

6 DISCUSSION

At the beginning of this thesis, drawing on the existing literature, I presented the concept of shared epistemic agency as emerging from the interplay of six distinct characteristics (see section 2.4.3). In the analysis section 4.2, I showed how I could identify thirty-six Episodes of participant interaction, each of which exhibited all six of these characteristics. This forms the data and findings that allow me to claim that my innovative pedagogy, based on the knowledge creation principles and iteratively refined through action research, produces shared epistemic agency as it is represented in the literature. What also emerged from the analysis is a different way of looking at shared epistemic agency. I have moved from seeing shared epistemic agency as a discrete set of distinctive behaviours to a more holistic view of its inseparable connection with student participation and community practice. These two themes, of the student and their community, guide this chapter and contribute to the answering of the research questions.

I have organised this chapter into three sections. In section 6.1, I respond to the first research question by considering the themes of “the student as a participant” and “the concept of a learning community”. Section 6.2 responds to the second research question, taking a deeper look at the second theme of the new learning community. Section 6.3 presents my holistic reflections on the action research, and the chapter concludes by reviewing in a broader context the key features of the innovative

pedagogy that changed the student and the community, and that could be adapted by other researchers and educational practitioners.

6.1 Answering Research Question 1

What are the indicators of shared epistemic agency in the mathematics classroom?

I present a new conception of the student and their learning community in terms of the indicators of shared epistemic agency in my mathematics classroom. I contend that this emergent conception of a student as a Participant is connected with the positions of the learner, knower, and facilitator in the new Learning Community. Participants in the study developed a practice of learning through interaction, created knowledge from within the community through their agency and their experience, and democratised their participation.

6.1.1 Theme 1: The Concept of “Student as a Participant”

At the start of chapter 3, I introduced the students in this study as “participants” in order to emphasise their active participation in creating and enacting the innovative pedagogy, as well as their roles within the action research methodology of reflection and improvement. In addition, the term “participants” suggests liberation from the conventional view of a student in the classroom (see section 2.3.1). In this section, on the strength of my own experiences of participant enactment, and of the taxonomy of the types of participation which I provide in chapter 5, I present a new conception of the Participant.

The Participant that emerges, as an index of shared epistemic agency, is multifaceted. This Participant is a learner in their capacity to Extend their knowledge, a knower in their capacity to Explicate their knowledge, and a facilitator in their capacity of Expertise (see Figure 6.1).

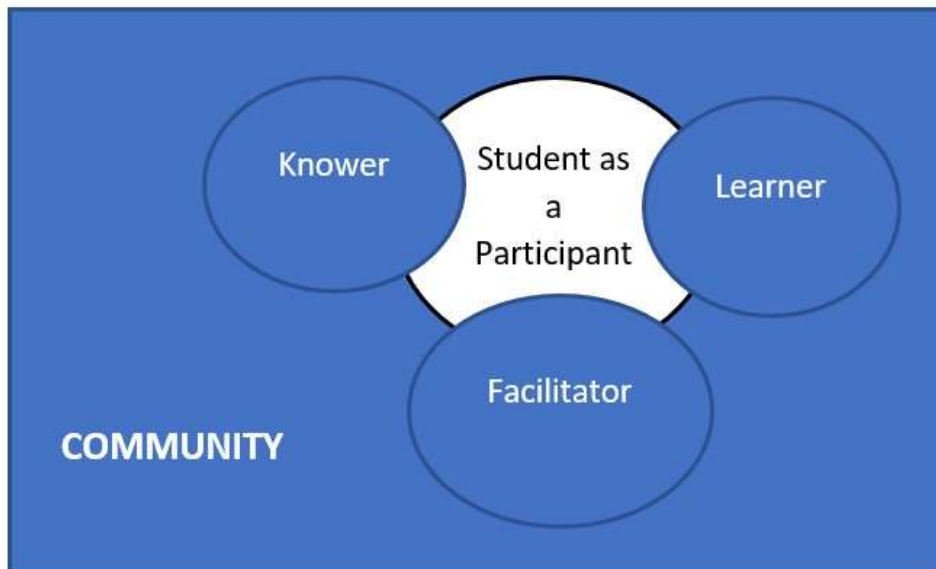


Figure 6.1 – The multi-faceted student as a Participant

My findings (see section 5.2.1) make it evident that the terms “teacher participant” and “student participant”, used to refer to participant roles in the enactment of the pedagogy, were not by themselves sufficient to describe the epistemic interactions that took place amongst participants. Initially, I designed the teacher and student participant roles under the assumption that the teacher participants for each lesson alone would act as knowers, with the remained of the participants being learners. The only disruption to this assumption was the convenient expectation – set by myself as the class teacher – that all participants would arrive at the lesson with some knowledge of the specific mathematics topic (see section 3.3.1). My later analysis reveals that, during the Episodes of

shared epistemic agency, both teacher and student participants sought to extend their mathematics knowledge (see section 5.1.2.1), and so both groups acted as learners. Both teacher and student participants made knowledge explicit to others (see section 5.1.2.2) as knowers, and both controlled the learning culture of the classroom (see section 5.1.2.4) as facilitators.

In this way, all participants made advances to the mathematics knowledge that they brought with them to their lessons. Thus, in enacting the pedagogy, temporary positions of “learner”, “knower” (having epistemic authority), and “facilitator” (having process authority) became available to be taken up reflexively or interactionally by participants. A participant could be either a student participant knower (SK), student participant learner (SL), student participant facilitator (SF), teacher participant-earner (TL), teacher participant knower (TK), or a teacher participant facilitator (TF), at any given moment.

6.1.1.1 The Participant as a Learner

The Participant, in their capacity as a learner, is an individual in a community who seeks to extend their existing knowledge; that is, a Participant who directs their agency towards Extension. A Participant can assume the position of a learner at any moment in the pedagogical process. In this sense, being a learner is not a permanent state that a Participant occupies, but a flexible identification. In the aspect of a

learner, the Participant takes control of their knowing and unknowing, is productive of epistemic interactions, and is not knowledge-less.

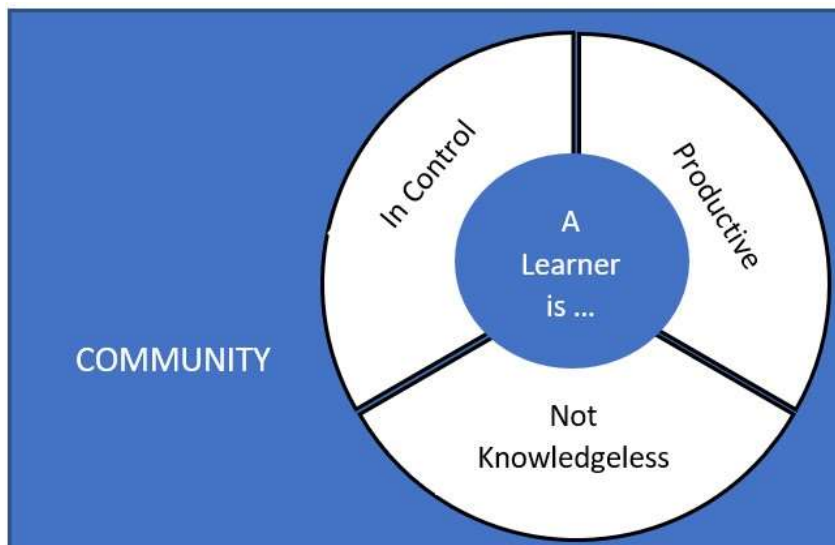


Figure 6.2 – The features of the Learner position

6.1.1.1.1 A Learner Can Take Control of their Knowing and Unknowing

I define a learner by the characteristic of Extension, towards which they direct their agency. In stating that the Participant “directs their agency” towards Extension, I am highlighting the fact that the Participant can, on their own terms, decide upon and seek to extend their mathematics knowledge as a learner. The Participant can wilfully assume the position of a learner, as evidenced by the findings that the learner is a reflexive positioning (see section 5.2.1.1). A Participant can position themselves as a learner by seeking to know, but there was no evidence to suggest that another Participant can position a Participant as a learner. I argue that this reflexive positioning, which suggests that being a learner is an identification that individual takes upon themselves, places the learner in

control of their knowing and, conversely, their unknowing; this quality is most deeply connected with the concept of agency in general, and challenges the conventional views on which the learner is neither empowered nor in active control of their epistemic status.

The learner is not only in control of their knowing and their unknowing, but can also determine how they seek to extend their knowledge. The findings show five different modes by which the learner seeks to extend their existing knowledge. The frequency of modes (see Appendix 8) reveals that while Questioning is the predominant mode of Extension, the learner can also demurely make a Request or tenaciously Challenge the knowledge presented to them by another Participant as they seek to know. Figure 6.3 represents these diverse modes of Extension (see section 5.1.2.1), pointing up the learner's capacity to be adaptive in their quest for knowledge.

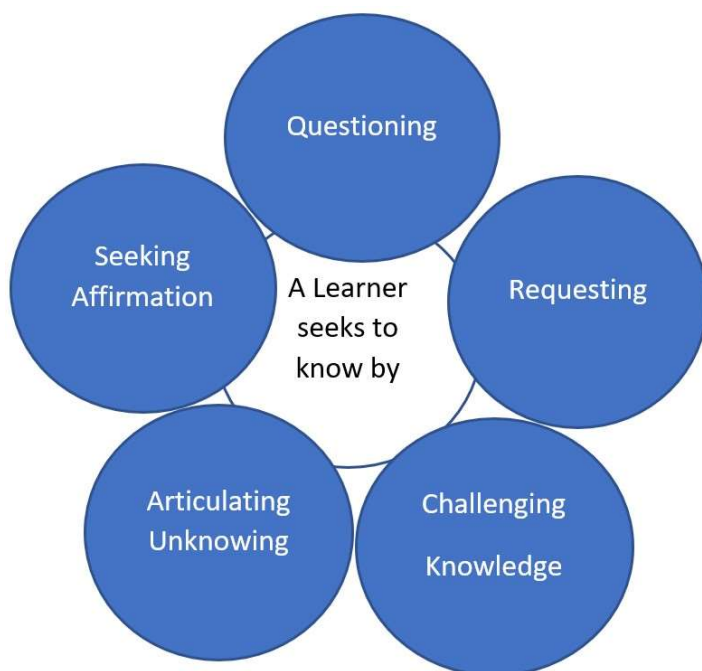


Figure 6.3 – The modes of Extension that point to a learner in control

By articulating their unknowing, the Participant as learner can also control the actions and reifications of other Participants in the community. The findings point to the learner position implicating a form of process authority that impacts the actions and reifications of other participants (see section 5.2.2.3). It is important to note that while I am unable to avoid speaking about the learner as an individual, the Participant's position is always a function of their interactions within a community; the learner seeks to extend their existing knowledge in a community, not in isolation; The learner seeks to extend their knowledge *from* the community, other participants in the community are the motivation for the position, and that is what makes it productive as whether directly or indirectly, this seeking also helps fellow learners within this community to achieve knowledge of their own

6.1.1.1.2 A Learner as Productive of Epistemic Interactions

The learner position that emerges from this study is productive in that, in seeking to resolve their unknowing, they set in motion a series of actions and reifications on the part of other Participants that leads to the creation of New Knowledge. This is because the learner and knower positions are iterative and reciprocal, and provide evidence of productive agency (see section 5.2.1.4). It is important to reiterate that the knowledge they attain is new because it is new to the students, and not new to the world (cf. Bereiter & Scardamalia, 2011, p. 4).

