Students' experiences and perceptions of discussion within the context of dialogic mathematics learning and identities

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It is widely acknowledged that dialogic exchanges facilitate the construction and organisation of mathematical knowledge and challenge power structures. However, the complex nature of interactions mean that students' experiences are diverse and may differ from the intentions and assumptions of educators. This case study seeks to bring students' stories to the fore by exploring their perceptions and experiences of discussion, and in particular, the ways in which they experience dialogic characteristics such as collective discussion. Data was collected through interviews with students aged 11 to 16, from classes where discussion is encouraged. The findings show ways in which individualistic narratives can dominate, and how these are linked to aspects of identity. This research brings an important student perspective to the field of dialogic learning and identity at a time when social and economic inequality have created divisions in society and assessment culture has made mathematics into an individualistic pursuit.

Keywords: Dialogic learning; identity; secondary mathematics; individualism

Introduction

This research comes at a time when social and economic inequality have created and exaggerated divisions within society. Within this context, effective dialogue in classrooms is challenging, but also vital. We need classrooms where each student can contribute, breaking down power structures and celebrating alternative perspectives. The assumptions and expectations of teachers and educators are part of systemic injustice, as they tend to facilitate social reproduction (Wright, 2017). Therefore, when asking whether dialogue is taking place, it is vital to explore perceptions and experiences from the point of view of students themselves. In this way, this research aims to be dialogic itself, listening to and learning from students' stories in order to move forwards towards a truer dialogic experience.

In this study I worked with students in my own mathematics classes in an English secondary school. I looked at how their perceptions and experiences align with dialogic characteristics and how this is linked to different aspects of their identities. A key theme which emerged was the idea of 'individualism', which I define to be a focus on oneself and one's own learning as separate from others. This is in contrast to 'collective' which Alexander (2020) defines to be learning, enquiring and addressing tasks together. The findings demonstrate a complex set of perceptions and experiences linking with identities and often aligning with individualism. This complexity presents many barriers to identifying with dialogic learning, but also possible openings. These openings give us opportunities to reflect on how to challenge some of the individualistic narratives within society.

Literature review

Dialogic learning is more than just discussion – it is exploratory rather than polished and requires students to engage with each other and consider alternative perspectives – something which does not always occur in discussion (Fujita et al., 2019). Alexander (2020) characterises dialogue as collective, reciprocal, supportive, cumulative, purposeful and deliberative. Cognitively, it gives students the opportunity to arrange ideas (Barnes, 1992) and form a greater understanding of connections between topics (Solomon and Black, 2008). From a social justice perspective, dialogue is essential to challenge oppression (Freire, 2000) and social reproduction (Bourdieu and Passeron, 1977). It creates shared understanding, building community (Martin and Towers, 2009). Listening to each other and appreciating alternative viewpoints creates a culture of agency, and not just acceptance and inclusion but the valuing of diversity.

Mathematical dialogue is both a mathematical and a social activity and so cannot be considered in isolation from both mathematical and social aspects of identity. Brown (2007) found that groupwork led to a greater sense of membership and a more personal relationship with maths. Snell and Lefstein (2018) found that teachers tend to reinforce an identity of 'low ability' during dialogic learning. Identities can be fragile, conflicting and hard to manage (Kumpulainen and Rajala, 2016). In order to examine these links with identity more carefully, and because identity is complex with many aspects (Darragh, 2013), I have decided to make an explicit distinction between mathematical and social identity. Mathematical identity is a student's relationship with maths (e.g. Boaler, 2002), and social identity is their sense of membership in their class or other group (e.g. Tajfel and Turner, 1979).

My research question is in two parts: In what ways do students' experiences and perceptions of discussion in secondary mathematics classrooms compare to the characteristics of dialogic learning? How do these experiences and perceptions relate to students' identities?

Research methods

I worked with 12 students aged 11 to 16 over several months, to capture changing thoughts and identities. Due to the length of the study, the sample was chosen from my own students by open invitation, to make sure they felt comfortable taking part and for logistical reasons. For each student, there was one general interview followed by three or more stimulated-recall interviews based on excerpts of discussion that were audio-recorded during the lesson. This focus on real discussions generated a greater depth of data. I analysed the data using thematic coding. I approached this inductively to make sure that I was led by the students' voices rather than my own ideas. Once themes had emerged, I recoded the data deductively. It is important to emphasise that I was analysing what the students said about discussions, rather than the discussions themselves. This makes the research different to works like Kumpulainen and Rajala (2016) where discussions themselves are analysed.

