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the role of doubt in collaborative philosophical inquiry with children

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abstract
This paper examines cultivated epistemic doubt in the context of collaborative philosophical inquiry (CPI) with children in Years 2 to 7 at an inner-city primary school in Brisbane, Australia. The paper documents and categorises episodes of epistemic doubt expressed by children as they participated in an extended, design-based investigation of CPI. Epistemic doubt is theorised according to pragmatist notions developed by Charles Sanders Peirce (1877) who maintained that the space for inquiry is formed between 'genuine doubt' and a fixed or settled belief. The inquiry process is genuinely elicited when a 'real' experience provokes one's sense of disequilibrium, resulting in the need to revise an existing belief. He later proposed the process may commence with 'cultivated doubt' (rather than genuine doubt), initiated within the inquiry by the inquirer/s desire to review their own existing beliefs and assumptions. The cultivation of doubt would then provoke further examination and re-evaluation of these beliefs, thus leading to genuine doubt at the middle point of the inquiry. The doubt expressed by the students in this study arose from classroom discourse and inquiry rather than spontaneously through direct experience, hence would be considered cultivated doubt. Two distinct categories of cultivated doubt were found: doubt as an interactive process within the group that enhanced collective inquiry; doubt as the object of inquiry. When doubt was the object of inquiry, children sought to distinguish its features and how it functioned within the group to sustain dialogue. The paper enhances our understanding of cultivated doubt during CPI and demonstrates that even quite young students can engage in the collective examination of the features of doubt. Implications for educators are elaborated in terms of the pedagogical practices that engage children productively in the exploration of epistemic doubt.

keywords: philosophy; inquiry; collaboration; doubt; pedagogy.

el rol de la duda en la investigación filosófica colaborativa con niños

resumen
Este artículo examina la duda epistémica cultivada en el contexto de la investigación filosófica colaborativa (IFC) con niños en los años 2 a 7 en una escuela primaria del centro de Brisbane, Australia. El artículo documenta y categoriza episodios de duda epistémica expresada por niños mientras participaban en una extendida investigación basada en el diseño de IFC. La duda epistémica es teorizada de acuerdo con las nociones pragmáticas desarrolladas por Charles Sanders Peirce (1877) quien sostuvo que el espacio para la investigación se forma entre la "duda genuina" y

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una creencia fija o establecida. El proceso de investigación es genuinamente provocado cuando una experiencia "real" provoca en uno la sensación de desequilibrio, lo que resulta en la necesidad de revisar una creencia existente. Más tarde Peirce propuso que el proceso podría comenzar con "dudas cultivadas" (en lugar de dudas genuinas), iniciadas dentro de la investigación por el deseo del investigador de revisar sus propias creencias y suposiciones existentes. El cultivo de la duda provocaría entonces unos nuevos examen y reevaluación de estas creencias, lo que conduciría a una duda genuina en el punto medio de la investigación. La duda expresada por los estudiantes en este estudio surgió del discurso y la investigación en el aula en lugar de espontáneamente a través de la experiencia directa, por lo tanto se consideraría una duda cultivada. Se encontraron dos categorías de dudas cultivadas bien diferenciadas: la duda como proceso interactivo dentro del grupo que mejoró la investigación colectiva; la duda como objeto de investigación. Cuando la duda era el objeto de investigación, los niños buscaron distinguir sus características y cómo funcionaba dentro del grupo para sostener el diálogo. El artículo mejora nuestra comprensión de la duda cultivada durante la IFC y demuestra que incluso los estudiantes bastante jóvenes se pueden comprometer en el examen colectivo de las características de la duda. Las implicaciones para los educadores se elaboran en términos de las prácticas pedagógicas que involucran productivamente a los niños en la exploración de la duda epistémica.

palabras clave: filosofía; investigación; colaboración; duda; pedagogia.

o papel da dúvida na investigação filosófica colaborativa com crianças

resumo
Este artigo examina a dúvida epistêmica cultivada no contexto da investigação filosófica colaborativa (IFC) com crianças de 2 a 7 anos numa escola primária no interior de Brisbane, Austrália. O artigo documenta e categoriza episódios de dúvida epistêmica expressada por crianças conforme elas participavam de extensivas sessões baseadas no design da IFC. A dúvida epistêmica é tratada de acordo com as noções pragmáticas desenvolvidas por Charles Sanders Peirce (1877), que sustentava que o espaço para a investigação é formado entre uma "dúvida genuína" e uma crença fixa ou estabelecida. O processo de investigação é genuinamente provocado quando uma experiência "real" provoca em alguém um senso de desequilíbrio, resultando na necessidade de revisar uma crença já existente. Mais tarde, ele propôs que o processo pode começar com uma "dúvida cultivada" (para além de uma dúvida genuína), iniciada dentro do processo de investigação pelo desejo do/a/s pesquisador/es/as de rever suas próprias crenças e assunções existentes. O cultivo da dúvida provocaria então um exame mais profundo e a reavaliação destas crenças, levando assim à dúvida genuína em um ponto no meio da investigação. A dúvida expressa pelos alunos neste estudo surgiu do discurso e da indagação em sala de aula, ao invés de espontaneamente por meio da experiência direta, portanto seria considerada dúvida cultivada. Duas categorias distintas de dúvida cultivada foram encontradas: a dúvida como um processo interativo dentro do grupo que intensifica a investigação coletiva; dúvida como o próprio objeto de investigação. Quando a dúvida era o objeto da investigação, as crianças procuravam distinguir suas características e como funcionava dentro do grupo para manter o diálogo. O artigo aprimora nossa compreensão da dúvida cultivada durante a IFC e demonstra que mesmo os alunos muito jovens podem se envolver no exame coletivo das características da dúvida. As implicações para os educadores são elaboradas em termos de práticas pedagógicas que envolvem as crianças de forma produtiva na exploração da dúvida epistêmica.

palavras-chave: filosofia; investigação; colaboração; dúvida; pedagogia.

the role of doubt in collaborative philosophical inquiry with children

introduction

Children's experience of epistemic doubt was investigated as part of an extended design-based study into collaborative philosophical inquiry (CPI), conducted in an inner-city primary school that serves a multicultural community in Brisbane, Australia. CPI in the classroom is a deliberative, dialogic process that prepares students to become critical, creative and caring thinkers and reasonable, active citizens throughout their lives. The first author (Fynes-Clinton) was employed at the school for over seven years in a curriculum leadership position. Commencing in 2010, she led the process at the school that established CPI as the pedagogical method informing curriculum planning, development and implementation. At the time of its introduction, students from non-English speaking backgrounds and Indigenous Australians made up a significant proportion of the school's student population: 32% of students spoke English as their second language and 12% were Indigenous Australians. These percentages varied over the following years but the pattern remained similar. Prior to the implementation of CPI, academic outcomes were low and student behaviours often significantly impacted the learning environment.