In reflexively positioning themselves as a learner, Participants typically position another Participant interactionally as a knower, as shown in Extract 5.20, wherein Crimson, in positioning himself as a learner by directing an epistemic question to Jevonte, positions Jevonte as a knower. The Participant, thus positioned, had the opportunity to accept their conferred status, and make their knowledge explicit to the other Participant, beginning an epistemic interaction based on an iterative relationship between the learner and knower positions (see section 5.2.1.4). The original Participant continues seeking to know, and other Participants seek to explicate their knowledge until they resolve the unknowing. This capacity of the learner to sustain epistemic interactions as they tenaciously seek to know makes them productive.

6.1.1.1.3 A Learner is not Knowledge-Less

The findings show that knowledge is a prerequisite for Extension (see section 5.2.3.3). A Participant positions themselves as a learner by seeking to know. For a Participant to seek to know, however, they must first be aware of what they do not know. It is conceivable that the learner could seek to know everything about the mathematics topic, confirming that they are knowledge-less concerning that particular topic, though this is improbable in a subject with interlinked content – in any event, one requires such abilities as basic arithmetic in order to even approach any secondary mathematics question. The modes of Extension, which elaborate upon the nuances of its expression (see section 5.1.2.1), confirm that in the position of a learner, Participants can articulate what

they do not know about the mathematics topics, and can also challenge the knowledge and Explications of other

Participants. This shows that the learner is not knowledge-less, but knowledgeable.

As Participants position themselves as learners during their epistemic interactions, the corresponding unknowing could reside in the learner's mind, and accompany them to the lesson, or else it could arise from participation in the innovative pedagogy. The question of where the unknowing originates suggests parallels with the acquisition and participation metaphors of learning (Sfard, 1998) discussed in section 2.2.1, wherein the acquisition metaphor is seen to represent knowledge as the capacity of one's mind, and the participation metaphor is seen to represent knowledge as being situated in the cultural practices of a community (Lave & Wenger, 1991). Moreover, the fact that an Intention is initiated by participants during interaction, and triggered by an Assumed or Identified unknowing (see 5.1.1), shows that participation in the pedagogy creates the awareness of the state of unknowing; in this way, the pedagogy is productive to the extent that it creates an awareness of what one does not know, which itself constitutes knowledge.

I have outlined so far how the Participant can position themselves as a learner within the community. In this capacity, they take control of their knowing and unknowing, and can affect the actions and reifications of other Participants; they are productive of epistemic interactions, and are inherently knowledgeable. These characteristics are indicative of how the Participant behaves as a learner when realising shared epistemic

agency. The conception of the learner that I present in this study is in conflict with that which is assumed in the dominant discourse on education. Gert Biesta (2010) argues that the term “learner”, when used to describe young people in schools, is understood in terms of a lack; the learner is considered to be an individual who is missing something that they need to learn. In this sense, the learner is not yet complete; they are not yet knowledgeable, not yet skilful, not yet competent; they need to learn in order to know. Biesta was not, in making these observations, arguing for a change to the term; he was questioning the assumptions we (teachers, parents, policymakers, and children) make about learners. This study testifies to the fact that the young people in our classrooms are not lacking in knowledge, and are fully capable of taking control of what they know and do not know. I argue, in the next chapter, that educators should assume the capability of learners as a general principle.

6.1.1.2 The Participant as a Knower

The concept of the Participant as a knower, presented in the study as an indicator of shared epistemic agency, refers to an individual who can explicate their mathematics knowledge to one or more Participants in the classroom; this Participant directs their agency towards Explication. Similar to the position of a learner, the knower position is temporary, flexible, and community-based. It differs from the reflexive position of a learner as it is an interactive positioning (see section 5.2.6.1.1); this means that a Participant can position themselves as a knower in their

actions or reifications in order to explicate knowledge to another Participant; or, another Participant can position them as a knower in a bid to have them to explicate their knowledge to one or more Participants. The positioning of a knower is based on an interaction with another Participants in the community; it does not occur in isolation, but instead, its assumption constitutes the continuation of an interaction with one or more fellow Participants. A Participant does not position themselves as a knower to explicate knowledge to themselves; this position always maintains an orientation towards others. In this position, a knower has epistemic authority, is responsive to unknowing, and is ultimately productive.

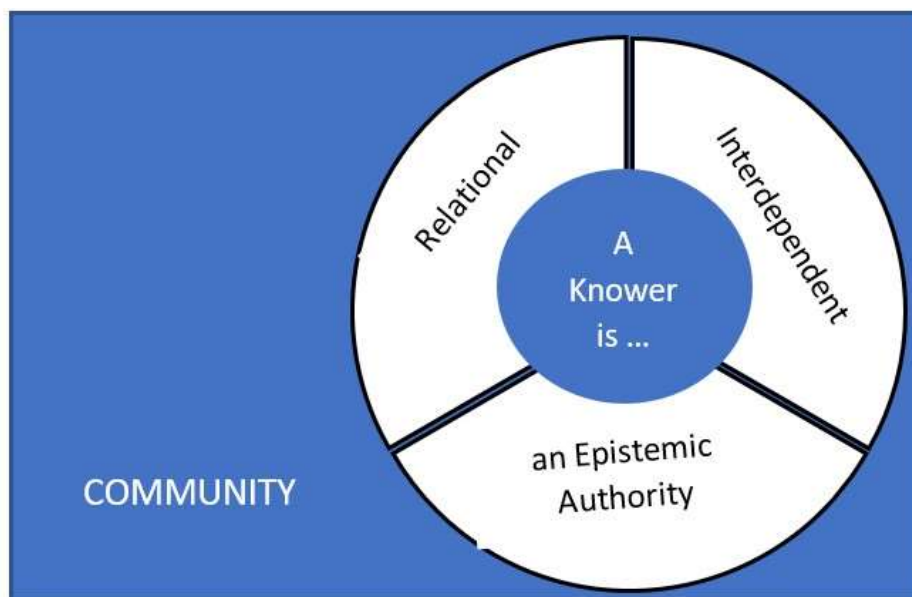


Figure 6.4 – The features of the knower position

6.1.1.2.1 A Knower has Epistemic Authority

Participants attribute epistemic authority (see section 2.3.2) to an individual when they validate them as a knower, and thereby recognise

them as legitimately knowledgeable. In the recorded data, Participants are seen to recognise another Participant's epistemic authority based on their previous competent participation in epistemic interactions in the classroom and the quality of their current knowledge. For instance, in Episode 2, Extract 5.17 (see section 5.1.3.2.3), wherein Crimson positions himself as a learner at the start of the Episode, having given the correct factorisation of the quadratic equation, he is later positioned as a knower by Teesh in her bid to extend her own knowledge. In contrast, in Episode 23, Extract 5.20 (see section 5.2.1.4), in line 5, Daniel positions himself as a knower, following Pearl opening up of this position in line 3. Daniel was not validated as legitimately knowledgeable in that moment; his contribution was ignored. However, Crimson's affirmation in line 6 and his subsequent clarification was validated as knowledgeable, and the explication continued the interaction with him once more assuming the position of a knower. Participants determine the competence of previous participation in line with the standards of effectiveness set by the classroom community.

The findings attest to the competence of the knower, as they reveal that the appeal to a knower was the most frequent way in which New Knowledge was produced within the community (see Figure 5.3).

6.1.1.2.2 A Knower is Interdependent on a Learner and Relational

In addition to being positioned, Participants can position themselves as knowers to resolve other Participants' unknowing. When a Participant

positions themselves as a learner, they open up the position of knower for another Participant to occupy, as demonstrated in Episode 23 (see Extract 5.20), wherein Pearl, positioning herself as a learner by seeking affirmation of her mathematics knowledge, opened up the position of knower to be occupied by a participant willing to provide this affirmation. Hence, the position of knower is assumed in response to a learner-Participant, and is inherently interdependent upon it.

Having been positioned by another Participant as a knower, it is up to the knower to accept the position by explicating their mathematics knowledge. This suggests the relational aspect of the knower position. A Participant who accepts the position reveals their capacity to recognise others' needs and respond to them; thus in this pedagogy, acting as a knower also enacts Mutual Relations within the community.

I identify in this study three factors that may motivate the knower to take up the position made available by another learner, or to position themselves as a knower. These factors are the responsibility Participants have for the advancement of other Participants' knowledge (see section 6.1.2.1.1 below), the feeling of being valued by the community (see section 6.2.1 below), and their accountability to the classroom practice (see section 6.2.2 below). These factors, which I discuss in detail later in this chapter, could explain why the knower appears to respond to an unknowing and to seek to resolve it. This response was evidenced as Participants became knowers; for example, in Extract 5.13, wherein Teesh positioned herself as a knower to explicate Pearl's knowledge. This, once more, is connected with the reciprocal and iterative nature of

knower and learner positions in a knowledge-building interaction (see section 5.2.1.4), which I attribute to the tenacity of the learner who seeks to know, and which causes the knower to respond with Explication. The capacity of a knower to align their thoughts with those of other Participants, to interpret what is needed to resolve their unknowing, and to make decisions regarding best how to respond were identified in the analysis of the modes of Explication (see section 5.1.2.2). Participants made decisions on clarifying knowledge, explicating the unknowing of another Participant, telling another Participant, and affirming the knowledge of another Participant; the capacity for making such decisions can be considered as relational agency (cf. Edwards, 2005).

Jacques Rancière (1991) has claimed that the assumptions that inform teachers' behaviours, such as that of the logic of Explication (see section 2.3.1) that consider the students as in need of the teacher's explanation in order to learn, has resulted in "student" being equated with "stultification" (p. 7), as the student's intelligence is seen as subordinate. In his view

To explain is to arrange the elements of knowledge to be transmitted in accordance with the supposed limited capacities of those under instruction. ... Explanations are needed so that the one who is ignorant might understand the explanation that enables his or her understanding. ... its primary function is to infinitize the very distance it proposes to reduce. To explain something to one who is ignorant is, first and foremost, to explain that which would not be understood if it were not

explained. It is to demonstrate an incapacity ("On Ignorant Schoolmasters" in Bingham et al., 2010, p. 3).

This comment contests the relational bases of Explication that I put forth in this section. Rancière views Explication as part of the pedagogy myth of schooling, serving the purpose of demonstrating incapacity, and perpetuating the unknowing of the learner. Rather than advancing knowledge and bridging the inequality between the one who knows and the one who does not know, it performs the function of enacting, even inaugurating, and confirming an inequality. It consolidates the learner's status as requiring Explication from another in order to know. Rancière views the learner as the product of the knower rather than a condition of the learner. Through my experience as a teacher, I can identify with Rancière's critical view of the learning environment. The conventional pedagogic relations between the teacher (knower) and the students (learner) do not support possibility that students could learn without a teacher, instead installing the teacher as a necessary presence for providing students with instruction.

The knower I present in this study, however, is a product of the learner, who is themselves reflexively positioned to extend their knowledge. While I cannot attest to what lies in the Participants' hearts, it should be clear enough in my findings that the knower position in this study is flexible and temporary. The learner is a past knower, and can be a future learner or knower; as such, participants can identify with both positions. Can the knower seek to demonstrate their incapacity? I suggest, on the strength of my findings, that both knower and learner participate in epistemic

interactions for knowledge advancement. However, when the knower positions themselves as a knower based on the Assumed unknowing of another participant, are they, through their Explication, replicating the behaviour of the traditional schoolmaster and inadvertently demonstrating the incapacity of the learner? I do not think so.

