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How inquiring develops and affects well-being throughout childhood

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Office of Research – Innocenti Working Paper
WP 2021-14 | Dec 2021

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UNICEF Office of Research – Innocenti receives financial support from the Government of Italy, while funding for specific projects is also provided by other governments, international institutions and private sources, including UNICEF National Committees.

This project was co-funded by The Learning for Well-being Foundation and the Fetzer Institute.

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For readers wishing to cite this document, we suggest the following form: Vrolijk, M., Cebotari, V., Richardson, D., Cunsolo, S. (2021). *How inquiring develops and affects well-being throughout childhood*, Innocenti Working Paper 2021-14, UNICEF Office of Research – Innocenti, Florence.

No conflicts of interest were reported by the authors.

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Graphic design: Alessandro Mannocchi, Rome

Cover illustration: Sandbox Inc.

How inquiring develops and affects well-being throughout childhood

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ABSTRACT

This working paper is a first attempt to map the existing theoretical and empirical literature about a possible core capacity for well-being: inquiring. The main research question is: drawing from a multidisciplinary evidence base, what is the empirical and theoretical knowledge of children's inquiry, and how does it interact with overall child well-being throughout childhood? Moreover, the review of the literature will contribute to the understanding of inquiring as a core capacity for well-being within the Learning for Well-Being framework. The paper includes systematic searches in five electronic databases and a selection of studies based on pre-set criteria. It focuses on the development of inquiry throughout childhood, inquiry in education, inquiry in family settings, and possible links between inquiry and well-being. Moreover, children's inquiry is studied from various theoretical perspectives by applying a Matrix of Four Perspectives and an additional literature search. From the review of literature, multiple studies reveal different conceptual understandings of what inquiry entails. Inquiry shows characteristics of a core capacity, with evidence of the development of inquiry up to a certain age during childhood. However, evidence of the relationships between inquiry, well-being and spirituality is sparse. Various gaps in the empirical inquiry and question-asking literature exist, such as an underrepresentation of the youngest and oldest segments of the child population in empirical studies. None of the studies explored inquiry in a home environment for children beyond 10 years of age. Various studies show overlaps between inquiry and other possible core capacities. In combination with exploring eight further potential core capacities for well-being, this study can contribute to the understanding of core capacities benefiting child well-being.

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1. INTRODUCTION

There are many studies on how children ask questions and how this capacity develops over time. A teaching approach in science education prioritizes inquiry and conceptualizes children as little scientists. However, not all conceptualizations of children's inquiry processes focus on the child and how they experience inquiring. A study by Olsson (2013) argues for the importance of taking children's questions seriously. Moreover, Keifert and Stevens (2018) turn away from conceptualizations of inquiry in science education and focus on the child's everyday experience. In this working paper, the child's inquiry capacities are the focus point. This study aims to bring together various relevant research strands and findings to answer questions such as: How can we conceptualize the capacity of inquiring? What kind of evidence is there for its innateness? How does inquiry develop throughout childhood? What are the implications of having weaker or stronger inquiry capacities for a child or an adult working with children?

The main research question which this study explores is: drawing from a multidisciplinary evidence base, what is the empirical and theoretical knowledge of children's inquiry, and how does it interact with overall child well-being throughout childhood? The working paper maps evidence of the development of inquiry as a core capacity for children, studies the relationship between inquiring and child well-being, and explores the Learning for Well-Being Foundation's (L4WB) theoretical framework through applying a Matrix of Four Perspectives and an additional spirituality search. According to the L4WB framework, children's 'core capacities' support a child's well-being. The literature mapping will show to what extent evidence informs the hypothesis that inquiring can be understood as a core capacity for well-being.

The Measuring What Matters (MWM) overarching background paper further explains the conceptual L4WB framework and its background. This inquiry working paper is part of the MWM project. The project is a series of working papers that explore empirical and theoretical literature on nine core capacities for well-being: inquiring, relaxing, noticing (observing), listening, reflecting, subtle sensing, empathizing, enriching sensory awareness (embodying), and discerning patterns. This working paper can be read in combination with the other eight working papers on core capacities, the overarching MWM background paper, and the MWM synthesis report.