The CPI approach at the school was based on the original work of Matthew Lipman and associates (1980, 1988, 2003, 2008), and later adaptations incorporated by practitioners in the context of Australian schools (Cam et al., 2007; Davey Chesters et al., 2012). CPI classes took place in every classroom for approximately one hour per week; however, the design-based study focused on selected classes as outlined in the Method section of this paper. Using the pedagogical approach of community of inquiry, students worked together with their teacher (as facilitator of the process) to examine open philosophical questions on a range of concepts. Concepts were chosen based on relevance to the Australian Curriculum, and to the students' own concerns, interests and life experiences. Students were encouraged to collaboratively view ideas

through the philosophical lenses of ontology (What is there?), epistemology (How do we know?) and axiology (Should we care?). Discussions focused on values and thinking processes rather than preferencing the attainment of factual knowledge, as sometimes happens when attending to the requirements of an overcrowded curriculum.

As CPI was introduced and implemented, a significant cultural shift in thinking and behaviour occurred at the school (see Fynes-Clinton, 2018). CPI became an integral pedagogical practice in every year level. Over time, students utilised the skills and processes of CPI in other curriculum domains and in solving disputes in the classroom and playground. In addition to the cultural shift, there was an identifiable lift in students' engagement in learning and academic outcomes as assessed through the National Assessment Program - Literacy and Numeracy (NAPLAN). Moreover, a review of the school in 2015 by an external evaluator identified CPI as playing a key role in creating a more peaceful, caring and respectful community of students and staff who value thinking and learning (Fynes-Clinton 2018). The investigation of doubt arose in this context as students at the school began to identify as a collective community of thinkers and learners.

theoretical background

Philosophy for Children (P4C), conceived by Lipman, drew its roots from pragmatist philosophy originating with Charles Sanders Peirce (1877) and John Dewey (1916), and socio-cultural theorist, Lev Vygotsky (1978). Although these theorists did not suggest philosophical inquiry with children, their theoretical notions greatly influenced the work of Lipman.

The notion of *genuine doubt* was proposed by Peirce (1877) as key to collaborative inquiry. Peirce maintained that inquiry forms the space between genuine doubt and a fixed or settled belief. He contrasted genuine doubt with 'paper doubt,' a term he coined to reject Descartes' position on doubt as grounded in theory rather than in

practice. Cartesian philosophy proposes that 'felt' experience is essentially non-cognitive and therefore could not possibly result in reasoned judgement. Peirce perceived genuine doubt to occur when an action or 'real' experience brings about a feeling of disequilibrium, resulting in one's need to revise an existing belief, thus initiating an inquiry process. Later he reviewed his original ideas about genuine doubt, proposing that philosophical inquiry may commence with 'cultivated doubt' rather than genuine doubt. He suggested that in a philosophical inquiry process, cultivated doubt could be created through reflection on one's existing beliefs and assumptions prompting examination and re-evaluation of these beliefs, thus leading to genuine doubt at the middle point of the inquiry (Johanson, 1972; Hilderbrand, 1996; Pardales & Girod, 2006; Peirce, 1877). Peirce (1955) maintained that if one's doubt is genuine, then one will seek to resolve the uncertainty through the methods of tenacity, *a priori*, authority or inquiry (Fynes-Clinton, 2018). The doubt expressed by the students in this study would be considered cultivated doubt, as it arose from classroom discourse and inquiry rather than spontaneously through direct experience. If the students consequentially action this doubt through lived experience, doubt may then become genuine.

John Dewey (1916) argued that thinking is 'the method of intelligent experience' (p153). Building on Peirce's notion of thinking as a sensed experience, he posited that sense-perception is linked to inference-making, and it is through these inferences that beliefs are formed. Dewey (1997) further maintained that learning is promoted when 'the grounds for a belief are deliberatively sought' (p.2) and examined actively and persistently to prove or disprove the adequacy of a belief. In this process beliefs can become knowledge 'in light of the grounds that support it' (p. 6). Dewey proposed that the act of curiously seeking new experiences is fueled by wonder. Building on his perception of wonder, the discussion section of this paper highlights the role of epistemic doubt in the process of moving from wonder to deeper understanding.

Lipman's notion of the community of inquiry was influenced by Vygotsky (1978), in particular, his notion of the *Zone of Proximal Development (ZPD),* the space between a child's developmental level, as determined by their capacity to solve problems independently, and the level of the child's potential ability when guided through the process by adults or "more capable peers" (p.86). He posited children's thought and language development occurred through the process by which listening to and imitating others in their external environment promoted internalisation of their thinking and learning. CPI enables students to learn through listening to the ideas and observing the practices of all participants within the class community. The teacher as facilitator of the process and more capable peers together create multiple zones of proximal development within the community (Brown 1992); thus, enabling both collective and individual thinking capacities to progress over time.

In previous papers and the first author's doctoral thesis (see Fynes-Clinton & Renshaw, 2016; Burgh et al., 2018; Fynes-Clinton, 2018) children's doubt was examined in relation to collaborative thinking and deep reflection within the community of inquiry. This paper provides a distinct contribution by theorising doubt through the specific focus on Pierce's notion of *cultivated doubt*. Moreover, the paper examines the features of pedagogy required to cultivate doubt within a community of inquiry.

method

The focus on doubt per se emerged in the final stage of the longer-term design research investigation of CPI conducted across four years (2012-2016) at the above-mentioned school. Design research in education evolved from two sources. The first, from the fields of design studies and engineering, focuses on the production and modification of 'artefacts or designed interventions' to assess their efficacy in different contexts (Gorard et al., 2006). The second, and most significant influence for this research, was Vygotsky who pioneered 'teaching experiments', as a way to research the process of development in the ZPD (see Brown, 1992; Davydov & Kerr, 1995;

Vygotsky, 1978). Teaching experiments were based on the view that human functioning is mediated by semiotic tools and cultural artefacts and that human capacities are not fixed but malleable under different sociocultural conditions. Vygotsky's approach was later elaborated by Russian scholars such as Davydov & Kerr (1995) in the field of mathematics education, and by Ann Brown (1992) in classroom research regarding communities of learners (Fynes-Clinton, 2018).

design cycles and participants

The design research approach in this investigation was implemented over three key cycles. Data relating to epistemic doubt was collected through (audio-recorded) whole class communities of inquiry, small group focused dialogues and students' written reflections.

Cycle 1 commenced in second semester 2012 with two class teachers and all students (aged 7-10 years) in each of their multi-age classes. This cycle focused on the procedural and intellectual elements of collaborative inquiry by teaching the student participants to apply key tools for reasoning and inquiry during CPI (see Fynes-Clinton, 2018). The thinking tools included questioning, analogical reasoning, distinction making, justification of viewpoints, criteria building and testing reasoning with counterexamples along with how to propose and test hypotheses, and reflect on the thinking and reasoning as it occurred within the group and individually.