The evidence of this study conflicts with Rancière's view, and allows an alternative view of Explication within the context of this innovative pedagogy, in which the function of the Explication is not to demonstrate the learner's incapacity; rather, it is the learner to whom the knower's purpose is subordinate. The relationship between the explicating knower and the learner most notably produces positive outcomes for the latter, not for the former. Rather than demonstrating incapacity, it demonstrates the productive nature of the two interdependent positions. Moreover, Rancière's challenges the role of the teacher are connected with a call for something resembling autodidacticism; I hold that while self-learning is of value to educational practice, I present in this study the possibility of learning as co-participation, and the benefits of such a style of learning, as discussed in detail in the next chapter.

6.1.1.3 The Participant as a Facilitator

The third Participant position indicative of shared epistemic agency is that of the Participant with the capacity to control the learning culture in the classroom (see section 5.2.1.3). This Participant has process authority, with which they direct their agency towards Expertise. The Participant can

be “teacher-like”, taking on the responsibilities that are typically associated with the role of the teacher (see section 5.1.2.3).



Figure 6.5 – The features of the facilitator position

6.1.1.3.1 Process Authority Facilitates Learning

In developing the pedagogy, I expected the Participants to share their mathematics knowledge with other Participants in the mathematics classroom, leading to the interactive positioning of Participants as learners and knowers with epistemic authority. There was initially no explicit requirement built into the design of the pedagogy for Participants to control the learning culture of the classroom. However, I recognised this necessity in the literature, observing Scardamalia’s (2002, pp. 3–5) argument for the necessity of giving students control for the strategic activities involved in learning if they are to take responsibility for advancing their collective knowledge. This led to my inclusion of

Expertise as one of the characteristics of shared epistemic agency.

Consequently, the pedagogy implicitly demanded that certain Participants take control the learning environment as they occupy the role of teacher participant. The modes of Expertise identified by the analysis (see section 5.1.2.3) support this inclusion, confirming that both teacher and student participants directed their agency toward process authority by managing resources, checking students' knowledge, and/or controlling the learning behaviour. In this way, I hold that, in directing their agency towards Expertise and taking on the process authority in the classroom, the Participants were interactionally positioned by the pedagogy or by themselves within the pedagogy as learning facilitators.

6.1.1.3.2 Process Authority as Negotiated

This study determines process authority to be the product of a negotiation between

Participants. This negotiation involves the recognition of the skills, experience, personalities, roles, and knowledge of all the Participants in the classroom, as well as an awareness of how these can contribute to advancing collective mathematics knowledge. The ability of participants to negotiate their participation is evidenced by the blending of authority (see section 5.2.2.1) between the teacher participants and myself, their recognition of my "mathematics knowledge for teaching", and the blending of authority amongst the Participants in their roles as teacher participants, wherein they made decisions in response to the learning behaviour of the other

Participants; in each case, they assumed control over knowledge advancement. Facilitators took control of the learning behaviour, as illustrated in the analysis (see section 5.1.2.3.1), but did not control social behaviour, allowing dialogical and physical interaction to take place at participants' will (see section 5.2.2.2), promoting knowledge building as learners and knowers. These decisions regarding the distribution of control crystallised over time and became essential aspects of the practice. The innovative pedagogy, for which my initial framework was therefore only the seed, can thus be described as having established and consolidated itself through negotiation amongst Participants.

6.1.1.3.3 Summary

The “student as a Participant” can temporarily and flexibly position themselves reflexively as a learner, knower, or facilitator. They can be positioned interactionally as knowers or facilitators, and institutionally by the pedagogy as facilitators in the classroom community. These positions are indicative of the qualities of shared epistemic agency. As a learner, the Participant can control their knowing and unknowing and the ways they extend their knowledge; the learner is knowledgeable of what they do not know, and productive of knowledge building interactions that lead to the creation of New Knowledge. As a knower, Participants have epistemic authority based on their competence in epistemic interactions, and are relationally responsive to an Assumed unknowing. When positioned as a facilitator of learning in the classroom, Participants blended their control of the learning process with the authority of other Participants in the

classroom, and negotiated control of the learning process based on their relative skill and experience in a given context.

I consider the Participant described by this study as competent in the learning environment. This competence is not the emancipatory result of their having surmounted societal oppression, the oppression that gives rise to the banking model of education (Freire, 1970) that I consider to bear troubling similarities to the institutional methods I have experienced in my school, and which other researchers agree is the predominant pedagogy in mathematics classrooms in England (see section 2.3.1). Their competence is not a result of their achieving intellectual equality with myself, the teacher, that Rancière (1991) argues is necessary for the emancipation of learners. However, this is not to say that the Participant is not empowered; indeed, this study points to qualities of agency that are explicitly considered to be empowering (see section 6.3). My study, I hope, reveals that the Participant is competent to the extent that they possess the agency required to assume control, responsibility, and authority for their knowledge through their mutual and self-positioning. This competence, which renders Participants as equals within a democratic classroom community, is not hard-won; it does not require a sweeping social movement or radical change to the structure of the role of the teacher to surface, but only needs to be made visible by such practices as I have implemented in my pedagogy.

In presenting the Participant as competent, I have partly achieved the aims of this study; I argue for considering the students in my class as active Participants in the classroom who take responsibility for their

learning, and who both contribute to and are constituted by a learning community. The wider aim was to present to the mathematics education community a different approach to classroom pedagogy in the context of the school curriculum. In this study, I hope it is clear that the Participant is trustworthy, responsible for and expected to possess knowledge; and, if nurtured, could transform education.

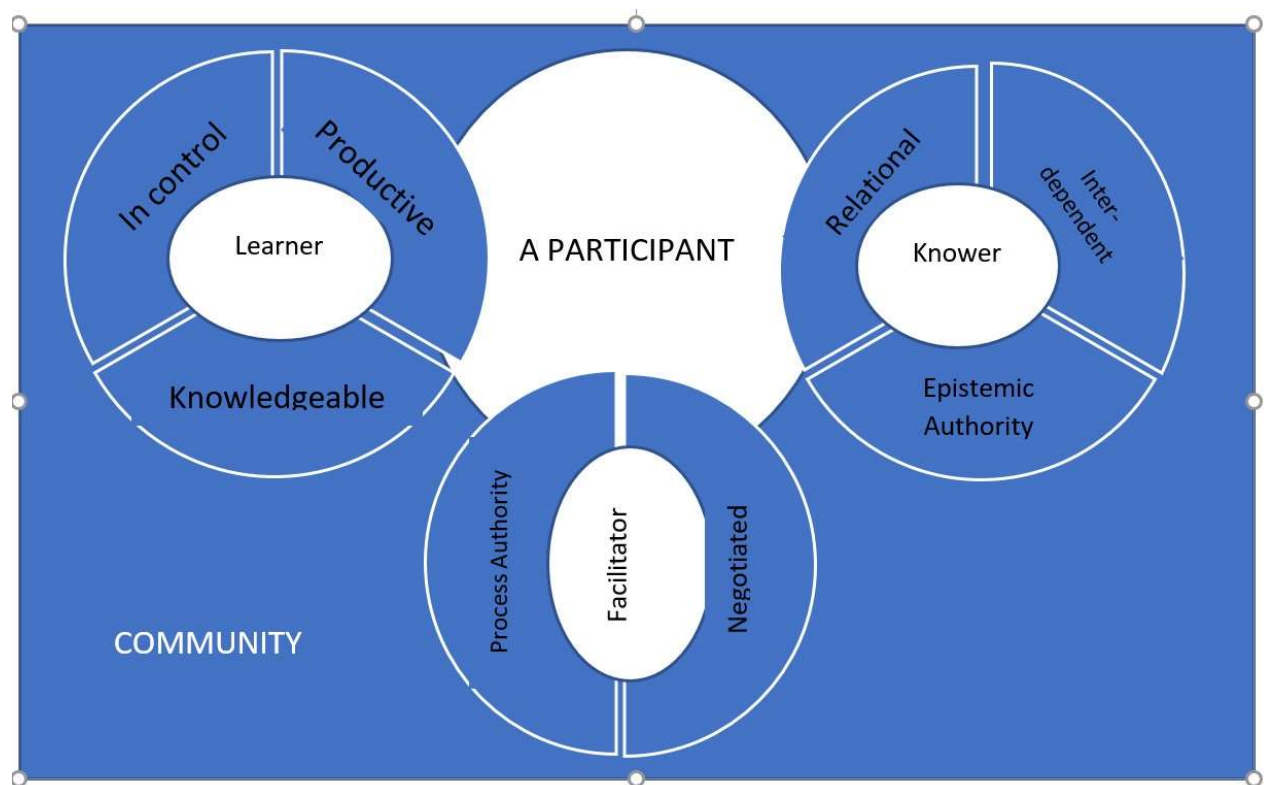


Figure 6.6 – The features of the Participant as a learner, a knower, or a facilitator

The conception of the student as a Participant raises the question of what I am as a member of the classroom, and I will discuss the specific nature of my participation in section 6.3.1.

6.1.2 Theme 2: The Concept of a “Learning Community”

The Participants in my mathematics class acted as a community that supported the advancement of each other's mathematics knowledge. They were more than a group of 18 individual students in a classroom learning mathematics; they became a community bound together by the Mutual Relations that developed around them as they endeavoured to learn the subject. It was these relations that enabled them to sustain their learning and achieve what they did.

Over time, the group emerged as a Learning Community focused on enacting the pedagogy, but the Participants did more than this alone: they brought their unique selves into the enactment, and forged their own unique way of learning mathematics. I could not have planned the Learning Community that emerged; it was its own organism, a community of Participants who were interactive in their knowledge building, democratic in their valuing of each other's participation in the innovative pedagogy, and productive of New Knowledge within the community (see Figure 6.7). This section will discuss what was noteworthy about the community that my mathematics class became and how these qualities of note indicate the shared epistemic agency of the Participants.



Figure 6.7 – The features of the Learning Community

Figure 6.7 shows the Participant within the Learning Community. This section will show how the Learning Community is interactive, productive, and democratic, and how this is an indication of shared epistemic agency. In the subsequent section, addressing research question 2, I will describe how the community's definitions of competence and accountability sustain the emergence of such agency.

6.1.2.1.1 The Interactive Classroom Practice

In section 6.1.1, I introduced the student as a multi-faceted Participant. The Participants learnt mathematics as they interacted with each other in the mathematics classroom, and these interactions defined their practice of learning mathematics in a community. Though I discussed the facets of the Participant independently, their continued existence was made possible only by their interaction.

There was a constant buzz of activity in the classroom; the most appropriate description would relate an *ecology* of epistemic interaction. All Participants mutually engaged in epistemic endeavours. They continuously and spontaneously interacted with each other from moment to moment in the classroom; they stood up, moved around the class, called out to each other, and worked independently; they formed groups and pairs, dissolved them, and regrouped or formed the same or different pairs; in these ways, they learnt mathematics (see section 5.2.2.2). The collective mathematics knowledge was advanced primarily because the free pursuit of dialogical and physical interaction supported the spontaneity of the actions and reifications that are characteristic of the learner, knower, facilitator positionings.

There was often a transparency or public element to their participation; for instance, a Participant positioning themselves as a learner provided an opportunity for other Participants to be share in the Intention towards resolving an unknowing, hence advancing their knowledge as a collective (see section 5.1.2.1.5). Public positioning as a knower or learner opened up the possibility of epistemic interactions, and other Participants join these with their own actions or reifications, or by simply listening in. Any given Participant's knowledge or lack thereof was a communal property, and, conversely, the community's unknowing and knowing were the responsibility of the individual Participants (see section 5.2.3.3).

