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Lunn Brownlee, J. and Ryan, M. (2020). Supporting elementary school children to engage in collaborative argumentation : Developing a kaleidoscope framework of inquiry dialogue. *Teachers and Teaching*, 26(7-8), pp. 543-557. https://doi.org/10.1080/13540602.2021.1900811 .

Supporting elementary school children to engage in collaborative argumentation: Developing a kaleidoscope framework of inquiry dialogue

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While the early years of children's education have long been acknowledged as crucial in supporting learning and development, there has been less focus on argumentation literacy as a way to promote active learning. This conceptual paper explores a new cross-disciplinary teaching framework, called the kaleidoscope framework of inquiry dialogue, which explicates the role of elementary school children's collaborative argumentation processes during inquiry dialogue. The two key theories (reflective devices) in the framework include reflexivity and epistemic cognition. Using a kaleidoscope metaphor, we conceive of dynamic theoretical interactions which depend on aspects of children's collaborative argumentation skills and learning/teaching contexts (the pieces of colored glass contained within the kaleidoscope) that are in focus at any particular point in time. The paper first discusses inquiry dialogue and collaborative argumentation, followed by an overview of the underlying theories of reflexivity and epistemic cognition used in the kaleidoscope framework. Implications for supporting elementary school children's collaborative argumentation processes during inquiry are discussed throughout.

Keywords: epistemic cognition; epistemic reflexivity; AIR framework; collaborative argumentation; inquiry dialogue; elementary school education

Introduction

Education, which goes beyond a focus on work-related futures, supports children to become "active, responsible and engaged citizens" (OECD, 2018, p. 4). There is general agreement that a quality education involves, among other things, a focus on active or agentic learning experiences (e.g., Lazonder & Harmsen, 2016; OECD, 2018). Inquiry-based methods provide a means through which children can become more active and agentic in their own learning by engaging in "self-directed investigations" (Lazonder & Harmsen, 2016, p. 681). One such inquiry-based method involves the use of inquiry dialogue. Inquiry dialogue emerges in response to "an open question, and its main goal is to collectively formulate reasonable judgments, adding to a group's existing body of knowledge and mutual understanding (Walton & Macagno, 2007)" (Reznitskaya & Gregory, 2013, p. 118).

Inquiry dialogue involves a focus on argumentation, which is an essential life skill for active citizenship (Nussbaum, 2002; Wilkinson et al., 2017), with strong research evidence for its utility with regard to effective learning outcomes (Kuhn, 2015). Using argumentation to make decisions, even for elementary school children, can include elements of inquiry dialogue, collaborative argumentation processes and notions of epistemic cognition. Epistemic cognition describes how individuals formally and informally 'acquire, understand, justify, change, and use knowledge' (Greene et al., 2016, p. 1). We are interested in how teachers might support epistemic cognition related to argumentative reasoning during inquiry dialogue, specifically collaborative argumentation. Such a focus on inquiry dialogue reflects a type of epistemic education, which finds parallels in programs that include critical thinking, argumentation and inquiry, but distinguishes itself by the way in which it explicitly addresses the metacognitive aspects related to epistemic cognition (Barzilai & Chinn, 2018).

In this paper we describe a new cross-disciplinary theoretical framework which draws on Archer's (2012) critical realist frame of reflexivity (i.e., adaptability, self-awareness & decision making for action) and Chinn, Duncan, and Rinehart's (2018) epistemic cognition (epistemic *A*ims, *I*deals and *R*eliable (AIR) processes) to explore argumentation reasoning in the context of inquiry dialogue. By bringing together the theories of reflexivity and epistemic cognition, theoretical synergies emerge that illuminates argumentation reasoning in a different way and provides way in which teachers can recalibrate their instructional practices.

We create these theoretical synergies by using a kaleidoscope metaphor to explain not only the theories on which our framework is based, but also how these theories might intersect with each other to reflect argumentation and subsequent learning/teaching actions. Like a kaleidoscope, our framework is a viewing device for illuminating argumentation reasoning and action during inquiry dialogue in elementary school classrooms. Each of the contributing theories, reflexivity and epistemic cognition, act as reflecting devices (mirrors) within the kaleidoscope framework of inquiry dialogue. This mirroring means that in addition to a cause and effect mechanism in which reflexivity/epistemic cognition influences children's reasoning, we can conceive of interactions as always changing, depending on which aspects of children's reasoning and contexts for reasoning are in play at any particular point in time. Children's reasoning processes and their classroom learning/teaching contexts are therefore represented as the pieces of colored glass (later described as emergent properties) contained within the kaleidoscope framework of inquiry dialogue which are then interacting with the theories — our reflective devices — as the kaleidoscope of theories is manipulated.