Cycle 2 was implemented in two purposefully selected focus classes (Silverman 2000), the first taking place during the second semester of 2013 with children aged 7 to 12 years and the following in second semester of 2014 with students aged 8 to 10 years. A purposeful sampling procedure was used to invite students to participate in the focus groups based on their demonstration of a passion for philosophical inquiry during Cycle 1. Purposeful sampling enabled depth and richness of the evidence supporting the investigation (Silverman, 2000) and importantly, allowed the researcher to gauge students' capacity to apply new understandings, given specific conditions

conducive to deep inquiry. Cycle 2 focused on the substantive elements of the inquiry and investigated students' capacities to deepen and connect the inquiry through appropriation of the skills learned during Cycle 1.

Cycle 3 data was collected in 2016 in a mixed year level, focus class with students from 8 to 12 years of age who had been invited due to their interest in philosophical inquiry. Cycle 3 specifically focused on the construct of doubt. Through this focus, further questions emerged: *Can primary students recognise and examine epistemic doubt within the community of inquiry? In what ways does doubt emerge within the inquiry?*

results

identification of doubt

Episodes of epistemic doubt were identified across the three design cycles as they occurred in whole-class communities of inquiry and small-group focussed dialogues (consisting of three to five students in each group). Cycle 1 data included four communities of inquiry and four small-group dialogues, Cycles 2 and 3 each consisted of four communities of inquiry and eight small-group dialogues.

There were three steps in identifying episodes of doubt and clarifying the types of doubt that occurred. Step 1. *Prima facie* indicators of doubt were used to select episodes for further analysis. *Prima facie* indicators included statements such as, "I am not too sure", or "I am not very confident about this idea", or "I don't know if you will agree with this". Other indicators of *prima facie* doubt included the following: long pauses when speaking or extended filler sounds such as "hmmm" that suggested uncertainty or lack of clarity. Step 2. All *prima facie* episodes of doubt were examined to establish the key features of doubt as expressed by the students in the whole-class communities of inquiry and the small-groups. These features included the following: explicit statements of doubt, uncertainty or confusion; extended hesitancy in expressing or clarifying an idea; offering alternative suggestions during discussion; providing counterexamples during discussion; persistent questioning to test a point

under discussion; persistence with an idea that challenges the general views of the community; and changing one's position during discussion. Step 3. When the features of doubt identified above were further examined, two distinct categories of doubt were identified. The first was *doubt as a process* that promoted to collective inquiry; the second was *doubt as the object* of inquiry. Doubt as *process* is an interactive feature of the group discussion where students express uncertainty and other indicators of doubt to promote collective inquiry, and invite other members of the group to contribute. Doubt as *object* is the focus of inquiry as students explore the features and functions of doubt itself.

The next section provides evidence of the above two categories of doubt, and further refinement of each category (*doubt as process* and *doubt as object*) into two sub-categories. Episodes from the corpus of data have been selected to highlight the distinctive features of each category and show the differences between the sub-categories of each type of doubt.

doubt as a process within the group to promote collective inquiry

The above category of doubt comprises the following two interrelated sub-categories as described below:

students' expression of hesitancy with their own thinking or ideas

The students expressed hesitance with their own ideas in two distinct ways: hesitancy with one's own idea through forms of speech; and revision of thinking in response to further discussion. Students showed evidence of this category of doubt in how they spoke, namely by protracted pauses (-), use of filler words such as *like…, but…, and…, well…* (possibly to extend thinking time) and through revision of words or phrases, and using terms such as *possibly, might or could.* With regard to revision of thinking, students were more direct in their expression of hesitancy, explicitly noting a shift in thinking or change of mind after consideration of an alternative suggestion or

expression of uncertainty with their own ideas. The following extract from the 2014 Small Group Focused Dialogue provides examples of this.

section 1 (evidence of explicit hesitancy)

> Jonah (Year 2): I am not really sure about my idea, not too keen, Thinking is like imagining because imagination is like – is basically like – it's kind of hard to explain – imagination is like an upgraded think but imagining is sort of thinking.
> Year 2/3 Teacher: Why?
> Jonah: Thinking is like imagination because when you are thinking of a question you are *'imaginating'* the answer (student's own neologism).
> Year 2/3 Teacher: … At the same time?
> Tuong (Year 3): When you're thinking you are imagining everything right there and you put it all together - like if you are thinking you are imagining what the person says and from that you find the answer.
> Year 2/3 Teacher: You imagine what the person said or you remember what the person said?
> Tuong (Year 3): It's kind of hard to say.
> Clinton (Year 3): Thinking and imagination are like part, part, whole because if you add thinking and imagination you will get a whole. …you might get 'thinkanation'.
> Year 2/3 Teacher: …You are actually saying that they are different, but you are putting them together?
> Clinton: Yes, like the two number facts are different – like seven and eight.
> Year 2/3 Teacher: Can we ask some questions about that idea?

students discuss idea in pairs

section 2 (evidence of greater certainty)

> Jonah (Year 2) (as spokesperson for small group): Imagination is like thinking but you have added new parts in – like the Lorax and the movie of the Lorax – they've added new stuff in. …
> Brittany (Year 2): Thinking is like a picture in your head and sometimes you can make a story up about it.
> Year 2/3 Teacher: Can you explain the difference?
> Brittany: They don't match – thinking is like a picture in your head and imagination is like a dream.
> Further into the discussion:
> Edra (Year 3): I think they're different because thinking – you think life – if you have two things and you want to put them together you have to think of the answer and imagination is like – it's a bit more exciting than thinking.
> Year2/3 Teacher: Why?
> Edra: Because it adds a bit more suspense into your thinking.

> Jing (Year 3): I disagree with the idea.
> Year 2/3 Teacher: Which idea? The idea that….
> Jing (Year 3): The idea that imagination is more exciting – sometimes imagination is not exactly more exciting, sometimes it's worse than thinking – like something scary… not just one feeling.

This episode commences with explicit hesitancy by Jonah and expressions of tentativeness by Truong and Clinton before shifting to greater certainty after the paired discussion. As Jonah expressed his uncertainty, he also used filler phrases (It's basically like…; it's kind of hard to explain…), possibly to allow himself thinking time as he was expressing the idea. He also overtly expressed his uncertainty with his own idea but remained open to *trying it out* with his class community.

After the paired discussion, the students showed little hesitancy. Brittany proposed the *picture verses dream* analogy. Edra elaborated the dream idea by noting it is more exciting and a bit more suspenseful overall. Jing, in the final comment, enabled the community to step further into the exploration of doubt by providing challenge to clarify the idea. By the end of the episode, the community had a set of differences between thinking and imagination and an understanding that they *go together,* evidenced by the use of neologisms. Jonah proposed that imagination is upgraded thinking and coined the neologism *imaginating* to express the unity of thinking and imagination. Truong took up this idea to propose thinking and imagining as an internal dialogue - if you are thinking you are imagining what the person might say and from this process you can find the answer. It was Clinton who provided a way of distinguishing these processes by proposing a part/whole relation - by adding thinking and imagination - to achieve a new synthesis, *thinkanation*. Students spoke with greater certainty as the discussion developed. This demonstrated that collective inquiry progresses when ideas are proposed tentatively to open a dialogic space.