The language used for meaning making functioned in its own way within the classroom context, and was not drawn from the standard mathematics

vocabulary. My observations of epistemic interactions purposefully did not specify the quality of the mathematics communication in terms of received ideas about the curriculum, encouraging creativity and innovation. In Episode 1 (see section 5.1.2.2.4), wherein

Pearl's use of the word "split" to describe the process of factorising quadratics was further elaborated by Teesh as "splitting the number usually in the middle" – this is not typical mathematical language; a discussion of performing arithmetical operations on the coefficient of b would have supplied the "proper" description. The Participants, however, clearly did not suffer from lacking the appropriate mathematics vocabulary; instead, their focus was on meaning and logic, and Participants in the classroom were able to support each other in their own informal and idiosyncratic ways – they understood each other's meanings. This understanding was facilitated by the Mutual Relations amongst the Participants that developed throughout their participation. They saw themselves in each other, and so could take risks with their learning, ask for support, and offer support to each other confidently. Once more, this mutual support should not be seen as the result of dependency or incapacity (see section 6.1.1.2.2); instead, it demonstrated the strength of the relations between collaborating agents in the Learning Community. Through their participation, they learnt how to be with each other, their personalities, their likes, their moods, and in this way, they were able to get the best out of each other; this is perhaps best demonstrated in Episode 25 (see section 5.1.2.3.2). The Participants showed solidarity with and trust in each other, praised each

other (see section 5.1.2.4.1), and were sensitive to each other's perspectives. On occasion, they were also rude to each other as shown in Episode 19 (see section 4.1), but they repaired relations, and through further interactions, learnt to work with each other more patiently and effectively towards their common goal of learning mathematics.

My Participants inhabited an autonomous Learning Community; all were participating in an epistemic activity, and each interacted with the others and their knowing or unknowing as they moved between positions from moment to moment. I present this interaction as indicative of shared epistemic agency, which, given the particulars of my framework and analysis, is distinct from, if initially based upon Damşa et al.'s notion of SEA, which emphasises collaboration where I emphasise interaction.

Collaboration is "the action of working with someone to produce something" (*Dictionary Online - Google Search*, n.d.). In the context of education, there appears to be a lack of consensus on how collaborative learning should be defined; however, as a learning approach, there is agreement that it minimally involves groups of learners working together to achieve a common goal (Barron, 2000; Erickson, 1996; Stahl, 2016). In comparison, interaction involves "communication or direct involvement with someone or something; reciprocal action or influence" (*Dictionary Online - Google Search*, n.d.).

The difference lies in the context and the pedagogy; in Damşa's studies (Damsa et al., 2010; Damsa, 2014), the project involved undergraduate students in groups of 57 working together on a specific design project for

a real-life client. The course leaders had defined the purpose of the collaboration from the start, and all group members were aware of the requirements of the design project. The groups had a clear outcome of producing a co-constructed knowledge object that guided their collaboration (Damsa & Ludvigsen, 2016; Oshima et al., 2018). The collaboration was evidenced to be productive of knowledge. Similarly, in collaborative or group work that occurs in mathematics lessons described in previous research (Bearison et al., 2002; Schwarz et al., 2021; Stahl, 2016), the problem to be solved is precisely defined and determined before the collaborative or group work, and each group member is aware of it. Typically, the collaborators or group members occupy fixed groupings for the duration of the collaboration. This description suggests that for an activity to be termed collaborative, it should be goal-directed, deliberate, and have a desired outcome and agreed purpose. In my study, the Plan stage of the teaching cycle, wherein the teacher participants produced the PowerPoint lesson plan can be said to be collaborative in this sense. Producing the lesson plan was the clearly defined goal of the fixed groupings that the Participants had agreed upon at stage 1 of the teaching cycle. This goal sustained the collaboration.

The remaining phases of my innovative pedagogy, however, were different. The epistemic focus was on the moment-by-moment epistemic interactions that occur in the classroom, and not on the narrow results of a collaborative effort. Consider each Episode of shared epistemic agency (see section 4.1): the Participants involved had no predetermined goal that determined the interaction, and neither was there a predetermined

group for the duration of the Episode. Instead, an Episode started with a spontaneous Intention to resolve an unknowing, leading to the further spontaneous interactions of other Participants. There was a fluidity in the Participants' engagement in their interactions that sets it apart from that which arises within the rigid determinations of a merely collaborative learning environment. Participants could continuously change their positionings during the interaction and opt in and out of it at will. The knowing and unknowing of each Participant was the basis of the spontaneous interaction of the following Participants; there was dynamic epistemic reciprocity between the positionings that was productive of New Knowledge. As is clear, this knowledge was the product of interactions (see section

5.1.3), and not of collaboration alone.

The distinction between Damşa's SEA construct and the shared epistemic agency indicative of the Participant in the learning environment is essential to note. A "pedagogy of interaction" reveals what is useful in a secondary school classroom for the emergence of shared epistemic agency – the benefits of which I hope to have shown – while a pedagogy of collaboration indicates what is useful for groups collaborating to achieve a specific project.

6.1.2.1.2 A Productive Community

The Participants learnt mathematics in line with the National Curriculum by enacting a deep constructivist pedagogy (see section 2.1.3) that

expected them to take responsibility for higher-level capacities of classroom practice (Scardamalia, 2002; Scardamalia, 2014), such as planning the learning (see section 3.3.1.2), managing the learning (see section 5.1.2.3.3), checking their own and each other's learning (see section 5.1.2.3.3), and explicating knowledge (see section 5.1.2.2) – functions which are usually left to the teacher. By assuming these responsibilities, they advanced the community's mathematics knowledge by relying on their agency. Particularly indicative of shared epistemic agency was their capacity to enact the innovative pedagogy (see section 3.3.1) interchangeably as both teacher participants and student participants (see Photograph 5.2). In the Plan stage of the pedagogy, the Participants, in pairs, prepared to teach a mathematics topic to the class. To meet this requirement, they demonstrated their ability to use available resources, such as knowledgeable people beyond the classroom, the MathsWatch platform, and other media, to come to know their mathematics topics and share this knowledge with other Participants. I did not collect data during the planning stage, but it was possible to identify planning practices, drawing on my observations and the actions and reifications produced on each the teaching day. Participants exhibited a capacity to alleviate their unknowing by finding the mathematics knowledge relevant to their topic, make sense of this knowledge, use it to answer the questions in the booklet (see Extract 4.1), think about how to explicate it to the other classroom participants (see Photograph 5.3), and work in collaboration with their teaching partner to plan their PowerPoint lessons (see Photo 5.1 that shows Tom and Daniel's lesson plan on the

board) and position themselves as knowers and facilitators in their lesson. Damşa et al.'s research presented the actions of groups in collaboration to produce a knowledge object (see Appendix 5); it is reasonable, in this study, to attribute these actions to the teacher Participants.

In the Share stage of the pedagogy, teacher participants came to the lesson with the questions booklet and a PowerPoint lesson. As was the practice, community knowledge was advanced through Participant epistemic interaction as they positioned and repositioned themselves. It is important to note that before the lesson, part of the classroom practice was that the teacher participants gave student participants a question from the new topic. In this way, the revised pedagogical design expected the student participants to arrive at the lesson with at least some knowledge. Both teacher and student participants bringing prior knowledge to the lessons contributed to the productive nature of knowledge-building interactions, as this knowledge was shared to build new knowledge (see section 5.1.3), challenged (see section 5.1.2.1.4), and modified through the interaction of the learner and knower as, who exercised their productive agency (see section 5.2.1.4).

6.1.2.1.3 Democratic Participation

Another indicator of shared epistemic agency was the democratic participation of all

Participants in the pedagogy, regardless of their presumed ability (see section

5.2.3.2) The Learning Community did not consider ability labels, and all Participants' contributions were valued and acknowledged.

Nevertheless, the Participants started the academic year with their mathematics ability labels, which were based on their performance in primary school terminal examinations, and which outlined their predicted grades at the GCSE examinations. The Participants encountered these labels and their discourse as students in other subject areas across the school, such as when studying English, Mathematics, and Languages. However, as they engaged in the practice of learning mathematics in the classroom, lesson after lesson, and enacted the pedagogy as both teacher and student participants, experiencing the different positions available to a Participant (see section 6.1.1), their participation expressed and constituted a rejection of these labels (see section 5.2.3.2).

Participants did not limit their own or each other's participation based on these labels. Labels of presumed ability limit and constrain the mathematics made available to students (C. Morgan, 2013; Smith & Morgan, 2016); however, the experience of participation in the Learning Community clearly did not involve such constraints, and these labels were implicitly rejected. Thus, the innovative pedagogy and its discourse of democratised participation did not recognise or consider these labels as reifications of students' abilities.

6.1.2.2 Summary

My mathematics classroom emerged as a community of Participants with a practice of learning mathematics through interaction. This interaction

was democratic, because all Participants experienced taking part in all aspects of the innovative pedagogy, and the contributions of each were valued and acknowledged. This Learning Community was productive of new mathematical knowledge based on the Participants' exercise of agency in exploring external sources, which allowed them to arrive at the classroom with the seeds of knowledge for shared development. Through epistemic interaction with other Participants, they shared, challenged, and modified this knowledge, and in this way, made sense of the mathematics. The Learning Community created knowledge from within itself to advance their knowledge as a whole.

This Learning Community that was interactive, democratic, and dependent on Participants' capacity to take responsibility for advancing their mathematics knowledge was a product of how the community interpreted the enactment of the pedagogy. The Pedagogy did not prescribe specific practices for the Learning Community; it emerged by itself through Participants' enactment of the pedagogy, and is an index of their participation.

As I mentioned throughout section 6.1.1, the learner, knower, and facilitator positions existed only in relation to the Learning Community that resulted from enacting the innovative pedagogy. The learner positioned themselves for a knower to emerge from the interactive, democratic, and productive Learning Community. The facilitator was so positioned by the pedagogy, and Participants positioned themselves during interaction in the Learning Community. The students as Participants in a Learning Community were

interdependent non each other, and together instantiated a shared epistemic agency in a mathematics classroom.

This learning through interaction shows that learning mathematics was, and could be more than the process of one individual offering explanations to another, as it appears in the conventional pedagogy; in my study, it involved the productive democratic epistemic interactions that take place between the Participants as they position themselves as learners, knowers, and facilitators that promote lead to individual and collective knowledge advancement.

Returning to the research question, I argue for considering the student acting as a Participant and the emergence of a Learning Community, defined below respectively, as two strong indicators of shared epistemic agency.

This Participant is identifiable in their capacity as flexibly and interchangeably:

- A learner who controls their knowing and unknowing, is productive of epistemic interactions and is not knowledge-less. This capable learner has the potential to be transformative.
- A knower with epistemic authority who is relational in their response to an unknowing, and interdependent on a learner.
- A facilitator with process authority who can negotiate the blending of their authority with that of other Participants to support the advancement of collective knowledge.

The new Learning Community is identifiable as a classroom community that is:

- Interactive – the Participants learn mathematics through epistemic interactions wherein their participation positions them as learners, knowers, and facilitators
- Productive – the Participants create mathematics knowledge through the enactment of the pedagogy and their epistemic interactions therein
- Democratic – the Participants are presupposed to be able to participate, and their participation justified this presumption

6.2 Answering Research Question Two

What sustains shared epistemic agency in the mathematics classroom?