Findings

Three themes emerged from the data: 'individualism', 'linear learning' and 'safety'. Due to limited space in this paper, I have chosen to focus on 'individualism' because this stands in clear contrast to the idea of collective discussion (a key characteristic of dialogic learning). In this section I explore elements of individualism and collectivism

in the data through a series of examples and demonstrate some of the links with identities.

In whole class discussions, some students felt like the class was working on a question together, for example: "Someone puts their hand up and says an answer to it. And then someone else says a different answer. And then someone else has a different answer. And sometimes it's funny, because they like argue about the answer." (Sue, year 9, age 13-14). At other times, students perceived the class to be working as a set of separate individuals; for example, when Eddie (year 9) was asked what other students were doing during a class discussion, he said "Working it out themselves". Similarly, Adrian (year 11, age 15-16) perceived his class to be working separately: "I'm happy that they could answer the questions and get them right. But I felt a little disappointed in myself because when I tried to answer I couldn't get...". Tom (year 11) repeatedly said things like "Listening to the question, then answering myself in my head."

Individualism can also be seen in groupwork, where students talk about sharing out the work. For example: "I think there was like four or five of them, and I did two of them, and I think she did two of them as well. So like we shared our part in it" (Mandy, year 7, age 11-12). However, there are also examples where students seek a shared understanding: "It was just kind of trying to explain to each other our thought processes, so that maybe we could figure out where we went wrong, if one of us went wrong. … Towards the end of it, we started getting on like the same kind of ideas, so we managed to get it" (Annie, year 10, age 14-15).

There are also examples that incorporate elements of both. Annie (year 10) described one group activity as collective, saying that everyone agreed, then said: "Er, well, Stuart kind of stated his opinion, and then no-one else, well I'm guessing we all agreed because no-one else really said anything, and we all just agreed at the end". In fact, Annie said that she and another group member did not contribute at all, and that she had an alternative view which she did not share. Adrian (year 11) talked about sharing out cards, but also coming to a shared understanding: "What me and William did, was we shared half the cards, so then we had it in turn. So he would get, put one of the cards in the middle between us. And we'd sit there, put our heads together and think about it, and then we'd have our conversation about it, and then yeah".

Links with identity

Annie (year 10) has a strong sense of herself as being part of a group working towards a shared understanding, linking social identity and collective discussion: "I feel like they were coming up with their *ideas* separately, but then they would take it in to the rest of the class and then we would work together to kind of like, go over it." On the other hand, Fiona's (year 7) sense of her group leads to feelings of self-consciousness: "I know everyone was listening, and, sometimes when someone's speaking, people look back, and then when people, lots of people are looking at you like whilst you're speaking, it's just, it's just a bit harder." In contrast, Frank (year 7) lacks interest in his group, saying "I'm not really bothered about anyone else too much." These examples show that social identity is complicated, and that experiences of discussion are linked to the nature of social identity rather than how strongly they identify with their group.

Links with mathematical identity were also diverse. This quote from Fiona demonstrates an individual relationship with mathematics and with discussion:

> I like getting all the questions right, I don't want to get the answers wrong, so I have to try my best, and when I get them right then that's good … sometimes if I

> can't do it, then, I mean like it's kind of, stressful, because I'm like trying to get, do the best in my work. (Fiona, year 7).

Ollie, on the other hand, values different ways of thinking about mathematics, preferring a more collective approach:

> Your partner would give you thoughts that like, you wouldn't, it's not like you didn't know them, you just didn't think about them. And when you work together, like you always come up with the best solution. (Ollie, year 9).

Links with fundamental beliefs about education

Finally, I want to draw links with fundamental beliefs about education. Adrian and Tom (year 11) often described effort and engagement as determining factors in mathematical success. Tom thought that some of his classmates might think of themselves as mathematicians "cos they're always saying the answers or, more involved". Adrian said "If they put the focus and attention and dedication into it, then they can achieve what they want to achieve". Adrian also sees class discussions as a stepping stone to the next part of the lesson – necessary to move everyone forwards but not valuable in themselves:

> If they start answering the questions, right, and they start memorising how you do it, then we don't, not trying to sound rude or anything, but then we won't really need the class discussions that, as much. (Adrian, year 11).