The following extract shows further evidence of the students' cautious articulation of their ideas through the use of interjections, pauses (-), filler words and

through revision of words or phrases (as italicised in the extract below from 2014 Mixed Year level Community of Inquiry data).

> Toby (Year 4): I'm linking to Jonah's – if you want to do something and you get it from your mind, *like if – well - so you -the mind controls you to like* – I stomp my foot there - but how do you get the idea, how *like* does your mind figure out why you stomp your foot on the ground like that? Is there anything making the mind want to do that – *it's like a bit of a new question…*
> Edward (Year 5): I think the mind is more important because *maybe* we're just thinking like its *um maybe* we're just thinking all the same *and we're just like – say we were – this is going to sound really weird* but say we were from the fifth dimension - *not that there is a fifth dimension, um, but like um, like* where this piece of mind just imagining we have a body and imagining that all these other people look and feel and do stuff that we think they should do.
> Toby: The brain, like the brain can't do anything without the body – the brain's *useless* - if it doesn't have a body it can't communicate with anybody – it can't talk, it can't move – it just sits there and does nothing – *and but, like I'm not saying it's less important, well, maybe I am, I don't know* – it's like your brain wouldn't be able to do anything without the body it'd just be a brain.

Toby expressed hesitancy regarding the idea that the mind controls the body through his questions about what might make the mind want to control our body. He demonstrated his uncertainty through explicating the questions in his mind. Edward responded to Toby tentatively trying out his ideas prefaced by *'this is going to sound really weird'*. He courageously shared his thoughts with the community in a manner that cultivated uncertainty and offered his thoughts for further elaboration. His suggestion that the mind was more important than the body elicited further doubt, as evidenced by Toby's alternate view that the brain would be '*useless*' without the body. Through his elaboration of the brain-body connection he also showed hesitancy with the idea he was articulating and his further uncertainty regarding the notion that our minds would be more important than our bodies. This was evidenced by his use of *thinking aloud* to share his internal tension with the idea as he presented it. The hesitancy and use of self-questioning enabled both students to examine their thoughts as they were being articulated, opened the dialogic space and facilitated the emergence of deep reflective responses. Often an inquiry can be 'shut down' by the way in which

responses are presented or result in conflict rather than open dialogic argument, especially if the speaker seems determined to be 'right'; whereas hesitancy as evidenced in this extract encouraged thoughtful, considered responses. The students were able "to see that something is missing, is needed but not clearly available" and used questions with the aim to uncover what needed to be understood (Turgeon, 2015p. 290).

provocation of doubt regarding an idea under consideration

Examples of students' provocation of doubt during communities of inquiry are presented below. The provocation of doubt was identified through students' use of a combination of doubt indicators in the form of questioning, disagreement, counterexamples. Perseverance with one's own idea appeared to be used in the context of exploratory dialogue (similar to playing the devil's advocate) as a device to advance the discussion. The doubt indicators signaled the students' expression of their own uncertainty (Peirce, 1877) with views presented during discussion. Students provoked doubt within the community in response to their own uncertainty with an idea under discussion and this, in turn, cultivated further exploration of doubt. The provocation of doubt elicited collective doubt within the community. Evidence of this is demonstrated through the 2012 Year 2/3 Community of Inquiry 2 data.

> Year 2/3 Teacher: Clinton, can you explain first of all your response when Jonah shared - "This is how the universe got made – it's what the scientists say" and you said it's what they "know" – in inverted commas. What did you mean by that?
> Clinton (Year 3): I mean like it's what they believe they think is true. It's not saying they're wrong – it's saying that they haven't figured it out yet – it's like they don't definitely know – they think.
> Year 2/3 Teacher: They think they know and it's not definitely true?
> Brittany (Year 2): Maybe they believe it might happen, but they don't know it's going to happen.
> Clinton: Jonah was saying - with the book – he was saying that's real because that's what happened and I'm saying, "how do you know because no-one was alive then."
> Year 2/3 Teacher: Are you saying you want proof?

Jonah (Year 2): This is proof [the book].

In the above extract, Clinton shared his doubt regarding scientific understanding of how the world came into being. His initial thoughts opened the dialogic space for the cultivation of epistemic doubt within the group. Brittany built on this through sharing the implication that believing is not the same as knowing. Clinton persisted with the idea that a scientist could only *think* their knowledge was true as they weren't alive at that time. Clinton stated that he did not necessarily doubt that the scientists' information was correct, rather he doubted the claim that the knowledge could be known to be true. Clinton articulated a distinction between 'thinking' that we know and knowing with absolute certainty, thus aligning with the pragmatist view of knowledge as fallible. The provocation of doubt was evidenced through Clintons' persistence with his own idea and also his clearly articulated and sound justification of his idea. This enabled Brittany to expand the idea and succinctly clarify her thoughts for the group. Interestingly Jonah justified his own disagreement by emphasizing that *proof* could be found in the book, thus opening the collective space for further exploration of doubt.

The following extract is from 2013 Community of Inquiry 2 data. The students had been exploring the concept of identity and at that point were grappling with the idea of how our identity is shaped and whether our decisions in life become part of who we are. The extract below shows evidence of students' cultivation of collective doubt within the community, constructed through disagreement and counterarguments.

> Barbara (Year 6): I think if you made a really bad decision, it doesn't, it affects who you are a little bit but the way you fix it, it changes you as well. So, but if you keep it there and then um. …
> Teacher/Researcher: The way you fix it helps you become who you are? That's an interesting idea.
> Barbara (Year 6): So like, um you make a really bad decision and that defines a little bit of how your choices - how you react and then um, but it's not for the rest of your life, its only for a short time and if you fix that problem and move on to another bit, you kind of forget about it and it doesn't really have an effect on your life anymore.

> Teacher/Researcher: Let's think about this idea …
> Jonah (Year 4): Well I disagree because um, I have a counterexample, two actually - that idea that you, because not every decision, bad decision that you make, you can overcome - like, smoking, you take up smoking - the problem is cancer and that's something that you can't fix. There are some choices that you make that even if you, even if you stop, that stops it from getting worse but still it's like it has scared you for the rest of your life. But, but it depends if you make the choice to make a choice to make that scar bigger or just keep it at the same size. And um, the idea that a choice can affect your past as well, I think Oliver mentioned, I disagree with that idea because you can't change your past and I disagree, you can always change your future, but I don't think it can in anyway change your action.
> Teacher/Researcher: You have introduced some – you have thrown some ideas out there.
> Tate (Year 4): um, I think that they can actually scar you forever. You go to jail, it takes up maybe a quarter of your life, you always feel guilty for what you've done, people see you, they recognise you from a newspaper article or something and people will be going like, oh you robbed a bank or you, you wouldn't be able to communicate with someone, with anyone, so your life would be sort of wrecked because everyone is thinking he robbed a bank or he's a dangerous man; he could still be on the run or something. …And it would have also taken up a bit of your life so you're thinking well what if I didn't do this, then maybe, maybe if I didn't have a lot of money I could have found another way, I could have loaned from somebody or something.