This question originated from my readings of the literature and my encounters with other researchers (Moss & Beatty, 2011; Scardamalia & Bereiter, 2010; Zhang et al., 2018) who endeavour to sustain student engagement in long-term, high-level knowledge-building activities and discourses. Each of these researchers acknowledged that the students' initial curiosity was fleeting for many individuals, and overall not sustainable in the long term. In one strand of the earlier research, a virtual “knowledge forum” platform was used to develop a knowledge-building culture that sustained a sense of belonging (Moss & Beatty, 2011; Scardamalia & Bereiter, 2010). More recently, this platform, enriched by reflective assessments supported by analytic tools (Yang, van Aalst, et al., 2020), and the related virtual “Idea thread Mapper” (Zhang et al., 2018), have sustained students' engagement in

knowledgebuilding interactions by co-organising their inquiries and helping them to monitor the emerging directions of their learning.

In this research, I did not make use of a virtual platform to help develop a sense of community; I wanted to find out what could be capable of sustaining students' engagement in the classroom environment – what kept them coming back lesson after lesson, giving of themselves for the advancement of the community knowledge. I developed my innovative pedagogy in order to locate and intensify what sustained the students' shared epistemic agency within their community. Based on my findings, I assert that it was a Learning Community developed through Participants' interactions, that sustained shared epistemic agency. It was what the community defined as competence and their resulting accountability to the practice that sustained the emergence of shared epistemic agency anew in each lesson; I discuss these two factors below.

6.2.1 Competence

Competence is experienced and manifested by Participants during their engagement in the practices of a community. Counterintuitively, it should not be understood as the property of an individual, and though the community defines it, it cannot be awarded by the community to anyone in particular. As Wenger (1998) puts it, "It is not merely the ability to perform certain actions, the possession of certain pieces of information or the mastery of certain skills in the abstract" (Wenger, 1998, p. 136).

Competent membership of a community includes the ability to engage with other members and respond to their behaviours. A competent member understands the community's purpose to such a degree that they take responsibility for engaging with its purpose and its continued negotiation. They are familiar with and part of the community's actions and reifications through their participation in its practices (Wenger, 1998).

In a conventional pedagogy, competence in mathematics is attributed to whomever gets answers questions correctly or performs a problem the fastest (cf. Darragh, 2013; Lambert, 2017). In my class, Participants defined competence as participation in epistemic interactions with other Participants, and not in terms of personal ownership of knowledge, that is, of knowledge stored in a learner's mind. I arrived at this interpretation of competence because my analysis of Episodes revealed that epistemic interaction was what Participants continuously did (see section 5.1), what they expected each other to do (see section 6.1.2), and what appeared to define being in the mathematics classroom for them (see section 5.2). It was also how they learnt mathematics, and learning mathematics was the purpose of their coming together as a class to begin with. Wenger's regimes of competence (Farnsworth et al., 2016; Wenger, 1998) equate a valued community member with one who participates meaningfully in what matters to the community; the community values a member of a community because of their competent participation in the community. In essence, this was represented in my study by becoming a valued Participant, and taking part in epistemic interactions as a learner,

knower, and facilitator, that sustained the community and the emergence of shared epistemic agency.

6.2.1.1 Competence as a Knower

The interactional positioning of a knower (see section 6.1.1.2), that is, a Participant ascribing the knower's position to another Participant, resulted from the Participant seeing competence in the other Participants, the competence to contribute to the Extension of their existing knowledge. The findings on positioning (see section 5.2.1) show how Participants who positioned themselves as learners sought the Extension of their existing knowledge from another Participant. The learner sought this Extension from the other Participant because they judged the knower capable of extending their knowledge; they judged them to be competent. A knower is positioned due to another Participant perceiving their competence.

My analysis show that the learner did not typically expect the knower to resolve the learner's unknowing by themselves; instead, the learner expected the knower to participate in the Extension of their knowledge. Competence lay in being part of the process, and taking on the position of a knower in that moment.

Positioning oneself as a knower is also viewed as competence, as it leads to the advancement of community knowledge. This positioning contributes to resolving an

Intention triggered by an Assumed unknowing (see section 5.1.1), the first part of an Episode of shared epistemic agency. An Episode of shared

epistemic agency leads to New Knowledge, and this matters to the community. The proportion of Episodes resolved by an appeal to a knower (see section 5.1.3.2.2 & Figure 5.3) further proves that a knower's competence should be understood in terms of their value to the community.

6.2.1.2 Competence as a Learner

As explained in section 6.1.1.1, positioning oneself as a learner was also seen as competence in my classroom community, as it was a requirement of the epistemic interactions that led to the creation of New Knowledge (see section 5.2.1). Participating in the community as a learner was meaningful to the classroom community as it helped achieve what mattered to them; it helped them to individually and collectively learn mathematics. Uncertainty and conflict have been observed to be trigger conditions that stimulate the initiation of learning (Clarke, 2001). This is consistent with my findings, which show, firstly, that Episodes of shared epistemic agency that led to the creation of New Knowledge were triggered by Participants' Intention to resolve an unknowing (see section 5.1), and secondly that the learner position was productive to epistemic interactions (section 6.1.1.1.2). Participants positioned themselves as learners publicly, again and again. In this way, they positioned others and themselves as knowers, again and again. This acknowledgment of each other's competence, leading them to position each other as knowers, alongside their own competence as learners, contributed to their sense of

belonging to the classroom learning community (Wenger, 1998, pp. 178–179).

The idea that an expression of unknowing as representative of competence and authority (see section 5.2.2.3) – moreover, even that it is desirable in a classroom – is at odds with the dominant discourse of education. This discourse has come to consider expressions of students' uncertainty as ignorance, as demonstrated by the actions of students in other mathematics classrooms; it is connected with the mathematics classroom culture that begins with the teacher's exposition of the topic and enforces the expectation that students listen to learn from this exposition to solve similar questions. Indeed, this expectation renders students who cannot solve problems independently as lacking.

Conversely, in my experience, in-school appraisers working with teacher capabilities and performance management (DfE, 2012) judge a teacher's expositions; the implicit message is of a correlation between the quality of a teacher's exposition and the speed of students' understanding.

Expressing uncertainty when following a teacher's exposition is not viewed as competence, but rather as evidence of a lack on the part of the teacher or student.

In the Learning Community that emerged in my classroom, extending one's knowledge was beneficial to the community; thus, seeking to do so, however humbly, was viewed as competent behaviour.

6.2.1.3 Competence as a Facilitator

Participants positioned by the pedagogy or by themselves as facilitators within the pedagogy were viewed as competent by the community. The pedagogy positioned the Participants as competent by means of the expectation that they take on the role of teacher participant and deliver mathematics lessons to their classmates. The expectation involved a bestowal of knowledge, capability, and authority, usually reserved for the “teacher” role, upon the Participant. When positioned as a facilitator by the pedagogy, the teacher participant was expected to check participants’ mathematics knowledge and facilitate the learning in the classroom by assuming process authority.

6.2.1.4 Competence as Productive Interaction

Competent community members engaged in what mattered to the community (Wenger, 1998), as was evidenced by the epistemic interactions between learners and knowers in the classroom. The Participants publicly asked Questions, Identified unknowing, made epistemic Requests, and Sought affirmation. In response, other Participants publicly directed their agency towards Explication, Clarifying, Affirming, and Articulating knowledge. The notion of productive agency (Schwartz & Okita, 2004) describes how individuals' agency can alter their environment in such a way as to cause adaptations to existing practices. The knowledge of an individual – whether complete or incomplete – when shared with the community, invites other individuals to use it; they modify it, causing a change in the original individual and producing collective learning. This explains the productive nature of

Participants' interactions, that is, how their epistemic interaction leads to further epistemic interaction (see section 5.2.1.4), and can also explain why an individual Participant did not need absolute knowledge to establish competence. Participation in epistemic interaction was in itself productive. This conception of a process of productive interaction bears some resonances with (Stahl, 2016) notion of group cognition. Though his research relates to group work and this study relates to community interaction, his notion of group cognition nevertheless demonstrates the mechanism by which epistemic interactions are assigned value in the Learning Community. It suggests that through interaction, Participants collectively accomplished what they could not have accomplished on their own.

Competent participation is what matters to the community. Epistemic interaction mattered to the community, as was evident when the class moved out of the computer suite to a new classroom. This movement was during the GCSE exam period, during which the ICT suite became a study room (see section 3.4.5.1.1). Upon occupying the new classroom, the Participants changed the seating arrangement: they organised the tables in groups of four. Each table of two Participants faced another table of two Participants, allowing pairs to become a group of four and two groups of four to become eight. Participants working on their own was no longer the established practice.

Sociomathematical norms are the established practices of a mathematics classroom (Yackel et al., 2000); as Yackel notes, individuals' beliefs about mathematics learning, their own role, those of others, and the

classroom sociomathematical norms are mutually constitutive (Yackel et al., 2000); they develop with each other. Thus, it can be inferred that classroom interactions defined not only what it meant to be a competent member of my classroom, but also what it meant to learn mathematics (i.e., the sociomathematical principles by which the classes were routinely conducted).

One of the emerging themes of the innovative pedagogy was its sustenance of multiple ways of enacting competence in the classroom: by being a temporary knower with epistemic authority, by being a learner who creates a need to know, or by being a facilitator who exercises their process authority in interactions. I have argued that moving between these positions of competency and facilitating others to do so sustained the emergence of shared epistemic agency.

6.2.2 Accountability

Our perception of ourselves (our identity) has a powerful impact on interacting, engaging, behaving, and learning within a community (Wenger, 1998), and is central to students' beliefs about their role in the classroom and their potential. Different pedagogies are not just vehicles for more or less knowledge, but shape the identities which students develop in the mathematics classroom through the practices in which they engage (Boaler, 2002b; Boaler & Greeno, 2000). My innovative pedagogy viewed students as Participants; as they participated in learning mathematics as competent members of the Learning Community, they

individually and collectively negotiated their identity as such (Bishop, 2012; Wenger, 1998). Reified by other Participants as competent members of the learning community, they developed identities of belonging that made them accountable to the classroom practice (Farnsworth et al., 2016). I believe that this participation, belonging, and accountability process, as illustrated in Figure 6.8, sustained the emergence of shared epistemic agency.

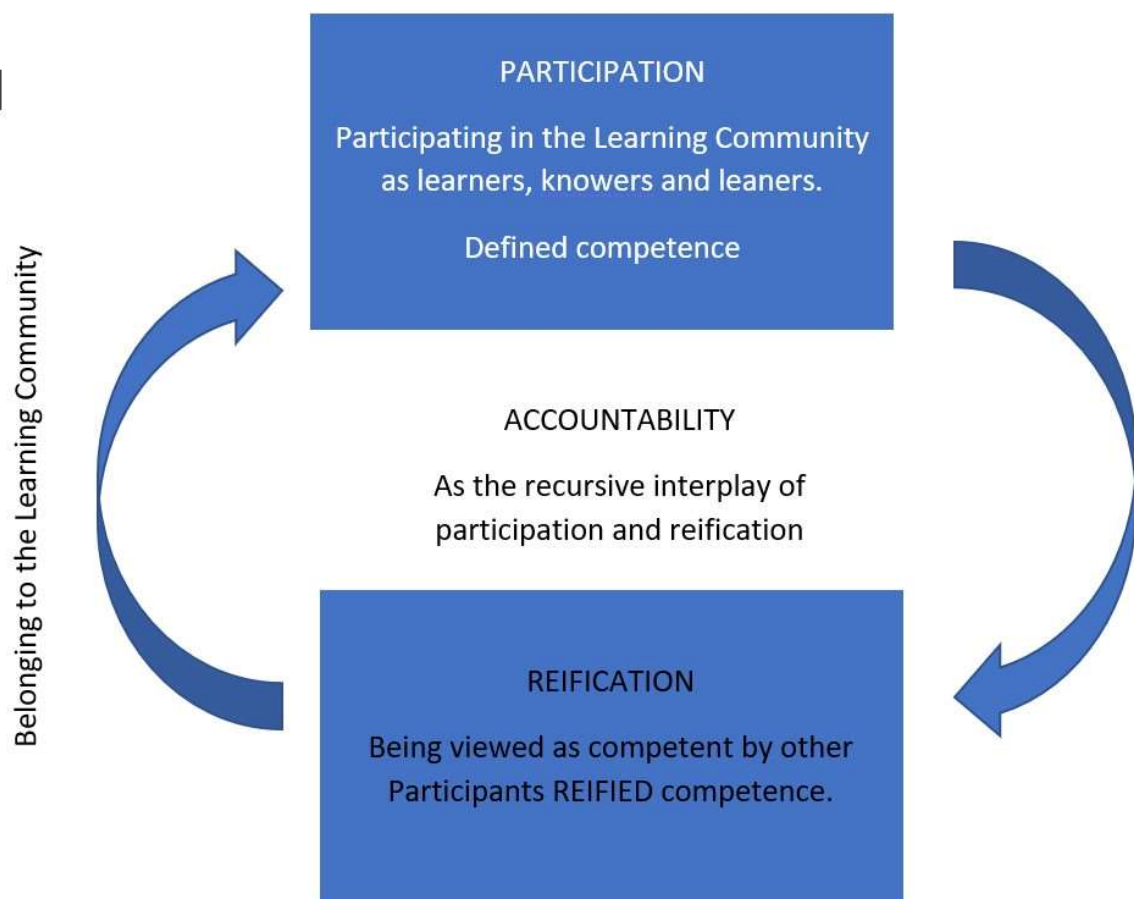


Figure 6.8 – Interplay of participation and reification

For instance, consider a Participant who takes up the position of knower; they identify themselves as competent in that moment. For the identity to