2. CONCEPTUAL UNDERPINNINGS

This study is part of a broader attempt to map the available empirical and theoretical literature on children's core capacities that might affect child well-being. It is a first attempt to map the existing theoretical and empirical literature about one of these core capacities: inquiring.

According to the L4WB framework, inquiring is defined as "asking questions to track an experience with openness and curiosity" (Learning for Well-Being Foundation, 2019, p. 6). L4WB conceptualizes the inquiry core capacity as follows:

> Inquiring involves seeking. It relates to actively seeking all manner of information (from the physical, emotional, mental and spiritual perspectives) and to tracking an experience with true curiosity whether it involves oneself, other people or the environment. Children do this naturally, and are excellent sources for demonstrating the meaning of 'true curiosity'. Inquiring also moves forward the experience, allowing an expansion of the topic and the action. Engagement in inquiring always opens more possibilities (p. 4).

Based on this definition, the search includes a broader concept related to inquiring: asking questions. Therefore, this study applied the search terms 'inquiring' and 'asking questions' to find relevant studies.

According to the L4WB hypothesis, each core capacity can be experienced through each perspective (mental, emotional and physical) and should have a spiritual dimension. Based on the L4WB definitions for inquiry, the matrix is applied to categorize all studies identified in this working paper (*see Table 1*). Applying the matrix to the inquiry literature contributes to understanding how the literature allows for the theoretical classification of inquiry within L4WB's four perspectives. The results section compares all studies placed in the matrix as a full body of evidence. More background information on the development of the Matrix of Four Perspectives is available in the MWM overarching background paper.

Table 1: Matrix of Four Perspectives on inquiring

			SPIRITUAL (S)
	content **'what'**	***process*** **'how'**	***intention*** **'why'**
MENTAL (M)	A *mental perspective* refers to "our cognitive and rational processes" and the functions of "envisioning, planning and valuing" (O'Toole, 2016, p. 17)	"A *mental* expression of inquiring is associated with seeking information, clarity, a sense of the overview" (Learning for Well-Being, 2019, p. 6).	"At a *spiritual* level, inquiring is expressed as an openness to the unknown and unknowable" (Learning for Well-Being, 2019, p. 6).
EMOTIONAL (E)	An *emotional perspective* refers to both "our intrapersonal functions – our inner feelings, motivations and our interpersonal functioning – [and] our interactions with others" (O'Toole, 2016, p. 17).	"An *emotional* expression of inquiring is associated with seeking engagement of sharing and caring" (Learning for Well-Being, 2019, p. 6).	
PHYSICAL (P)	A *physical perspective* refers to "the physical senses, to our bodies, and to the material and natural environments" (O'Toole, 2016, p. 17).	"A *physical* expression of inquiring is associated with seeking action and movement" (Learning for Well-Being, 2019, p. 6).	

3. METHOD

The purpose of this study is to map the empirical and theoretical evidence of inquiry as it relates to children and adults working with children. This working paper is a literature review that takes a systematic approach.

3.1. Systematic search procedure

This working paper consists of systematic searches in the following electronic databases: Google Scholar, PubMed, ERIC (Education Resources Information Centre), EBSCO and ProQuest's Psychology Database. A list of key search terms helped focus the search on studies likely to meet the inclusion criteria. List 1 includes terms or phrases related to inquiring based on the conceptual framework; list 2 includes terms or phrases related to the population of interest, and list 3 includes terms or phrases related to the focus of the research question (Appendix A). Each search included terms from each list inserted as free text into the keyword fields. Separate searches included all possible combinations of terms across lists. A list of all searches is available upon request. If the search with terms as free texts delivered too many results, the searches were limited by applying relevance sorting options and scanning the first 40 most relevant hits. Due to the substantial overlap when using the search terms 'children' and 'adolescents', combined searches were used (e.g. 'Inquiry AND (Children OR Adolescents) AND Development').

Each independent search was conducted for a 5-year period to find the most recent results (2015–2020), and a 20-year period (2000–2020). All findings were limited to English, peer-reviewed studies by selecting the appropriate options in each database. In addition, the literature was scanned for existing literature reviews, systematic reviews or meta-analyses by selecting the option to search for reviews in the past 20 years when available or by adding the search term 'review'.