Further into the discussion:

> Toby (Year 4): I partly agree with that idea because if it is a very severe thing that you have done, like you have killed someone, then you can't really fix that and you just go to jail or you worse you face the death penalty; but if you do something that is not as bad like maybe if you sort of don't have any money and it's like snowing and you have, your only wearing a rag and you steal someone's coat that can be owned up for, you can fix that and you will have a better future.

The above dialogue provides an example of the way in which students built a reasoned counterargument to provoke doubt. Barbara's comment initially suggested that our decisions do not have to become an aspect of our identity; Jonah shared his disagreement with Barbara's idea, thus signaling doubt. He provided examples of times when this would not be possible and offered the notion that some decisions can scar us for life. His disagreement, communicated through well-considered counterexamples, cultivated doubt within the community by enabling the participants

to see a counter perspective. Interestingly he also commented that we have a choice not to make that scar bigger, opening the dialogic space for further thought about choice and its role in identity formation. Tate took a similar position through his suggestion that guilt may then become part of who you are (Fynes-Clinton, 2018). At this point, collective doubt had been cultivated and was further tested by Toby's suggestion that it would be dependent on the type of decision and the intent underpinning it. The students skillfully used counterargument and collectively connected their ideas to real-world situations to enable deeper exploration of Jonah's initial expression of doubt.

doubt as an object of the inquiry

This category encompasses the following two interrelated sub-categories as described below:

openness to the experience of not knowing

The first sub-category of *doubt as object* was students' expression of *not knowing* in ways that opened the space for thinking about *what could be,* given what is already known. When discussing knowledge and wisdom, all three students in the extract below (2013 Community of Inquiry data) used analogy to support their thinking about not knowing.

> Sharav (Year 4): I am thinking of like, um a box – two boxes joined together and if you know already that there's an edge you can't fit every time – so that's what happens to your thinking – you know – you don't know one or two things in your life – you can't know everything.
> Miles (Year 4): I want to build on Sharav's idea that there is always something that you don't know. It's like when you put a puzzle together and you are missing a piece - and that's like – it has all the knowledge on it but the things you don't know.
> Jonah (Year 3): And when S – I am linking to Sharav – say you, like you know that there are like two circles, one bigger than the other, and the first circle is the circle you know the stuff that you don't know and the other circle is the stuff that you don't know what you don't know.

The above dialogue demonstrates the students' collective thinking regarding what can be known, specifically in relation to *knowing* what we don't know and *not knowing* what we don't know. Although this is not a novel idea in the history of philosophy, it was not introduced to the students as part of their school learning. The students' presentations of the same idea through the various analogies formed a collage of thinking and reasoning within the community and demonstrated openness to the idea of sustained 'not-knowing' – a necessary precursor for students' to further explore the fallibility of knowledge. Acceptance of the fallibility of knowledge was evidenced in the above extract through the ways that the students found connections among their ideas and elaborated these connections to provide clarity for the community.

During 2016 (Cycle 3), the students had been discussing Socrates' claim of ignorance. The discussion progressed over four communities of inquiry. As an element of the stimuli presented in Cycle 3, the students had been introduced to key notions of doubt by Peirce and other philosophers. The following extracts from 2016 demonstrate an openness to their own fallibility regarding knowledge and understanding.

> Jonah (Year 6): um I think, ah, I agree that, I think he [Socrates] was wise because he was ignorant because um, if you know you're ignorant then that gives you something to um, go for um, you know and that 'cause you know you're ignorant you also, your mind isn't clouded with the thought that you're perfect, and you know things, you're a genius, um, you're the smartest man, when you know you're ignorant then, you kinda just think, you know, you think of yourself as not er, you know, not as this great awesome person that's perfect, you think oh well, you know, I, I want to pursue that knowledge and - that gives you something um, to - work for – so…
> *Further into discussion:*
> Simon (Year 5): Well I, I think it's sort of impossible to learn everything because people, people just make up things, games and stuff, to have, and you're brain doesn't have the capacity to hold everything which you learn and there's billions of things that you can learn to learn everything as well so I think it's impossible, so I think that, therefore, I think that everyone is ignorant in a way.
> Teacher/Researcher: Do you want to add to that?
> Carlos (Year 4): Oh, I think the reason that people thought he was wise was that he actually knew that he was ignorant, was ignorant and he said oh, I want to learn more than I do already rather than him just being ignorant.
> *Further into discussion – connections to doubt: Community of Inquiry 2*

> Jonah: I think wonder and doubt are related 'cause, so I think wonder leads to doubt 'cause um, well that's if you're kind of, if you're a deeper kind of thinker then wonder leads to doubt but then if you're just kind of a surface thinker like 'oh I wonder this, then you kinda s- okay next' – and then, that's not really going anywhere but if you wonder you know, like things and then you start thinking more deeply about it then you come to beliefs and then you doubt those beliefs to see if they're true um you know, and so (laughs) and then eventually um you tweak your ideas and they get better and better like – I think wonder leads to doubt.
> *From Community of Inquiry 2, student artefacts:*
> Jonah: Eliano asked me 'So does ignorance equal wisdom?' to which I replied 'yes' but I now doubt that and think the knowledge of ignorance is wisdom, just like Socrates

In the above student dialogue, the students suggested that if a person retains an attitude of infallibility, then they are unlikely to pursue knowledge. Jonah's initial comment implied that a person's mind can become 'clouded' by an inflated sense of their own intellectual abilities, and further into the discussion he referred to this idea when discussing the need to sometimes '*doubt yourself*'. Carlos suggested Socrates' wisdom was demonstrated by his knowledge of his own ignorance. Simon also took up this point, offering a distinction between being ignorant *of* the desire to learn and being ignorant *with* the desire to learn. As the discussion progressed the concept of wonder emerged, and the students were asked how wonder could be linked to doubt. Jonah's response suggested hierarchical development moving from wonder to doubt; this shift only taking place in instances of 'deep thinking' in which one may wonder about their own beliefs. He persisted with his earlier notion of ignorance as a mind that is 'not clouded' by one's inflated self-perceptions and further, used this thread to link his understanding of how this connects with doubt and wonder. Jonah, when articulating his thinking, used several filler words/phrases as he shaped his thoughts. Simon's use of 'I guess' at the end of his response suggests a level of uncertainty with the distinction he presented. The cultivation of doubt was evident through the students' carefully crafted, hesitant language choices and their considered connections to the ideas shared within the community of inquiry and to their previous learning.