be meaningful in the norms of this pedagogy, they have to participate as a knower by directing their agency towards Explication. In the same way, the innovative pedagogy positions Participants as facilitators once a teaching cycle identifies their potential competence, but it is their actions and reifications of competence that makes meaningful their identity as a valued member of the classroom, whose participation matters (Farnsworth et al., 2016; Wenger, 1998). The more opportunities for Participants to take up the positions of competence and feel valued, and the more Participants reify their participation as competent, the more the identity of belonging emerges amongst them. Consider Recording 7 (see section 5.1.3.2.3), wherein Crimson was positioned as a facilitator by the pedagogy. He participates as a competent member of the classroom community as a facilitator and a knower. However, it is the way other Participants reify his participation by positioning him as a knower, or accepting his control of the learning behaviour, or making an affirmative statement such as “Smart, it is!” (see section 5.1.3.2.3) that establishes his identity as a competent member of the group.

Participating in the innovative pedagogy led to the emergence of Participant identities of belonging through an interplay of reification and participation particularly, reification on the part of other Participants, who identify competence and participation in the individual. This relationship is iterative and reciprocal: the more the individuals that participate in epistemic interactions and facilitate learning, the more other Participants see them as competent. Further, the more Participants see them as competent, the more they feel valued and that they belong to the

community, and becoming accountable, as illustrated in Figure 6.8. The role of identity in sustaining the community is a continuous negotiation of participation and reification. Participants were continuously renegotiating their identities of belonging; consequently, they established their accountability before the community through their participation anew in each session.

Accountability to the practice of the Learning Community can explain the relational and interdependent quality of the knower positioning (see section 6.1.1.2.2) – why the Participants position themselves as a knowers again and again in response to other Participants positioning themselves as a learner. It can also explain why

Participants' intentions are triggered by the identified or assumed unknowing of an individual or a group of individuals (see section 5.1). Participants do not have to respond to the unknowing of another Participant, but in the Learning Community they continuously did, as demonstrated by the thirty-six Episodes identified in the data (see section 4.2.1.1). An Episode did not end until all participants acknowledged that the unknowing had been resolved (see section 5.1.3.1). Finally, that Participants accepted that the unknowing of all Participants needed to be resolved can be explained by their accountability to the Learning Community. Summarily, accountability to the community can explain Participants' continued participation in enacting the pedagogy, and why they continued to position themselves as learners, knowers, and facilitators in the Learning Community.

6.2.3 Sustaining the Community

Competence and accountability are connected through Participants' participation in the innovative pedagogy, and, in my classroom, sustained the Learning Community that emerged (see Figure 6.9 below).

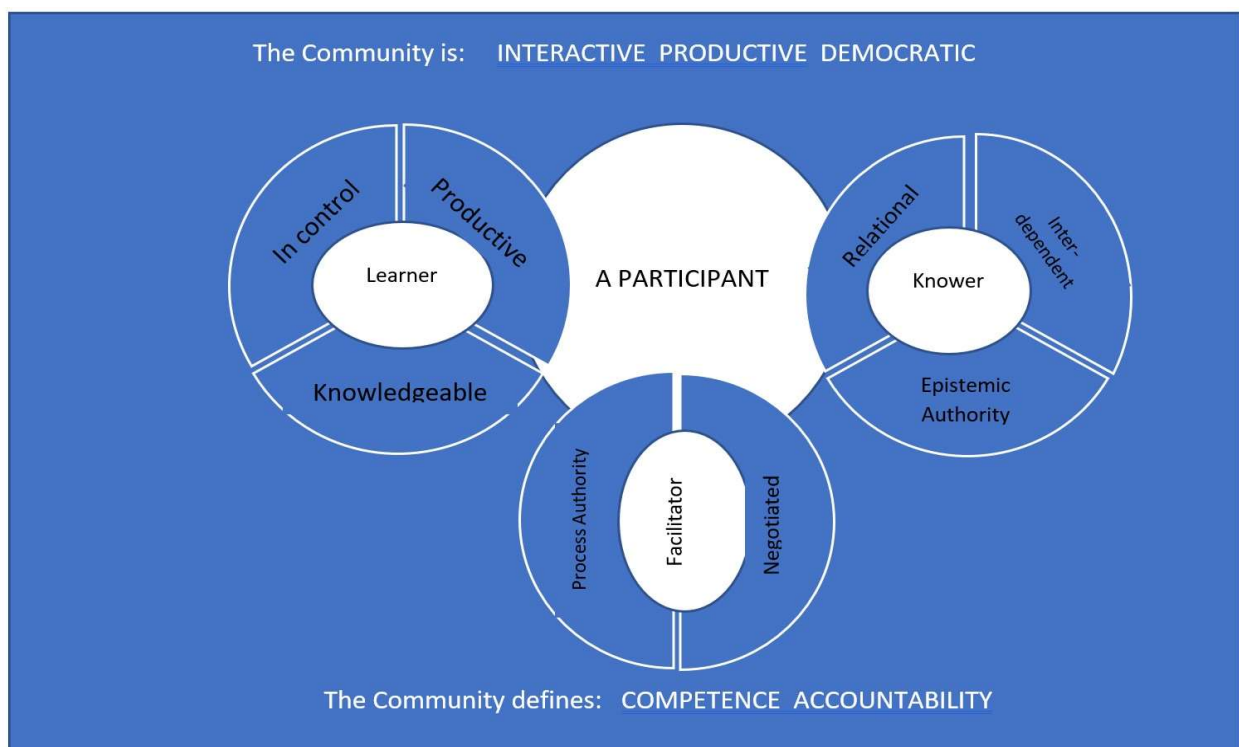


Figure 6.9 – The Participant in the Learning Community

To complete my response to research question 2, I provide evidence that the Learning Community was sustained throughout the study by citing Participants' achievement in the GCSE Mathematics terminal examinations. This data, available a year after the end of my study, can be taken as evidence that Participants sustained their accountability to the practice of the community through the following academic year. Wenger's (1998) trajectory of participation can explain this sustenance.

Our identity, he explains, is temporally continuous, possessing a coherence through time that connects the past, the present, and the future (Wenger, 1998). When negotiating our current identities, we incorporate who we were in the past and who we can be in the future. It can be surmised that Participants internalised the positive experiences of the innovative pedagogy, and that this formed a significant aspect of their past; looking towards the future, the Participants also considered the trajectories of the competence of past students as they took on new identities of competence in their subsequent mathematics classrooms. There is a discourse prevalent in England according to which good grades in mathematics are a gateway to future prosperity (C. Morgan, 2013). In my secondary school, this discourse connects hard work in the mathematics classroom and good grades in the Mathematics GCSE to future economic freedom. The school reinforces this discourse by celebrating the career paths of past students who achieved good grades in mathematics. Considering these former students opens up future trajectories for the Participants in my mathematics classroom; it shows them who they can become if they work hard in mathematics. Thus, they connect future trajectories with their present identity of competent participation in a classroom.

The following academic year, the Participants of my mathematics class became my Year 11 class. I did not follow the original format of the innovative pedagogy, as the mathematics faculty curriculum map focused on past exam papers. No longer upholding a systematic research framing, I personally observed that the Participants still valued each other, took

responsibility for their learning, and were accountable to each other, but I did not realise how different they were from other students until the last mathematics lesson, as revealed in Extract 6.2 below.

Year 11 lesson recollection, Thursday 12/03/2020, written as field notes and expanded upon for clarification

On this Thursday, I combined my students with the students from another maths class, as the number of staff and students in attendance was reduced due to fears associated with COVID-19. I went with my 6 students to the teaching room of 11H (presumed to be of higher mathematics ability than my class) to form a class of 13 students.

As Year 11 students, the group was preparing for their terminal GCSE examinations. I placed a question on the board for them to solve. After about 4 minutes, I noticed that the students from 11H were sitting quietly and working, while Roan, James, and Tom from my class had gotten up and were in discussion.

I presumed that the students from 11H had solved the question, so I invited any of them to come up to the board and share the answer; none of them wanted to get up. I called one of them to come up to the board and start solving it, but he said that he had no idea how to. The other students said the same. When I asked them why they had done nothing to help themselves, they responded that “Sir” (meaning their teacher) wanted them to depend on their own knowledge. One of the students then asked me to help them.

James then said, “Miss will not help you, you have to try.” James came to the board and did what he thought, with Roan and Tom interjecting at points, and eventually the question was solved.

Field notes extract 6.2 – Sustaining accountability

Extract 6.2 shows that being the teacher for a combined class made visible how the Participants' experience of the pedagogy had changed them to the extent that their shared epistemic agency had become normalised and taken for granted in our classroom setting. It points to the students as learners, knowers, and facilitators a year later. After reading the question, my class Participants immediately got up and discussed the question with other Participants. They acted as learners by first identifying their knowing and directing their agency towards seeking to extend their knowledge, and subsequently got up to speak to others and engage in epistemic interactions to this end. They acted as facilitators by directing other students in 11H to be agentic and try to solve the problem, and they acted as knowers by contributing their knowledge when James came to the board. On the contrary, the students from 11H, on realising they could not solve the question, sat quietly and waited.

Except in exceptional circumstances, all 15-to-16-year-olds in the UK take an external examination, the General Certificate of Secondary Education (GCSE), at the end of their secondary schooling. This examination has implications for both schools and individual students. For the students, it is a gateway to further education, if they achieve at

least a grade 4 in Mathematics and English, which is considered a pass. The accountability measures used by the DfE see them rate schools on their students' performance at the GCSE examinations. However, the Participants of this study graduated in June 2020, during the COVID-19 pandemic. On 18 March 2020, the Secretary of State cancelled the Summer 2020 exam series to help fight the spread of COVID-19, and schools awarded students who were due to sit the exams a Centre Assessed Grade (CAG), "centre" denoting the school at which a given student is studying. The national expectation was that faculty and school leaders would assure that the awarded grades would be based on a holistic professional judgment, balancing different sources of evidence. Each school faculty ranked the students (Jadhav, 2020) by their performance and then awarded a grade. Following the directive, in my school, the subject head used evidence from two mock examinations already submitted on the school system to arrive at the rankings and thereby the CAGs. Individual class teachers were not involved in this process. The centre heads further standardised all subject results.