In what follows, we first consider inquiry dialogue and collaborative argumentation as teaching and learning contexts in elementary school education. Next, we overview epistemic cognition using the recently theorized *AIR* framework as our first reflective device, followed by a discussion of reflexivity as the second reflective device. Finally, we explore how the kaleidoscope framework is informed by these two theoretical frameworks. The kaleidoscope framework of inquiry dialogue illuminates a new way of understanding, and supporting, children's argumentation reasoning and their decision-making during inquiry dialogue.

Inquiry dialogue for collaborative argumentation

Teaching through inquiry dialogue is a pedagogical approach to support children's collaborative argumentation (Reznitskaya & Wilkinson, 2017). It involves a collaborative approach to sorting various forms of evidence to establish conclusions in a way that is rigorous, logical and verifiable (Walton, 1998), and then using this evidence to take particular action. This approach to learning is supported by the OECD E2030 Position paper (2018), which argues that

> Learning to form clear and purposeful goals, work with others with different perspectives, find untapped opportunities and identify multiple solutions to big problems will be essential in the coming years (p. 4).

The OECD position articulated in this quote can be interpreted, in some ways, as supporting a focus on argumentation literacy.

Argument literacy lies at the heart of inquiry dialogue. Wilkinson et al. described argument literacy as reasoning that is related to understanding, creating and weighing up of arguments using discussions, reading, and writing (Reznitskaya &

Wilkinson, 2017). Put simply, an argument involves using reasons to support a claim (Reznitskaya & Wilkinson, 2017), which involves a process of weighing up or evaluation of ideas. A great deal of research into argumentation has taken place in the context of science education (Duncan et al., 2018). Nussbaum (2002) has explored how to promote effective argumentation in social studies, Reznitskaya and Wilkinson (2017) have examined argumentation in the context of literacy learning, and Gregory (2007) has explored how argumentation can be supported in communities of philosophical inquiry (similar to Philosophy for Children movement).

One specific type of argumentation involves collaborative argumentation. Collaborative (or dialectical) argumentation is about finding ways to work together to reach agreement on positions and to engage in reasoning with evidence to support such positions (Chinn & Clark, 2013). Chinn and Clark noted that such argumentation supports authentic everyday thinking skills, improves conceptual knowledge and motivation, and enables knowledge construction based on social processes. Kuhn (2015, p. 46) also posits that argumentation has a strong social underpinning based on "collaborative intellectual engagement". This relates to collaboration with others with the intent of promoting cognitive gains (Kuhn, 2015). She explains how children need to understand other's perspectives in order to argue against other's views, and that they also need to ensure that they can support their own points of view in the face of critique. Reznitskaya and Wilkinson (2017) also described the significance of helping children to look for other competing ideas and perspectives, describing these as 'challenges' (p. 22). These connections between divergent perspectives engage children in meta-reflection. Kuhn (2015) argues that argumentation involves simultaneously examining other perspectives as well as one's own perspective. This examination by others can help children to understand that their own perspective is fallible.

Reznitskaya et al. (2008) reported on the effectiveness of children engaging in argumentation reasoning. They examined changes in children's argumentation skills by examining four studies of collaborative reasoning across 14 elementary school classrooms. There were 10 classroom which served as comparison groups for the studies. The post-test only results showed that, overall, the children who experienced collaborative reasoning were more likely to create more written arguments, counterarguments and rebuttals than the comparison groups. Reznitskaya et al. (2008) argued that children who experience collaborative discussions regarding argumentation were more likely to demonstrate effective argumentation processes and that argumentation is clearly a skill that children in elementary school can attain.