After each session, the students were given the opportunity to document thoughts elicited by the discussion and ideas that they had not been able to share due to the inquiry focus shifting beyond their idea. Jonah shared his doubt regarding his previous response to Eliano's question on ignorance equaling to wisdom. He made the distinction that it is the knowledge of the ignorance rather than the ignorance alone that equates to wisdom. This is an example of disequilibrium in that the student continued to puzzle over the question and his beliefs well past the time in which he had initially responded to the question. The students' willingness to remain open to learning was evidenced by the way in which the ideas were revisited, tweaked, elaborated and challenged throughout the discussion and written reflections. The discussion encouraged students to think about the benefits of remaining open to learning – an intellectual stance necessary for inquiry to progress. The comments overall and the key themes underpinning the students' responses align with the views expressed by Peirce in the 'First Rule of Logic' (1899/1998), in which he makes the connection between learning and the desire to learn motivated by a dissatisfaction arising from the feeling of uncertainty over our beliefs (Fynes-Clinton, 2018).

construction of a theory of doubt

During the final design research cycle (Cycle 3), students continued to explore philosophical positions on knowledge acquisition. Notions of doubt were examined as part of this exploration. The following selection of extracts demonstrates the student's capacity to construct their own notions of epistemic doubt based on discussions during Cycles 2 and 3 regarding the ways in which we acquire knowledge and understanding. The extracts provide examples of the students' ontological, epistemic and axiological understandings of the concept of doubt and its relationship with knowledge acquisition. During this cycle, students were introduced to a range of philosophical positions as stimuli to elicit deliberative dialogue on the concept of knowledge

acquisition. Notions of doubt were examined as part of this exploration, as demonstrated in the extract from the 2016 Community of Inquiry 4 data.

> Toby (Year 6): I think doubt is kind of thinking of the brain's filter, er, getting rid of the stuff that we don't need. So that's how we are more technologically advanced because our brain can filter out – well primitively but it can filter out what we don't need and that's how humans are so advanced, I guess.
> Teacher/Researcher: What do you mean 'What we don't need? What were you thinking when you were saying 'what we don't need'?
> Toby: Um I'm not sure so – maybe there was well, a big company testing out a new product through their science division, you'd have doubt - if it's not working it's like, say if it's changing, it's going to ruin your business and that could be dangerous so you have to doubt it, you have to kind of doubt something if you want to carry on.
> Teacher/Researcher: Mm, good. Okay, I might just add a few qu… Oh sorry, Calan, go ahead.
> Calan (Year 4): I think um if you doubt something then um after you do that then you can try and figure out the answer because if you doubt it, it makes you want to think about it, so…
> Jonah (Year 6): That your knowledge um, I think that he means that your knowledge is er, its, is something's truly your knowledge it has to be your opinion, like you 'full-heartedly' believe in it. Er maybe doubt, if you doubt it– it's not really your knowledge, it's a concept, kind of?
> *Further into Community of Inquiry 4 discussion*
> Jonah: Um, I think that er - genuine doubt closely er related to 'wisdom begins with wonder' because the wonder is like the genuine doubt like you wonder something and you think 'oh maybe this is right or that is wrong' and you know, just like doubt and then through inquiry you get a fixed or settled belief which is like wisdom.
> Ellen (Year 5): I kinda think the same thing with opinion and like, knowledge is like a settled belief, according to Carlos, like you can't bend it or change it and opinion is like genuine doubt as well, it's like clay, you can like make stuff with it, you like, it's not necessarily like, like … (pauses)
> Teacher/Researcher: So, what's like the clay, what relates to the clay? Opinion?
> Ellen: Yeah.
> Teacher/Researcher: So, you can mold it? Okay. Would anybody else like to respond to that?
> Alina: No, no.
> Carlos: Um well, I think there's knowledge and that's the, your settled beliefs then there's doubts and those are your doubts and there are your opinions and those are the things that you are um always thinking about and agreeing with or even changing sometimes.
> Teacher/Researcher**:** Okay, and where do your thinking habits fit into that?
> Carlos: Um, those are the three categories of thinking habits, like so um, um if all your, if all your um, thoughts are in knowledge then you can't bend, if all your thoughts are

> in doubts then you, you can't bend but if all your thoughts are in opinion, you can bend really easily.

In the above extract, Toby aimed to define doubt through the analogy of the brain's filter. When asked to clarify this idea he provided a relevant example, first expressing his hesitancy with his own thinking. The students grappled with ways to define knowledge, opinion and doubt. Jonah's analysis of doubt and wonder appears to suggest that doubt sits between opinion and settled knowledge. Ellen suggested that opinion and genuine doubt are like clay in that they can be 'molded' although her interjections and long pause as she tried to conclude her comment suggest her disequilibrium with her own thoughts. When asked about where thinking habits fit in to this, Carlos responded with the theory that if you see your thoughts as opinion then you can 'bend' but if thoughts are either settled or always doubted then reconstruction is not possible. The distinction the student seems to be making is between certainty, absolute skepticism and fallibilism (opinion that can be doubted) (Fynes-Clinton, 2018). The capacity to remain secure in the dialogic space of doubt (their own or others) was evident as they sorted their ideas and tried out their thinking.

The data below was collected in during the Small Group Focused Dialogues and from the students' written artefacts 2016. Students examined philosophical theories of knowledge acquisition and were invited to construct their own epistemic frames. The students were asked to consider their individual stance on the philosophical theories examined and provide justification for their thoughts. Building on this, they then developed their respective theories of knowledge acquisition. The selection of samples for this study was specific to the notion of epistemic doubt.

> Solomon (Year 6): Um, I sort of agree with that like, you have like, you tend to think more in-depth – like not just shallow answers, like you sort of need to challenge those ideas through doubt, like you have to have that doubt, the doubt that that answer might be wrong and then you challenge yourself to like find out what it – how deep you can go.
> Jonah (Year 6): Um yeah, I really like, it's had a… the impact and you know I tend to look at things from a different side now and if I find something I'm interested in or if I doubt it I, I question it, I like um' do I really think that' and it helps in everyday life sometimes, helps with decisions and yeah.

Building on his previous comment:

Solomon: Well first I agree with Peirce, like you have to have that genuine doubt for your, like I guess you could say um how you look at it and that's how I acquire um - experience and understanding like I guess you could say that understanding things you need the experience to do it so and you also need the doubt to do it, like sort of going back a little bit, like someone used it this morning – people didn't like, think Pluto was a planet until they had the genuine doubt inside them and so then they did more like scientific like explore, explorations and then they genuinely found out that it was a planet so that genuine doubt should be running in the back of your mind at all times, like I have a doubt right now I'm going to make a mistake but I, I've had the experience of talking for, for pretty much all my life.