Table 6.1 below shows the results and ranks of the Participants. Column 2 is the minimum expected grade for each student, based on their end of primary school data. Column 3 shows their ranking before starting this study, based on their end of

Year 9 internal examinations (EOY9) that took place in June 2018. Column 4 shows their rankings in June 2020, and column 5 is their Centre Assessed Grade for GCSE Mathematics.

1	2	3	4	5
Participant	Min Expected Grade	EOY9 Rank 2018 (239)	CAG Maths Rank 2020 (230)	CAG Maths
1	4	58	12	9
2	6	73	23	8
3	4	184	67	7
4	4	85	70	7
5	4	<i>N</i>	73	6
6	4	74	76	6
7	4	188	100	6
8	4	113	104	6

9	4	165	107	6
10	4	71	112	6
11	4	181	129	5
12	4	138	137	5
13	4	143	146	4
14	2	133	168	4
15	2	180	172	4
16	4	<i>Not yet on roll</i>	175	4
17	2	165	186	3
18	2	<i>N</i>	208	2

Table 6.1 – Participants GCSE outcomes

I view this table as evidence that the Participants benefited from the innovative pedagogy. Most of the students improved their ranking over the two years; the mean change in ranking was calculated to be -22.8 places. Furthermore, the rankings compare the Participants to the other students in the cohort who experienced a conventional pedagogy. It is clear from the data that the innovative pedagogy did not adversely affect the Participants. Rather, when comparing the students' minimum expected grades to their CAG's, 83% of the class, except for three

students (who met expectations), exceeded presumed expectations, compared with 73% of the whole cohort.

6.2.4 Summary

Research question 2 originated in my encounters with other researchers' endeavours to sustain student engagement in long-term, high-level, knowledgebuilding activities and discourses. While an online learning culture sustained students' engagement in these researches, I wanted to develop an innovative pedagogy without reliance on technological means, and subsequently to find out what kept the Participants coming back lesson after lesson and with their classroom community in order to advanced their mathematics knowledge. I contend in this section that:

- The Learning Community defined competence as participation in what mattered to them.
- Advancing mathematics knowledge mattered to the Participants in the Learning Community.
- Participation in epistemic interaction as learners, knowers and facilitators was productive of mathematics knowledge.

Thus, participation as a learner, knower, and facilitator constituted competence in the Learning Community, and also shaped what it meant to learn mathematics. It is how the Learning Community defines competence that sustains the emergence of shared epistemic agency.

I further argued that:

- As Participants engaged with the Learning Community, they continuously negotiated their identity of belonging to it.
- They developed identities of belonging when their competent performance was reified by other Participants.
- Identities of belonging made Participants accountable to the practice of the Learning Community.
- As the Participants participated again and again, and as their participation was reified as competent again and again, their identity of belonging to the practice of the Learning Community was renegotiated again and again.

Hence, Participants' identities of belonging, which were cautiously negotiated by the interplay of participation and reification, established their accountability to the practice of the Learning Community, and therefore to its aims of advancing collective knowledge.

Returning to research question 2, I argued that the Learning Community, by its definition of competence and accountability to the practice of how Participants learnt mathematics, sustained the continued emergence of shared epistemic agency, even as students continued their studies in a new environment in Year 11.

6.3 Reflecting on the Action Research

Having answered research question 2, I realised the need to give an account of the development of shared epistemic agency that focused particularly on

my role as a participant and the innovative pedagogy. This section records my reflections on the research to this end.

My reflections on the development of shared epistemic agency have, as their bases of evidence, a different kind of data from the systematic Episodes that informed the rest of the study. While such data was neither rigorously collected nor systematised, it reflects upon my experience as a researcher and teacher in a manner that is faithful to the process of action research. It draws upon any evidence that is available to me through means other than formal methods of data collection; thus, it primarily consists in my personal recollections and recognitions from the period of the holistic action research process (McNiff, 2017, pp. 25–26).

As a supplement to the modalities of participation in epistemic interaction that I have discussed in the previous two sections of this chapter, I contend in this section that two further factors developed the Participant and the Learning Community: those of my role as a participant and of the innovative pedagogy itself.

6.3.1 My Role as a Participant

As I enacted the innovative pedagogy that expected Participants to take responsibility for higher-level capabilities of classroom practice, such as planning what is learnt (as a knower) and how it is learnt (as a facilitator), organisation of the classroom learning (as a facilitator), and evaluation of their learning (as a learner and as a knower), I myself also had to participate differently. Handing such responsibilities over to students

went against the dominant discourse of teaching, as well as against what I learnt and experienced in the position I held as a mathematics teacher for over two decades. Teaching can be taken to mean “everything that teachers must do to support the learning of their student” (Loewenberg Ball et al., 2008, p. 395). Though I was the teacher of the mathematics class, with the corresponding ethical responsibility for the students’ mathematics learning, I had to extend my ethical responsibility as a classroom teacher of mathematics beyond this narrow definition, to that of an Educator of mathematics. This extension of my role took my responsibilities beyond those of simply “supporting” students’ current mathematics knowledge, towards empowering them to control their mathematics knowledge and unknowing even beyond secondary education. The word “educate” comes from the root word “educere”, which means to “bring out or develop (something latent or potential)” (Dictionary Online - Google Search, n.d.). As an “Educator”, a term I borrow from (Kolb et al., 2014, p. 207), my role was to draw out from my students their latent potential. This term emphasises the aspects of teaching that enable others to continuously learn (Pelletier, 2012), and suggests the implicit belief that learning is most effective when students participate in knowledge creation through the use of their own intelligence, experience, experiments, persistence, and attentiveness (Biesta, 2017; Engels-Schwarzpaul, 2015, pp. 1254–1255). As an Educator, I want my students to acknowledge what they do not know, and to have the capacity and will to use the resources at their disposal to extend their knowledge. As an Educator who sought to empower the Participant, and

as a researcher into students' mathematics learning, I also became a Participant in the Learning Community, and I myself enacted the innovative pedagogy as a learner, knower, and facilitator.

6.3.1.1 My Position as a Learner

In order to realise the notions of the Participant and the Learning Community, I positioned myself as a learner in the innovative pedagogy; however, I was not learning secondary school mathematics. I was learning to be an Educator. This required me to learn to trust the Participants, their mathematical knowledge as knowers, their participation as facilitators, and their desire to be successful in mathematics as learners. This trust enabled the Participants to enact the innovative pedagogy, and, on my end, to answer the research questions and fulfil the aims of the study.

Learning to trust was essential in my journey towards becoming an Educator. By trusting, I overcame my fear that the Participants would not learn mathematics well without me being in authority; I was concerned that the Participants could not be as able a teacher as I was. Trust emerged over time as I experienced Participants' enactment of the innovative pedagogy. In the earliest teaching cycles, I met with the teacher participants before they taught their lessons to prevent my fear from becoming a reality. Meeting with the Participants made me realise how prepared and organised they could be, and halfway through the second

teaching cycle, I stopped meeting with them. I began to trust in their capabilities as learners to enact the Plan stage of the innovative pedagogy without supervision.

I also learnt to trust Participants as knowers, enabling me to deal with uncertain epistemic situations during the Share stage of the innovative pedagogy. These situations included those in which I had to decide how to respond when a Participant could not answer a mathematics question, or when they gave an incomplete or unexpected answer or reasoning.

This negotiation of uncertainty is one of the reasons teachers find it frustrating to share authority with students; they find it overwhelming to examine and to act on a possibly confusing or unanticipated mathematical contribution without preparation, preferring to control the dialogue through direct instruction (Sullivan et al., 2020). When a Participant could not give an answer to a mathematics question, I learnt from my experience the negative consequences of undermining the Participants by publicly doubting their capacity as knowers and seizing epistemic authority as a knower (see Appendix 9). I learnt to be patient and to give Participants in the Learning Community the opportunity as knowers to respond to the uncertainty by themselves. For instance, in Extract 4.3 (see section 4.2.1.2) from teaching cycle 3, when the teacher participant Teesh could not answer the question asked by Crimson and Pearl, the other teacher participant made the statement, “Guys we don’t know, so we have to come up with an answer together”; prior to that, student participant Jevonte said “go on

MathsWatch” to find out the answer. Even as the Participants were coming around to a response, I was not patient, I interjected, and, in teacherly fashion, steered them towards the answer. In contrast, my patience in subsequent cycles allowed Participants to come up with suitable answers upon which that they all agreed without my intervention, as shown in Extract 5.13 (see section 5.1.2.3.3), wherein I did not seize epistemic authority when Pearl expressed her unknowing, allowing Teesh to emerge as a knower.

A strategy I learnt to employ in response to Participants’ public unknowing was to privately pose a question to challenge an individual participant’s mathematics knowledge. An extract from Episode 30 (see section 5.1.3.2.4) exemplifies this strategy, encouraging, without disrupting or preventing, the emergence of a knower. Deepz was the teacher participant for the mathematics topic of bounds; Jevonte was at the board finding the upper and lower bound to the nearest 5 metres. Using the method presented by Deepz, Jevonte was adding and subtracting 0.5. The Participants who were all looking at the board did not challenge the inconsistency on the board. As an Educator, in order not to undermine Deepz and other Participants’ claims to the position of knower, I questioned Crimson individually as to the difference between rounding to the nearest metre and rounding to the nearest 5 metres. As a learner, Crimson, having conducted his own research on the internet, challenged Jevonte. The epistemic interaction that ensued resolved the unknowing and produced New Knowledge. In this way, I was able to help the Participants, without compromising their status as knowers.

Trusting the Participants as knowers enabled me to learn, as it challenged what I believed about mathematics and its education. For instance, Crimson and Beyoncé taught the basic principles of Pythagoras' theorem during teaching cycle 5 in order to introduce their application in 3D space. They started the lesson with the explanation that Pythagoras could be solved either algebraically or non-algebraically. They explained that the non-algebraic method was “square, square, add, square root” or “square, square, subtract, square root”. I had up to this point only experienced solving the Pythagoras theorem in terms of the algebraic equation $a^2 + b^2 = c^2$. This experience with Crimson and Beyoncé as teacher participants challenged me to truly commit to my belief that mathematics is dynamic and subjective, and that it should be always be relevant to the context in which it is used. I readily accepted the Participants' knowledge as legitimately mathematical; their non-algebraic method made sense, and was effective for solving the relevant problems.

Teachers have to confront the subjective nature of their beliefs about mathematics and what constitutes its proper practice. While I questioned the mathematics behind the non-algebraic method that Crimson adopted from an external source, and questioned my students using the non-algebraic method, the experience challenged me to reconsider what it means to “do” mathematics, and what is valid and invalid.

While I have not fully resolved whether the non-algebraic method that I allowed Crimson to use in the class is totally mathematically sound, the Participants' challenge to my beliefs positioned me as a learner seeking to extend my knowledge of what constitutes mathematics.

6.3.1.2 My Position as a Knower

As a knower enacting the innovative pedagogy, my participation was to validate the

Participant as a knower. To this end, I had to view myself as a co-knower in the Learning Community. That meant that my mathematics knowledge was not the dominant knowledge in the classroom; it was a voice like any other voice, and I was not the sole epistemic authority.