Underlying collaborative argumentation is reasoning based on understanding, creating and weighing up different points of view (Reznitskaya & Wilkinson, 2017). This weighing up of different ideas suggests an evaluativist epistemic stance, in which knowledge is considered to be constructed and evaluated on the basis of multiple, sometimes competing, perspectives. Reznitskaya and Gregory (2013) described the connection between argumentation and evaluativist epistemic cognition, with epistemic cognition serving as an influence on, and an outcome of, dialogic teaching (i.e., inquiry focused teaching). Kuhn (2015) distinguishes between such argumentation based on an evaluativist epistemic stance and 'coalescent argumentation' (p. 50). Coalescent argumentation does now allow the exploration of divergent ideas and the focus is on coming to a joint understanding. Coalescent approaches to argumentation may not be as effective because ideas are simply aggregated 'rather than build on one another' (Kuhn, 2015, p. 51) and are thus more likely to reflect a subjective epistemic stance in which ideas are not evaluated. Collaborative argumentation, and the enactment of such

reasoning, is related to epistemic cognition, which is one of the reflective devices in our kaleidoscope framework of inquiry dialogue discussed next.

Epistemic cognition: The first reflective device for collaborative argumentation

The field of epistemic cognition has a long history spanning the last 50 years, beginning with the seminal work of William Perry (1970) who examined how university students' personal epistemologies changed developmentally throughout their undergraduate studies at Harvard University. Recently, the field has evolved in ways which recognises the more nuanced and context specific nature of epistemic cognition, as exemplified in the *AIR* framework (Chinn et al., 2014). *AIR* reflects epistemic *A*ims, *I*deals and *R*eliable processes and provides a way in which to consider children's epistemic cognition as a situated and social construct. The *AIR* framework forms the point of departure for our theorizing about teaching through inquiry dialogue and collaborative argumentation in elementary school education. In our kaleidoscope framework of inquiry dialogue, epistemic cognition is a reflective device for informing children's collaborative argumentation as they engage in inquiry dialogue.

The AIR framework of epistemic cognition

Chinn and colleagues described epistemic cognition as comprising epistemic *A*ims and values, *I*deals, and *R*eliable processes (*AIR* framework), which 'provide the resources that people use to create and evaluate epistemic products such as knowledge claims, models, evidence, and arguments' (Chinn et al., 2018, p. 242). The *AIR* framework, shown in Figure 1, provides a way to consider argumentation as both a reliable epistemic process and an epistemic product (argument) (Personal communication M. Kainulainen, November 2018).

[Insert Figure 1 here]

Figure 1

Adapting the AIR framework (Chinn et al., 2018)

Epistemic Aims refer to context specific 'goals to achieve epistemic ends... including knowledge, deep understanding, explanation, justification, true belief, the avoidance of false belief, useful scientific models, and wisdom' (Chinn et al., 2014, p. 428). *Epistemic Ideals* are the criteria or standards (Chinn et al., 2018) 'that must be met for an explanation to be good' (Chinn et al., 2014, p. 433). For example, Chinn et al. (2014) described how an effective explanation in science:

> (1) explains a broad scope of evidence, (2) is not contradicted by significant evidence, (3) is fruitful for future research, (4) is internally consistent, (5) coheres with other, accepted scientific explanations, and (6) (in some fields) specifies a causal mechanism (e.g., T. Kuhn, 1977; Newton-Smith, 1981) (p. 433)

These epistemic criteria or standards provide a way in which to judge epistemic outcomes such as arguments, justifications, knowledge, and evidence, either as something produced (created) or evaluated (Chinn et al., 2018).

Finally, *Reliable epistemic processes* (REPs), the third component of the AIR framework, 'comprises causal schemas specifying the processes by which knowledge and other epistemic products are reliably produced' (Chinn et al., 2014, p. 426). *REP*s are social, situated and meta-epistemic in nature (as for epistemic *I*deals) and may include a range of individual and group processes such as:

- individual processes (observe, perceive, read, evaluate perspective independently, consider personal experiences, displaying flexibility and open mindedness); and

- group processes (argumentation, brainstorming, discussion, group inquiry) (Chinn et al., 2018).