Jonah: Okay, um well I think you come to it through – like yes you need that genuine doubt to start off but then um like you can do two things to further explore that genuine doubt - you can have a discussion, see what other people think or then you can um experience it and make up a decision for yourself and um so like yeah, 'cause that inquiry can be just talking or it can actually be experience.

Toby (Year 6): Well, my theory was that I wrote this morning around – it was our knowledge, our basket of knowledge is pretty much what we do, what we experience what we accept and what we doubt so - yeah.

Simon (Year 5): Well I sort of disagree with what I said but um I think what my theory is, is that I think that like you need to ask questions to get knowledge and then you use that knowledge to the best that you can.

Teacher/Researcher: Yes, that's different from what you said yesterday.

Emiliano (Year 5): I think that basically you find the knowledge you absorb it into you – you fiddle with it and try to find, um like, how to use that new, new-found knowledge so that's how you understand and acquire the knowledge.

Juno (Year 4): Well I'm not quite sure if I've sort of already answered this but, well, well when I hear different people – different thoughts well sometimes it changes my thinking habits – like I said it makes me think differently about things…

Carlos (Year 4): Yeah, challenging to keep my opinion – and I'm like that because my opinion is always changing on how I look at things.

From students' written artefacts collected after Community of Inquiry 6 on the day prior to the Small Group Focused Dialogues:

Emiliano (Year 5): My theory on how we acquire knowledge and understanding is we desire to find knowledge, find it and absorb it.

Erica (Year 6): My theory on how we acquire knowledge and understanding is we build on others' ideas and think about our past experience.

Jonah (Year 6) My theory on how we acquire knowledge is through doubting or testing an opinion's legitimacy until it is proven right or wrong; this can be done through inquiry or experiencing it.

> Felipe (Year 6): My theory on how you acquire knowledge and understanding is that opinion and doubt can be discussed or deeply thought [about] to have a belief or knowledge.

The above comments suggest an understanding of the role of genuine doubt in inquiry akin to that proposed by Peirce. Overall, responses from the students imply that genuine doubt provides the experience that could lead to knowledge. Solomon made the suggestion that challenging ideas through doubt can lead to deeper understanding and further suggested that doubt 'should be running in the back of your minds' supporting this idea with the example that he has known how to talk for 'pretty much all of his life' but still doubts that what he says is always right. Jonah concurred with Solomon's thoughts, adding that he changed his thinking behavior and now questions ideas that interest him or don't sit well with him. He further made the distinction between an inquiry that is 'just talking' or one that is an actual 'experience'. Here it appears he is suggesting the way in which you 'further explore' genuine doubt provides the experience that could lead you to knowledge and that 'just talking', similar to Peirce's concept of paper doubt, would not generally lead to knowledge acquisition. His written reflection suggests 'testing an opinion's legitimacy until it is proven right or wrong', which resounds Peirce's idea that inquiry forms the space between genuine doubt and fixed or settled belief.

Simon noted that he had changed his mind about his written response from the previous day, indicating his sustained openness to doubt. Emiliano proposed that knowledge needs to be first 'absorbed' and then 'fiddled with' until you can gain an understanding of how to 'use that knowledge. Juno also concurred that he has become more open to ideas that can change his ways of thinking. Felipe, in his written reflection, noted that doubt should be deeply examined if one is to come to a belief or gain knowledge. The thoughts from the students collectively implied that knowledge is shaped by the following factors: one's life experiences; disequilibrium with beliefs and opinions; preparedness to test beliefs; participating in shared, deliberative

discussions; and through the process of reflection and action (Fynes-Clinton, 2018). The above extracts highlight the students' capacity to remain open to ideas both individually and collectively and to pursue rigorous exploration of epistemic doubt through inquiry. The content of their own theories was consistent with their epistemic stance as a community and the ways in which they treated ideas during the community of inquiry.

discussion

This section discusses the key findings that emerged from the examination of epistemic doubt: the role of cultivated doubt; the types of doubt that can be cultivated by students in the community of inquiry and the students' development of an epistemic stance conducive to rigorous inquiry.

the role of cultivated doubt

Peirce (1877) perceived genuine doubt to occur when an action or 'real' experience brings about a feeling of disequilibrium, resulting in one's need to revise an existing belief, thus initiating an inquiry process. Through this research, it became evident that primary school students do not generally commence an inquiry from the position of genuine epistemic doubt as described by Peirce. However, they can and do cultivate doubt within the community of inquiry and articulate it in different ways, some of which are not immediately apparent if searching only for the doubt perceived as genuine. This kind of doubt is not a shock or unexpected experience that challenges one's worldview. It is more a habit to be cultivated as part of CPI in which *tentativeness, elaboration* and *challenge* are combined to progress ideas.

The cultivation of doubt became apparent throughout the study and its emergence often enabled the students to explore doubt collectively, and in some instances, come to a position Peirce may consider to be genuine doubt. However, the

emergence of epistemic doubt relied on an interrelationship of specific pedagogical conditions: engagement with rich ideas that enable construction of knowledge and opinions; use of intellectual inquiry tools to support thinking; and experiences that promote self- and peer-assessment. These conditions provided students with rigorous thinking experiences. While childhood is often associated with experiences of delight and wonder, doubt on the other hand implies a more mature, skeptical subject. This investigation revealed that children can experience epistemic doubt and indeed analyse it. Children can wonder about experiences and ideas without embracing a position of sustained uncertainty as wonder may be fleeting and often unexamined; however, to doubt one's own beliefs requires a person to understand their own fallibility and remain open to uncertainty, often for sustained periods (Fynes-Clinton, 2018).

categories of doubt emerging during cpi

It may not be possible for all students individually within the inquiry to come to a position of epistemic doubt; however, when doubt is cultivated within the community, the questions and ideas presented by the cultivators can scaffold the development of epistemic doubt amongst other members of the community. Epistemic doubt can emerge as the students engage in the type of collective inquiry that enables examination of uncertainty and opens a space for *collective doubt,* a term coined by the researchers, to label the emergence of shared doubt within the community of inquiry. As particular students express their uncertainty, they create multiple zones of proximal development (Vygotsky, 1978; Brown, 1992) encouraging all participants to examine their own thoughts and prejudices. The following categories of doubt were identified through the research, as discussed below:

1. doubt as a process within the group to promote collective inquiry

Students expressed hesitancy through the ways in which they presented their ideas to the community and then revised their understandings in response to the provocation of collective thinking about the issue under inquiry. Further, they modelled preparedness to share their experiences of uncertainty, thus doubt became a part of the culture of the group that enabled tentative ideas to be expressed and built upon.

Provocation of doubt was identified through the students' use of the inquiry tools of questioning, disagreement and counterexamples and additionally, students' perseverance with an idea. Provocation of doubt in such ways highlighted the students' growing capacity to remain open to and work with challenge and complexity of ideas. Further, it elicited collective examination of doubt and the emergence of new understandings.

