to the significance of the word *just* in mathematics discourse because the word is instrumental in directing attention. Various words have been used to describe the ignored aspects of a person's mathematics, including the words *fluency* and *transparency*. When we look through a window to see things on the other side, we do not see the window, but it is nevertheless possible to look at the window. When we use language to talk about mathematics we do not notice our language choices, but it is possible to attend to language choices. These processes are transparent, though they need not be. There is value in having this kind of fluency to use tools such as language and mathematical algorithms transparently. There is also value in being able to shift attention to the language and algorithms themselves.

Jocelyn, with her complaint about insufficient explanation, appeared to be resisting the modeling or promotion of fluency. In fluency she noticed what she called a loss of freedom. She said this language practice was "not really giving you the freedom to do what you want." With fluency we *just do* or *just go*, and we forego the possibility of considering alternatives. By contrast, critical language awareness draws attention to alternatives and may hinder fluency temporarily.

Awareness of Possibility

When Jocelyn drew attention to the effects of vagueness in mathematics communication, this class had three different but interrelated accounts of the primary

effect of the simplicity-implying use of the word *just* in mathematics discourse. Each of these accounts could also apply to the generic verbs *do* and *go*, which also imply simplicity or unimportance as they gloss over procedures. First, this usage suggests that a procedure is obvious. Second, it directs attention away from the procedure. And third, this diversion of attention glosses over alternatives to the procedure. I feel that Jocelyn, who worried about glossed-over parts of an explanation, came closest to meeting my hopes for student critical language awareness — an awareness that opens up alternative ways of living within the discourse — because her contributions seemed to open up the possibility of alternatives.

Gary was interested in the way the word *just* suggests that procedures should be obvious. He saw the teacher's use of the word as a potential source of frustration, but what could he do differently because of this awareness? Perhaps it could mitigate his possible sense of inferiority, although he did not seem to feel inferior. I expect that other students who become aware of linguistic forms in their mathematics class would share Gary's strong sense of confidence. If this awareness is unnecessary for him, it might serve as a distraction.

Signot, another participant student, mentioned briefly that words like *just*, *go*, and *do* help students know what is important and what is unimportant. By this he seems to have meant that the words could help students figure out what the teacher deems important. An awareness of the pointing power associated with emphasis and de-emphasis might help a student or teacher direct attention effectively when communicating mathematics. Such awareness may also help a student or teacher understand someone else's linguistic pointing. With the exception of Signot's brief utterance, the students in this study seemed unmoved by the significant possibilities such awareness afforded them. Though I think such awareness would be helpful, it is not necessary. Few, if any, mathematics students are aware of this form of pointing. However, such an awareness may be valuable to teachers.

But Jocelyn, who was upset by vague language, demonstrated her awareness of a subtext in mathematics communication and opened up new possibilities for herself. She saw that alternative mathematical possibilities were being glossed over, and that she could attend to these alternatives even when the speaker might deem them trivial. This possibility would be available to her even if the teacher did not suggest it. This phenomenon is called "retrospective heteroglossia" by White (2003), who is a linguist: when interlocutors become aware of a person's moves to ignore or suppress alternative points of view, this reverses the effect by drawing attention to this person's agency and alerting others that they may have an alternative point of view. With an awareness of the role of *just*, *go*, and *do* in masking aspects of the mathematics, Jocelyn could choose to direct her awareness elsewhere. These three words alerted her to the ongoing stressing and ignoring that is at play in any mathematics communication. When she heard a teacher or classmate say "just go..." she could say to herself, "Yes, there is an obvious way of doing this, but how might I go about this differently?" This kind of awareness is the goal of critical language awareness — to become conscious of alternative possibilities within the discourse.

In any discourse, it is natural to *just* fit in, to follow the language and behaviour patterns of the people around us. In mathematics class, it is understandable that students would think, “This is *just* how it is done.” I ask, is it *just* (fair) to assume that they ought to fit in without discussing alternatives? Students can see alternative mathematical possibilities when they come to realize that certain language patterns can actually mask alternatives. This awareness is one possible benefit of directing students to attend critically to their language practice in mathematics class. Discussions about language can also afford teachers and researchers an insight into students’ perspectives on learning mathematics.

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Figures

JUST is ok for students to use
Teachers shouldn't use just
Teachers's JUST shouldn't do it

Figure 1. Gary's note to himself about the use of the word *just*