So, inquiry dialogue and argumentation are group processes that comprise *REP*s for achieving epistemic aims related to deep understanding and justification. However, *REP*s can also be unreliable under certain conditions (Chinn et al., 2018). For example, the process of arguing in small groups may become unreliable if voices in the group are silenced by others (Chinn et al., 2014). Here the silencing of others becomes a constraint on argumentation as a reliable process. Also, a reflexive approach to using *REP*s can lead to more informed action. For example, do children understand that different processes may be required at home and at school when deciding on what to play or who can be involved? These different contexts may require reflecting on personal, structural and cultural conditions as described next with respect to reflexivity.

Reflexivity: The second reflective device for argumentation

The next reflective device in the kaleidoscope framework relates to epistemic reflexivity. Reflexivity, according to Archer (2012), takes a sociological and critical realist view about how people navigate their lives by discerning personal concerns that are interrelated with social and cultural concerns (aims or goals). Archer's (2012) theory provides a generative bridge between sociological and realist perspectives as it includes individual thought processes within a broader sociological frame of critical deliberation and action in dynamic contexts. Once concerns are discerned, deliberation involves internal conversations that evaluate competing personal and contextual (structural and cultural emergent properties) concerns to arrive at a certain course of action. This decision making then leads to dedication in which some kind of action is taken (Archer, 2012) (See Figure 2). Recently, we theorized the role of epistemic reflexivity with respect to teaching in general (Lunn Brownlee, Ferguson, & Ryan, 2017). We briefly

overview this work to provide a context for considering how this framework might apply to teaching for inquiry dialogue.

[Insert Figure 2 here]

Figure 2

The Reflexive process (Lunn et al., 2018) -– a reflective device for collaborative argumentation in inquiry dialogue

Discernment is evident when teachers identify epistemic *A*ims and *R*eliable processes for decision making in their classrooms, often based on social priorities that they care about (Lunn Brownlee, Ferguson, & Ryan, 2017). Teachers then *Deliberate* by meta-cognitively identifying and weighing epistemic *A*ims and *R*eliable epistemic processes for teaching, keeping in mind situational enablements and constraints (Archer, 2012; Lunn Brownlee, Ferguson, & Ryan, 2017).

Enablements and constraints emerge through personal, structural and cultural properties in teaching contexts (Ryan et al., 2018). Structural emergent properties (SEPs) involve contextual situations, for example, classroom organization and management, curriculum, school rules, lesson structures, timetabling etcetera. Cultural emergent properties (CEPs) are the norms and expectations of the social group, ways of relating to each other, expectations of students and teachers, classroom climate, and ideas about knowledge that proliferate in classroom contexts. Personal emergent properties (PEPs) relate to the individual, for example, beliefs, motivations, knowledge, understandings. These properties can include epistemic and non-epistemic *A*ims and processes and are always emerging in relation to each other. Effective deliberation includes mediation of all three emergent properties and the consideration of which are

enabling and which are constraining so that adaptable decisions can be made about what to do next. We used this framing to argue that teachers can be meta-cognitively aware of how their own concerns, decisions and actions relate to the changing social context and prevailing beliefs, and how they might justify these.

Deliberation leads to *Dedication* or teaching actions in the classroom context (Lunn Brownlee, Johansson et al., 2017; Lunn Brownlee, Ferguson, & Ryan, 2017). This approach to reflexivity provides a social perspective of deliberation and action in decision making for teachers. We argue that this approach might help us to understand children's epistemic reflexivity and how it might provide a way in which argumentation in inquiry dialogue can be promoted in elementary education (Lunn et al., 2018).

In this paper, we argue that children can be supported to be reflexively (discern, deliberate and dedicate) and meta-epistemically aware of how their own concerns, decisions and actions can and should change according to different contexts. Research has shown that children are highly capable of these kinds of meta-cognitions when applied to topics and situations with which they are familiar (Walker et al., 2013).

Supporting children's epistemic reflexivity in the kaleidoscope framework of inquiry dialogue

We now extend on our original theorizing about epistemic reflexivity by exploring how to support epistemic reflexivity as children engage in collaborative argumentation during inquiry dialogue. We theorize that decision-making and action calibrates with epistemic stances by using the kaleidoscope framework. Reflexivity and epistemic cognition are mutually enhancing because the intersections help us to theorize about the epistemic decision-making process and actions taken within contexts that are always emerging. To examine this intersection, the three phases of reflexivity are now discussed and exemplified with respect to epistemic cognition. The two theoretical

reflective devices in the kaleidoscope framework are now discussed to illuminate collaborative argumentation that takes accounts of emergent properties and leads to action.