In the knower position, my mathematics knowledge was challenged by other participants as they sought to extend their own. For example, when Deepz, as a teacher participant, was introducing the concept of bounds using the strategy of halving the place value, Participants such as Daniel and James, who walked up to the board, asked many questions as they sought to extend their knowledge (see Extract 5.5). Deepz, the knower, directed his agency towards Explication as they engaged in an epistemic interaction. Positioning myself as a knower, I went to James and explained another way of finding the upper and lower bounds (it was the way I had taught it for years). James listened to me, but expressed a preference for Deepz's Explication; he went back to Deepz and continued an epistemic interaction until he resolved his unknowing.

In the Learning Community, in service to the emergence of the Participant, I was a knower in the background so that Participants could be knowers publicly. As an experienced mathematics teacher, I was able to contribute my mathematics knowledge for teaching (see section 2.3.2.1), including my knowledge of the mathematics curriculum, the sequencing of mathematics topics, and the examination requirements, to

prepare the booklets that offered Participants guidance on the boundaries of the mathematical knowledge required for completing each topic (see section 3.4.1.3). In this way, as knowers, the Participants and I were interdependent.

6.3.1.3 My Position as a Facilitator

In my capacity as a facilitator, in order to develop and enact the innovative pedagogy that sought to change my students' perspective of what it means to be a learner, I had to change how I behaved in the classroom to enable the Participant to emerge.

To become a Participant, the students had to overcome their initial resistance to what they viewed as taking on the teacher's role, and commit to participation in the innovative pedagogy. It was my responsibility to facilitate this change, and I used my authority as the classroom teacher to initiate the students' undertaking of the first teaching cycle. Following their enactment of the first teaching cycle and reflection on their participation, the emerging Participants did not resist engaging in the second or subsequent teaching cycles; they appeared to recognise their competence and become willingly accountable to the Learning Community.

I view the Educator as one who has the will to

Forbid the supposed ignorant one the satisfaction of what is known, the satisfaction of admitting that one is incapable of knowing more. Such a teacher forces the student to prove his or her capacity, to continue the intellectual journey the way it had begun. This logic operating under the

presupposition of equality and requiring its verification (Rancière in Bingham et al., 2010, p. 5).

Encouraging the students to participate in the first teaching cycle, indeed appeared to allow them to recognise their capabilities in enacting the innovative pedagogy, and their reflections seemed to verify the success of this participation.

I negotiated how I behaved in the Learning Community, my actions, and my reifications with the Participants. Sharing authority requires more than the teacher giving up some of their authority; it is also about the students' willingness to pick up the slack. Giving up my authority and taking up certain aspects was negotiated in the Learning Community on a lesson-by-lesson basis. The authority negotiations were situational; every lesson was a new day, subject to such considerations as the personalities and performances of the teacher participants, the mathematics topic, the questions, the weather, and, perhaps, what happened the day before and in previous lessons. The sharing of authority from my perspective was more of a gradual and nonspecific blending. It required a recognition that in this pedagogy, authority was not mine to share with the Participants; instead, based on our different strengths and our interdependence, we negotiated on each day and in each moment what each Participant would or would not do. This required me to decide how I should behave (cf. Blasco et al., 2021; Kolb et al., 2014) in each moment. This perhaps gives sense to Wagner and Herbel-Eisenmann's provocative, if gnomic, statement: "for a teacher to share *authority* is not like sharing a cookie, where if half is given away, only half is left" (2014, p. 872). Instead, when

authority is shared (and not divided up), it circulates amongst the Participants.

6.3.2 The Pedagogy of Trust

In chapter 1, I attempted to convey my motivations for undertaking this study. I had experienced the way in which students taking responsibility for what they know and do not know changes their relationship with mathematics (see section 1.1.3.2), and I wanted that to become the standard experience of the students in my mathematics classrooms. I started this study to discover the best environment for allowing students to participate in all aspects of learning mathematics, in the belief that this participation would improve their relationship with the subject and empower them to achieve the grades that would avail them of better opportunities in life. I designed the pedagogy to fulfil this purpose: to advocate for the participation and empowerment of my students. What makes my pedagogy different from conventional forms is that rather than changing the concepts of study, the curriculum, or the classroom environment, it focused on changing its perception of the subject of the pedagogy to achieve the desired outcome. The subject of the pedagogy is the student; the pedagogy described this student within the existing structures of the school. In saying that the pedagogy *described* the student, I mean to suggest that I designed the pedagogy to be enacted by students who already owned the qualities it aimed to produce, rather than designing a pedagogy that would produce the desired qualities in students. In this way, the latent potential already inhering in the student

had to emerge to meet the expectations of the pedagogy. For this reason, I refer to my pedagogy as a “pedagogy of trust”. I trusted the subject of the pedagogy to embody its purpose; I trusted in the student's ability to enact the pedagogy, and, as a result, achieved a new arrangement which transformed the student into a Participant, the teacher into an Educator, and the classroom into a Learning Community.

6.3.2.1 The Student, a Participant

The student was not solely an individual seeking to learn mathematics; the student in the innovative pedagogy was a Participant: a competent, knowledgeable individual operating in a Learning Community. This Participant and their peers could collectively and interdependently advance their mathematics knowledge.

As the focus of the pedagogy, the Participant is responsible for what they know and do not know, and also takes responsibility for the knowing and unknowing of their fellow Participants. This agency situated the Participants as autonomous agents in the Learning Community, directing how they learnt with the participant Educator who was in dialogue with them. Mathematical knowledge was available and accessible to Participants, and the pedagogy presupposed that they could access and make sense of this knowledge. Conversely, conventional pedagogies view the teacher as essential to students' acquisition of knowledge, and do not presuppose students' capacity to be knowledgeable before interacting with the teacher. In such the pedagogies, epistemic authority

lies with the teacher, and is intrinsic to their role; on the other hand, in my study, knowledge tracks and locates authority. Given that the Participant is in possession of knowledge in the innovative pedagogy, it opens up the possibility of authority lying with the student.

6.3.2.2 The Teacher, an Educator

The innovative pedagogy presumes the existence of an Educator; it does not describe the teacher. This lack of description could be a limitation in contrast to conventional pedagogy, which focuses on how teachers behave. However, it points to the teacher's function as situationally positioned in relation to the student – as dynamic and adaptive to new contexts. The assumption is that the Educator, as responsible for the students' education, should make a situational decision regarding how they should act in order to best enable the students to fulfil the purpose of the pedagogy. This description of the Educator contrasts with that of the teacher, whose purpose is to use the knowledge they have gained from institutional teacher education, awareness of policy, and practice in order to instruct students on what they should learn and how they should learn it.

The contrast between teacher and Educator is broadly analogous to the contrast between scientific research and historical research discussed in section 3.2.1.

Scientific research aims at objectivity, believing that knowledge is certain and true, and that general rules can be applied universally to produce

uniform outcomes. In contrast, historical research is subjective, embracing a pluralistic view of knowledge as contextual, uncertain, and open to modification.

The conventional pedagogy expects the teacher to act in conventional ways. The purpose of education is universal for all students. The teacher is not called upon to use their situational understanding in response to the actions and reifications of the students; instead, the teacher seeks for the students to adapt to the established practice.

The innovative pedagogy, on the other hand, accepts that the Participants will act in unique and unforeseeable ways in the Learning Community to advance their mathematics knowledge. It expects that the Educator, as an intelligent professional, can use their “situational understanding” (Elliott, 2011, pp. 66–67), established by a repertoire of experience, to decide how to respond to the actions and reifications of the Participants as they produce them – actions and reifications that may be difficult to stereotype and taxonomize. The Educator cannot rely on conventional rules and practices, but recognises that the Participants' attitudes towards producing actions and reifications are flexible. Hence, the Educator needs to select, from several possible actions, how best to respond to Participants' behaviour to sustain a positive learning environment.

Similarly, Carolin Kreber (2013) refers to the Educator as one who acts “phonetically”

(pp. 149–150). To act phonetically is to recognise that human beings are unpredictable, and that the engagement required for them to achieve genuine knowledge does not consist solely in the reception of scientific

knowledge; rather, the Educator must accurately assess a situation and make an appropriate decision while abandoning the security of regulations and rules.

Mutual uncertainty appears as a characteristic of the pedagogy. As a teacher- researcher, I started the enactment of the pedagogy unsure of how it would be enacted by the participants and the impact it would have on their mathematics learning. I had to through the action research process constantly renegotiate its terms and structures in response to developments in the shape of daily interactions learning. At the same time, the Participants engage in the epistemic interactions uncertain of their mathematics knowledge but resiliently building on each other's knowledge. Dealing with uncertainty contrasts with the structured and established practice of the conventional pedagogy. However, I argue that what is required is for teachers to accept that a pedagogy based on uncertainty is of interest.

6.3.2.3 The Classroom, a Learning Community

The pedagogy did not describe the Learning Community; it emerged by itself through the actions and reifications of the Participants as they enacted the innovative pedagogy, and the through the actions and reifications of the Educator as I responded to the Participants. I infer that the particular learning community that emerged in this study resulted from the Participants and their unique enactment of the innovative pedagogy. A significant contrast with conventional pedagogies that becomes clear here is that that this Learning Community was enabled to emerge. In conventional pedagogies, the sense of community is not essential to the mathematics

classroom; nor is any particular knowledge-producing environment encouraged to realise itself – rather, the objective is to have students assimilate and be assimilated into a prescribed practice.

In conventional mathematics classrooms, learning is primarily an individual endeavour, as demonstrated by the students in 11H (see Field Notes Extract 6.2). While students may help each other on occasion as they work in pairs or groups, the purpose of the activities that take place in the mathematics classroom activity is to have each student learn for themselves. In these learning environments, students are recognised for actions that contribute to their individual knowledge. In the innovative pedagogy, the Learning Community emerged autonomously as the Participants sought to advance their individual mathematics knowledge and that of other Participants; in this pedagogy, personal knowledge was the community's property, as Participants shared their knowledge from moment to moment. In the Learning Community, learning occurs as a process in which the boundaries between individual and community learning become blurred and permeable.

6.4 Summary

In this chapter, I present answers to the research questions posed at the start of this study. These answers were arrived at by considering the two themes that culminated out of the findings outlined in chapter 5. These themes were of the student as Participant and the Learning Community. Reflecting on the action research process, I presented the notions of the teacher as an Educator and the innovative pedagogy as the necessary

means for initiating the development of the Participant and their Learning Community.

The new conceptualisation of the student as a Participant and the classroom as a

Learning Community are presented as indicative of shared epistemic agency. The Participant can be positioned reflexively as a learner, interactionally as a knower or facilitator, and institutionally as a facilitator in a Learning Community that is interactive, democratic, and productive.

The Learning Community defines competence and Participants' accountability to its practice of learning mathematics through the enactment of the innovative pedagogy. The manner in which the Learning Community defines competence triggers the negotiation of the terms of Participants' belonging within the community and their accountability to its practice; this process takes place through participation and its reification on the part of Participants, sustaining the emergence of shared epistemic agency.

I present the teacher as an Educator whose purpose is to draw out from Participants their latent potential to take responsibility for the advancement of their mathematics knowledge, as a necessary condition for the development of their status as a Participant in a Learning Community that is indicative of their shared epistemic agency. In this sense, I present the Educator as necessary for the development of shared epistemic agency, and ultimately, as serving the purpose of the pedagogy.

The innovative pedagogy, with its aims of installing participation and empowerment, recognises that each Participant engage with the learning process differently; that is, they will bring their own personalities,

experiences, and background to the enactment. This uniqueness could give the impression that the findings of this study could apply only in the context of the participants of this study; however, I contend that this study's contributions to the field of mathematics education points to its generalisability. I present these contributions in the next chapter.