When describing these kinds of class discussions, Adrian's feelings were often dominated by whether he understood or was confused. However, in the stimulated recall interviews around group discussion tasks, he talked instead about the content of the activity and what he thought about it mathematically: "We were talking about the 20-sided dice. … We thought that, you probably have less of a chance because you got one to 20 on the dice instead of one to six". It seems that in whole class discussions, Adrian tends to focus on understanding it and moving forwards, whereas in group tasks, he often focuses on the mathematical content and the ideas that he and other students have. Perhaps group tasks have the potential to challenge fundamental beliefs and facilitate more dialogic activity.

Discussion

The findings showed the ways in which students perceived discussion in more individualistic ways, or more collective ways – collective being one of Alexander's (2020) dialogic characteristics. The findings demonstrated complexity, overlaps and also a difference between perceptions and experiences: Annie perceived her group to be coming to a collective agreement, but appeared to describe a more individualistic experience as not everyone contributed and not all ideas were shared. This is an example of a common problem where alternative perspectives are not explored (Fujita et al., 2019). Her group was not challenged to justify their ideas or make connections between multiple ideas (Solomon and Black, 2008). The findings suggest that even for students who value dialogue, achieving a true dialogic experience is challenging.

We also saw links with fundamental beliefs about education: namely, that the individual is responsible for their own success, and that learning is about understanding and then moving on. These are narratives presented to students by the education system via the knowledge curriculum and assessment culture. Adopting narratives from society aligns with sociocultural theory (Vygotsky, 1978), where a child's thoughts and actions become aligned with those that are "practiced [*sic*] and

valued by their culture" (Gauvain, 2008, p.407). In this way, these narratives are a part of the students' social identities as they align themselves with the society they are part of. However, we also see students identifying with more dialogic narratives and valuing, for example, other students' ideas. A particularly powerful example was Adrian, who – broadly speaking – was more aligned with individualistic narratives in whole class discussions, and dialogic narratives during groupwork. Adrian held multiple or varying beliefs. Therefore, whilst these narratives present barriers to dialogic learning, they may be flexible, with possibilities for them to be challenged.

When considering the links between discussion and identities, I found it helpful to use the framing developed by Cobb et al. (2009), which compares 'identity' to 'identifying with'. In other words, they consider identities as a form of affiliation or alignment with a person or group, or with mathematics. They argue that there are cases where "students identify with classroom mathematical activity, those in which they merely cooperate with the teacher, and those in which they resist engaging in classroom activities" (p.41). They are referring to mathematical identity but I see this claim as extending to other aspects of identity, because identifying with classroom mathematical activity is not just about the students' relationship with mathematics, but also their beliefs, interactions, classroom norms and their sense of themselves as part of a group. In this way, students can identify with, cooperate with or resist the narratives of individualism presented by the education system, and they can identify with, co-operate with or resist dialogic learning. For example, Ollie identified with dialogue when he explicitly valued the alternative perspectives of his peers. Eddie co-operated when he "just went with it" during a discussion. This framework provides a further layer of complexity. However, it also gives us some hope, as the more complex the barriers are, the more gaps and openings we start to see where dialogic learning can emerge.

Conclusion

Students are not necessarily identifying with discussion in the way we might assume or desire for effective dialogic learning. Individualistic narratives often dominate, and I want to reflect on ways to challenge these as I build on this study. The research gives the important message that perceptions, experiences and links with identities are complex, and that through this complexity there are openings which align more closely with dialogic learning. The questions to ask, therefore, are where these openings can be found and whether they can be encouraged through activities, through the teacher's actions or through schemes of work and assessments. For example, the findings suggested that smaller group discussions could be a powerful tool in challenging the anti-dialogic narratives by shifting the focus to the content of the discussion. Students are also unique, and as we explore these questions we must continue to listen to their stories and see discussion from their perspective.

Acknowledgements

I want to thank Julie Alderton for guiding me through this project. I also want to thank Susan and Jamie for listening to my thoughts as I tried to organise them.

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