Discernment for inquiry dialogue and collaborative argumentation

The initial task shown in the kaleidoscope framework in Figure 2 is about discerning or identifying a range of big ideas/questions to explore in teaching for inquiry dialogue (cf. Reznitskaya & Wilkinson, 2017). To Discern an overall question or focus for inquiry, children might be supported to explore different viewpoints, including those of their classmates. However, discerning or reflecting on a question for inquiry also involves being explicitly meta-reflective about epistemic cognition using the three aspects of the *AIR* framework. To clarify, we use an example of an inquiry question/topic that is related to how best to support social inclusion at school (e.g., reducing bullying), a concept with which most elementary school children are familiar.

Epistemic Aims related to identifying an inquiry question/topic about supporting social inclusion at school could be explicitly discerned with respect to, for example, adopting the best inquiry question/topic about how to promote social inclusion at school, understanding others' perspectives about ideas of fairness, equity and inclusion of others, and the need to explain and justify a range of ideas about what might be done to include others as they pursue their focus. This would reflect epistemic aims for deep understanding and justification (Chinn et al., 2014), which would be essential in teaching for inquiry dialogue and collaborative argumentation. Continuing with the example related to identifying an inquiry question/topic for promoting social justice, children could be encouraged to identify how their personal experiences with being bullied might influence their own and other's experiences of participation at school (epistemic aim of deep understanding). Children might reflect on why inclusion of

others could be important for school and beyond, along with what they need to learn regarding social inclusion to make a stand on such issues (epistemic aim of justification of perspectives).

REPs for achieving such epistemic *A*ims of deep understanding and justification with respect to the example of social inclusion could include processes such as:

- whole and small group brainstorming about inquiry questions/topics that might be effective in promoting social inclusion in their school context;
- providing reasons for why chosen inquiry questions/topics are important for promoting social inclusion;
- making links between different inquiry questions/topics posed;
- weighing up the importance of different ideas for questions/topics posed as well as values (these examples are adapted from Reznitskaya & Wilkinson's [2017] argumentation practices).

Children would also need to be supported through small and whole group discussions to identify epistemic *I*deals or the criteria they would need to use to evaluate what constitutes good knowledge for understanding how to promote social inclusion. Although these criteria could be generated through classroom consensus, examples of such criteria for what constitutes good knowledge might include being accurate and using evidence (e.g., using well-supported sources of evidence, discussing the accuracy of information), making clear and logical connections between different ideas identified, and being consistent between claims and reasons (logical thinking — making sure we are making assumptions that are connected to claims) (Reznitskaya & Wilkinson, 2017). This would be at odds with epistemic ideals that valued, for example, children's personal experiences only as the sources of information for

inquiring about how to promote social inclusion. In this discernment phase, teacher encourage children to select an inquiry question/topic which can promote argumentation processes, but in addition children are supported to explicitly think about their own and the groups' epistemic *Aims*, *I*deals and *REP*s. This approach to epistemic reflexivity highlights the novel focus in the kaleidoscope framework on engaging in both discernment of ways forward (topics/questions) and being meta-epistemically aware of these processes as they consider epistemic *Aims*, *I*deals and *REP*s.

Deliberation using collaborative argumentation

In the next task, the inquiry question/topic, which was identified in the Discernment phase, is now subject to a process of Deliberation (See Figure 2). Such deliberation involves teachers helping children to engage in the processes of collaborative argumentation as they address the identified questions/topics. Deliberation involves weighing up both subjective conditions (personal concerns, motivations, knowledge) and objective conditions (structures, processes, cultural expectations in this context), considering what might enable or constrain a way forward, and then making a plan of action. This may seem like a complicated set of skills for elementary school children, but we know that young children are capable of engaging in argumentation processes (see for example Reznitskaya et al., 2008). While Deliberation suggests an individual process, we acknowledge the nature of group processes in collaborative argumentation (Personal communication L. Ferguson, October 2018). Each aspect of the *AIR* framework (epistemic *Aims*, *I*deals and *REP*s) is now discussed relative to the Deliberation during teaching for inquiry and argumentation. The epistemic *Aims*, *I*deals and *REP*s identified in the earlier Discernment phase would continue to be in focus as children work towards identifying ways forward with respect to their inquiry question. Here, both the phases of Discernment and Deliberation are intertwined.