2. *doubt as the object of the inquiry*

The students' dissection of the notions of knowing/not knowing opened the thinking space, enabling the philosophical stance of ignorance to become the starting point for deeper inquiry, thus resulting in the collective construction of new understandings. Further, the substantive focus on knowledge and doubt facilitated the students' theorisation of doubt and the place of doubt and ignorance in philosophical inquiry.

Students' expression of uncertainty and their provocation and collective examination of doubt and ignorance within the community provided indicators of epistemic progress during CPI. Sustained epistemic progress occurs when the inquiry reaches a point whereby students can skillfully move between the positions of genuine disequilibrium and equilibrium whilst understanding the impermanency of any fixed belief. This in turn enables students to reach a deeper understanding of the issue under discussion through examination of a range of perspectives (Burgh, et al., 2018; Fynes-Clinton, 2018). Burgh and Thornton (2019) argue that CPI in the classroom affords

students "a means to distribute epistemic power in the classroom and opportunities for each child to exert epistemic influence" (p. 19). CPI, if facilitated effectively, can enable students to take ownership of their own thinking and influence others through sound reasoning and deliberative examination of ideas. The cultivation of collective epistemic doubt encourages students to view issues from a range of perspectives other than their own, examine their personal values, and in turn, consider their own relationship to the issues under discussion.

students' development of an epistemic stance conducive to rigorous inquiry

CPI requires a certain epistemic stance based on tentativeness and epistemic humility, and this is cultivated through the CPI itself. During this investigation the safe environment of CPI supported students to contribute partly formed ideas publicly in the group to create the space for collective thinking. When ideas are articulated with epistemic humility, participants feel safe to unpack the ideas and elaborate further to assist collective meaning-making. To successfully examine doubt, this stance needs to be pervasive throughout the community dialogues; however, it also requires challenge and the courage to challenge the ideas of others, even when one is still grappling with their own understandings. The courage and tenacity to try out ideas within the community is an essential trait for participants of CPI. Tentativeness, elaboration and challenge enable epistemic progress within the community. For many young students these traits may not be regularly modelled in their daily lives, and thus require cultivation through carefully facilitated CPI in which the authority is shared. Haynes and Murris (2013) argued that to understand the contributions of children in the co-construction of knowledge, the narrow focus on what we establish as knowledge needs to be challenged. This would require teachers as facilitators of the community of inquiry to accept that what children can bring to the inquiry is equally as valuable as their own contributions.

Tentativeness, elaboration and challenge were evident through the ways in which the students used questioning – questioning of others and self-questioning as they unpacked their ideas within the communities of inquiry and small group focused dialogues. Questioning is an essential element of inquiry, but its success depends on what the questions aim to uncover and how questions are framed. Haynes (2008) posited CPI with children must honour the genuine thoughts and voice of the child but also attend to the philosophical nature of the inquiry. Turgeon (2015) argued that questions need to be crafted in meaningful ways and underpinned by both ethical and epistemological considerations. She further maintained that questions can open the dialogic space and invite reflective practice but also have the power to fracture or derail discussion. If the types of questions posed do not enable epistemic progress or allow students a genuine voice then they may not be useful during CPI. Turgeon noted "doubt, confusion, curiosity and expectation of truth" prompt one to question (p. 291). The evidence from this study demonstrated students could identify when suggestions were unclear, or if more was needed to advance their collective understanding and could skillfully weave questions through their suggestions in a way that cultivated further inquiry and exploration of doubt. Questions were posed thoughtfully and meaningfully, thus encouraging participants to take considered intellectual risks with the aim to deepen their understanding. The student data supported the conclusion that considered combination of tentativeness, elaboration and challenge needs to be embedded in the practice of questioning.

implications for educators

It would be considered *a big ask* to expect that all teachers could recognise the emergence of epistemic doubt within communities of inquiry, especially teachers who are inexperienced with the community of inquiry pedagogy. However, this investigation revealed students often presented doubt indicators during facilitation such as: questioning the point under discussion; hesitance or self-questioning when

presenting a point; persistence with an idea that challenges the general views of the community; alternative suggestions; counterexamples; or a change of mind in response to the reasoned ideas of others. These indicators did not always mean that the student was in a position of uncertainty or doubt, but they provided a signal for the facilitator to be aware of the possible emergence and cultivation of doubt or to pose further questions to gain a better understanding of the students' intended meaning. The doubt indicators could provide teachers with a method of doubt recognition. Through this research, the term *genuine* has taken on a significance beyond what may have been originally intended by Peirce regarding his notion of genuine doubt. Evidence from the data strongly indicates that the capacity for students to reach a position of genuine epistemic doubt is inextricably connected to ways in which a genuine inquiry process becomes initiated through the students' genuine interest in an issue or a concept of which they deem to be genuinely problematic.

conclusion

These findings have implications for the planning and implementation of classroom inquiries across learning contexts and disciplines. Students need to be encouraged to embrace uncertainty and epistemic doubt so that they become active, informed citizens. In our current world, information (often touted as knowledge) is instantly available and globally our current way of living and being has become unsustainable for the future of our world. With the emergence of COVID 19, came a significant and somewhat alarming increase in the global dissemination of fake news, leading to heightened skepticism and cynicism among individuals and communities. Therefore, it is more important than ever that students learn to question published 'facts', beliefs and theories, and further to this, acknowledge their agentic power to effect change and exercise reformative action. According to Renshaw (2016) this would be considered 'worthwhile agency'. Additionally, he proposed that from a sociological perspective, children's awareness of their own agency is linked to 'specific mediational

means within classrooms' that enable them to gain a sense of ownership over the learning and the environment in which it takes place (p.60). It is equally important that they understand their inter- and intra-connectedness to the world and their natural environment. Murris (2016) argued that "pedagogical transformation is grounded in relational ethic with collective responsibility for the shared intra-connected natureculture worlds" (p. 247). This would suggest the collective examination of epistemic doubt has a prime role in the education of children.

Semantically, the term *doubt* often stirs negative connotations due to notions of self-doubt and its often-enervating effects; however, this investigation focused on types of epistemic doubt. It would be important for both teachers and students to understand the differences between epistemic doubt and other forms of doubt (such as self-doubt), and to examine the possible consequences of each. Dewey (1916) maintained "education is a constant reorganizing or reconstructing of experience" (p.76). Students (and teachers) need to experience disequilibrium with their own beliefs and those of others through participation in authentic, deliberative inquiry situations in which individual uncertainty provides opportunities to cultivate collective doubt amongst members of the inquiry. The experience of 'sitting with' uncertainty or genuine epistemic doubt can prompt individuals within an inquiry to question and reconstruct their own beliefs/values and further, comprehend the complex interrelationship they have with the world in which they live.

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