Epistemic *A*ims for deliberation are similar to those described under the first task of Discernment. Like the epistemic aims for discerning a topic/question, the ones identified as children engage in collaborative argumentation need to have a meta-epistemic focus (see Reznitskaya & Gregory, 2013). The aims are meta-epistemic in nature because children continue to reflect on why is it valuable to adopt the best position about promoting inclusion, why is it valuable to achieve deep understanding of other perspectives, and why is it important to explain and justify perspectives and the monitoring and regulating of cognitive aspects as they deliberate on the exactly how they are going to support social inclusion.

REPs for deliberation build on those identified in the Discernment phase to include other processes that are more specific to the processes of collaborative argumentation, deciding about how to address the question/topic of social inclusion, and adapting to new ways of thinking as new ideas present themselves, for example:

- understanding each other's ideas and actively listening to, respecting and building on, each other's ideas about how to address the topics/question about social inclusion;
- changing ideas if others provide good ideas or better evidence;
- changing ideas if a point of view has not been carefully thought through; and
- identifying and developing positive attitudes (curiosity) to learning and focusing on argumentation as not a threat (adapted from Reznitskaya & Wilkinson, 2017).

The *REP*s in this list that relate to changing or adapting ideas and developing attitudes are significant in the Deliberation phase where children's *REP*s might vary based on the task at hand or context being experienced. This is an essential characteristic of deliberation – adapting to personal and situational contexts. We earlier described how

enablements and constraints are specific to teaching contexts and emerge through personal, structural and cultural emergent properties in such contexts (Ryan et al., 2018). These emergent properties can also relate to how children make decisions with respect to the use of *REP*s.

Structural emergent properties (SEPs) involve the contextual situation for children's learning, including classroom organization, curriculum, school rules, lesson structures, timetabling etcetera. For example, classroom organization as an enabler of small and whole group argumentation might include establishing classrooms which are supportive of low-level conversational noise. Children are more likely to decide to engage fully in collaborative argumentation if they understand that productive conversations and disagreements are valued and supported in the classroom by the teacher.

Cultural emergent properties (CEPs) are the norms and expectations of the social group, ways of relating to each other, expectations of students and teachers, classroom climate, and ideas about knowledge that proliferate in this context. This emergent property is also significant as a potential influence on the adaptive selection of *REP*s for collaborative argumentation. For example, if norms and ways of relating to each other in argumentation are construed by social groups as eristic (quarrelsome), then using a *REP* that involves arguing against a perspective might be challenging and not be considered to be a reliable way of achieving certain aims (see also Chinn et al., 2014). Children may choose to change their argumentation strategy if they are supported by teachers to perceive that argumentation involves engaging with personal conflict.

Personal emergent properties (PEPs) relate to the individual such as beliefs, motivations, knowledge, and understandings. For example, children with low levels of

self-efficacy may find the process of argumentation to be a socially challenging task and not something they would choose to engage in as a *REP*.

Finally, epistemic *I*deals which provides criteria for deciding the quality of knowledge evident in the decisions about how to go forward. As a group, children can be encouraged to decide on what comprises knowledge such as:

- the use of robust arguments which show consistency with evidence; and
- understanding what robustness means, what it means to show consistency, how to identify consistent arguments and how to apply *I*deals.

The kaleidoscope framework has two distinct intersecting reflective devices during this deliberation phase. These are reflexivity (and adaptability) based on a range of emergent properties (personal, cultural and structural) and meta-epistemic awareness of *A*ims, *I*deals and *REP*s. In this deliberation phase children make decisions using collaborative argumentation processes (which involves reasons to support claims by Reznitskaya & Wilkinson, 2017) with respect to the overall inquiry question/topic. However, in addition children are supported to explicitly think and become meta-epistemically aware of their own and the groups' epistemic *A*ims, *I*deals and *REP*s throughout the process of engaging in collaborative argumentation.

Dedication

The final aspect of the reflexive process involves Dedication (Archer, 2012). This aspect is about children enacting their Deliberations in school and class contexts, and potentially beyond. Throughout Discernment and Deliberation, children are supported to engage in reasoning which is explicitly linked to epistemic *A*ims, *I*deals and *REP*s in different contexts of inquiry. In the Dedication tasks, children are supported to enact their decision making in the context of the classroom or playground. If we return to the

example of bullying identified earlier, inquiry dialogue supports collaborative argumentation about social inclusion which can help children to take an active stand on social injustices they experience in their lives at school and beyond (Lunn Brownlee, Johansson et al., 2017). It is also anticipated that the cycle of Discernment, Deliberation, and Dedication may lead to further changes in children's epistemic *A*ims, *I*deals and *REP*s for reasoning and enacting social inclusion in their school environments because children are exposed to a range of different epistemic perspectives as they engage in inquiry dialogue and collaborative argumentation.

During Dedication the *A*ims, *I*deals and *REP*s are non-epistemic in nature although the reasoning which leads to action is epistemically informed. Examples of dedicated action might include the following:

- standing up for a classmate when others are teasing or excluding them;
- initiating new classroom roles or protocols that enable more of their peers to have a say in the day to day running of the classroom;
- identifying children to act as peer mentors in the playground for children who are experiencing bullying and social exclusion.

The kaleidoscope framework which includes the reflective devices of reflexivity and epistemic cognition, helps us to theorize how children apply their *A*ims, *I*deals and *REP*s, for example, in the classroom or playground, and how they evaluate their own performance through a new cycle of reflexivity. We present the complementarity of these approaches as concentric circles that constitute the kaleidoscope framework of inquiry dialogue (see Figure 3) that is both individual and social in nature. By complementarity we mean that each circle can move and calibrate with the different aspects of each approach depending on the emergent properties that arise in relation to

each other. We argue that a reflexive epistemic cognition, even for the same individual, is different as the kaleidoscope moves to account for dynamic contextual conditions, including the consequences of actions taken. Using our previous example related to social inclusion, epistemic reflexivity may need to be adaptive and social if some new students with different mobility requirements arrive in the classroom and new assumptions about inclusion need to be formed. The *REP*s would need to consider these emerging personal and structural properties when deliberating about how to promote social inclusion when a child experiences mobility challenges. This might include debate (collaborative argumentation) about how some members of our community are marginalized because of their mobility and how we understand the concept of disability. When children dedicate action, they might decide that, rather than excluding their new classmates, the game or the location might need to change in response to their new knowledge about the child's experience with mobility. In this way, as personal, structural and cultural properties emerge in a context, new epistemic *A*ims, processes, and *I*deals may need to be undertaken through new cycles of reflexive action. Epistemic education is never static: it must be dynamic to account for the nuances of the always emerging context.

[Insert Figure 3 here]

Figure 3

The Kaleidoscope framework of inquiry dialogue for collaborative argumentation (adapting the AIR framework and reflexive process)

The goal of education is that citizens "will better align their beliefs with evidence, that they will insist on evidence when making judgments, and that they will be more successful at attaining knowledge and spreading that knowledge" (Barzilai & Chinn, 2018, p. 362). With a focus on reflexive epistemic education, children can engage in collaborative argumentation to identify, analyze, and evaluate different perspectives, and ultimately enact their deliberations (Lunn Brownlee, Johansson et al., 2017; Lunn et al., 2018). Teaching for inquiry dialogue and collaborative argumentation may be important in supporting children to engage in evidential reasoning for a range of topics. Just as important, is the way that these reasoning processes are applied in action, and how children can evaluate their actions in relation to the emerging conditions of their context.

This paper has argued that epistemic education (Barzilai & Chinn, 2018) can be enhanced with a process of reflexivity (Archer, 2012) to enable children to apply their collaborative argumentation skills through real action. We have argued that epistemic reflexivity is akin to a kaleidoscope, whereby conditions (personal, structural, cultural emergent properties) can change and what constitutes a reflexive epistemic action might be adapted in response. We have explained how teachers can support children to move through an epistemically informed process of reflexivity so they can attain and share reliable forms of knowledge and take more informed action in response to a range of inquiry topics in education.

Acknowledgements: The authors would like to acknowledge the feedback provided on an earlier draft of this paper by the Epistemic Education group at Rutgers University (20 November 2018); and a range of individuals from this group who provided individual feedback during follow up discussions, avoiding identifying any of the authors.

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Figure 1

Adapting the AIR framework (Chinn et al., 2018)

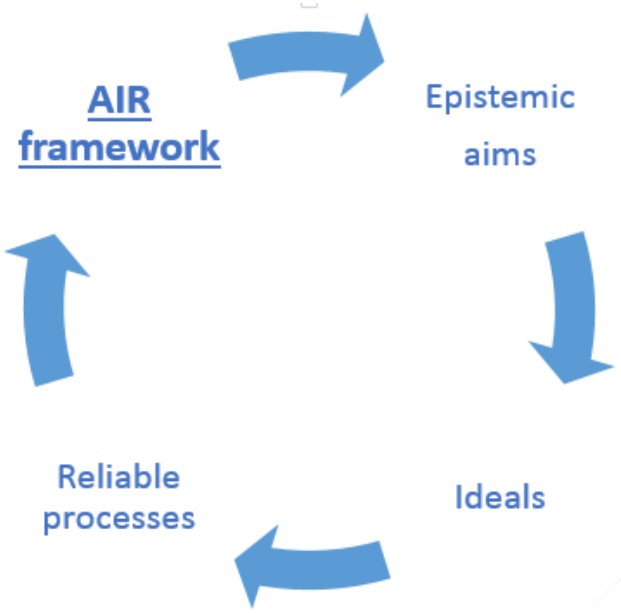

Figure 2

The Reflexive process (Lunn et al., 2018) -– a reflective device for children's argumentation reasoning in inquiry

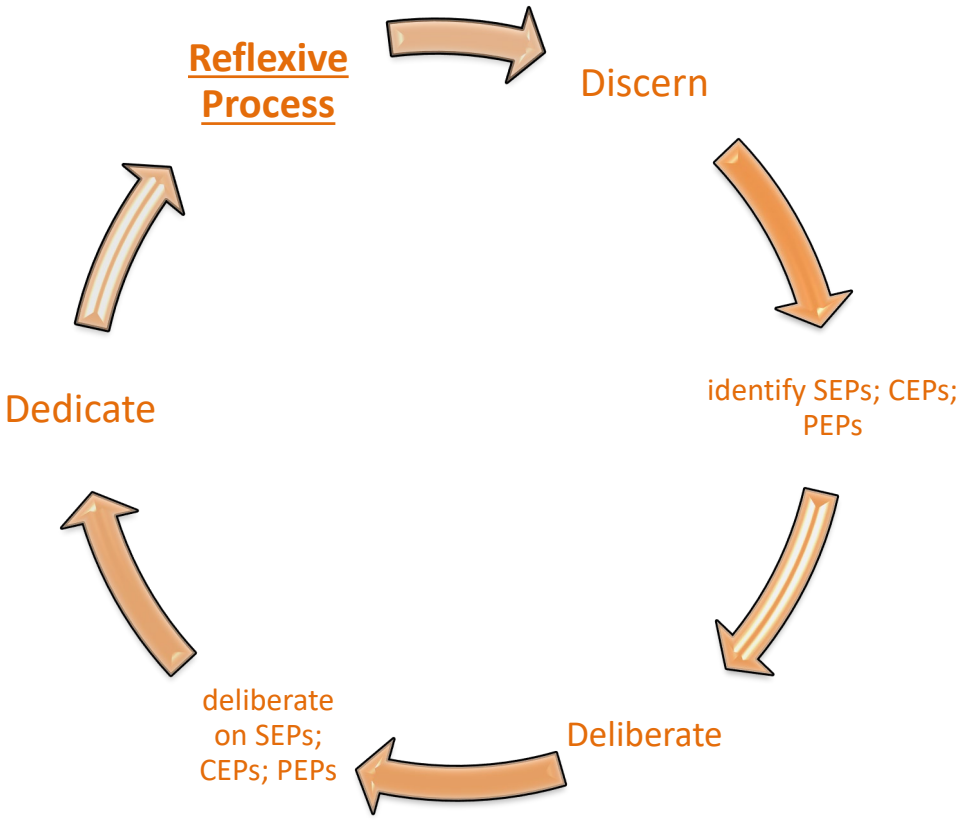

Figure 3

The Kaleidoscope of Inquiry for children's argumentation reasoning in inquiry

(adapting the AIR framework and reflexive process)