3.2. Inclusion and exclusion criteria

To be included, a study had to meet various criteria at different levels of the review process. During screening and identification, a study had to include children or adults who have a direct and explicit link with children. A study also had to include an explicit link to inquiry, its development or its connection to well-being. When studies met these principal inclusion criteria, they still needed to meet quality tests for eligibility: conceptual coherency, appropriateness of methods and scientific validity (Appendix B). The ethical conduct of each study was reviewed but was not a requirement for inclusion. The included materials had to be in a standard format (such as papers, reports and policy briefs) and not duplicate a study already included. Studies were excluded if they explored the development of core capacities or life skills but did not explicitly focus on the development of inquiry. Studies were also excluded if they solely considered the development of inquiry in adults without any links to children or adolescents. Finally, studies on children beyond typically developing children were excluded due to the vast amount of studies resulting from the initial searches. If all the different groups of children had been considered, this mapping paper would not have been achievable within its current scope.

All searches were recorded, and the details of searches, the number of excluded studies and the details of accepted studies were documented. The detailed record of searches and studies was archived and is available on request. In addition, the flow diagram in Table 2 includes an overview of how many studies were identified and retained based on the inclusion and exclusion criteria.

Various subsections are included in this paper to answer the research question. Topics include the development of inquiry across childhood, the effect of interaction between professionals and children for developing inquiry, overlap with other core capacities, and links with well-being.

Table 2: Flow diagram for the inquiry review

	Studies	Excluded studies
IDENTIFICATION	Studies identified through database searching including duplicates (*n* = 6,808,735). *Titles were read when appearing within the first 40 most relevant results.*	Studies excluded based on relevance hierarchy in databases (*n* = 6,805,193).
	Study titles read through (*n* = 3,542). *When relevant abstracts were opened and read through entirely.*	Studies excluded based on titles/abstracts (*n* = 3,096) and duplicates removed (*n* = 168).
SCREENING	Study abstracts read through (*n* = 278). *When relevant the full papers were loaded.*	Studies excluded based on abstracts (*n* = 113) and final duplicates removed (*n* = 35).
	Abstracts accepted and full papers loaded (*n* = 130).	Studies excluded based on fuller reading (*n* = 67).
ELIGIBILITY	Papers read through more closely (introduction, methodology, conclusion) and sorted within relevant subtopics when meeting the inclusion criteria (*n* = 63).	Studies excluded after full reading and final checks (*n* = 21).
INCLUDED STUDIES	Full paper read and included in the results (*n* = 42).	

3.3. Inquiry from the perspective of spirituality

An additional search round was conducted to incorporate possible evidence from the spiritual perspective on inquiry. This search was done in response to the identified evidence gap for inquiry and spirituality. In order to identify high-quality evidence relating to spirituality and inquiry, the input of various experts was considered, including the Learning for Well-Being Foundation, the Fetzer Institute and relevant individual researchers focusing on spirituality. Additional searches were conducted to find alternatives for suggested articles that were not available. Overall, 46 studies were examined through searching for the key terms 'inquiry' (search term 'inquir') and 'question-asking' (search term 'question') in the full texts.

The inclusion and exclusion criteria were applied to the resulting list of spirituality articles. This time, the suggested articles and books were included when the study was: explicitly on spirituality, of an empirical nature, on inquiring or question-asking, on children or adults who have a direct and explicit link with children. Moreover, the quality assurance inclusion criteria were applied (Appendix B). Finally, all material had to have a standard format and not duplicate a study already included. A detailed record of studies was archived and is available upon request. The flow diagram in Table 3 shows how many studies were suggested, searched through and finally included.

Table 3: Flow diagram inquiry and spirituality searches

	Studies	Excluded studies
IDENTIFICATION	Studies suggested and identified in additional search (*n* = 160).	Duplicates removed (*n* = 6) and studies excluded based on non-availability (*n* = 18) or relevance (e.g. not on spirituality) (*n* = 90).
SCREENING	Complete studies searched for inquiring key terms (*n* = 46).	Studies excluded based on no results for inquiring key terms in entire text (*n* = 19).
ELIGIBILITY	Papers read through more closely (introduction, methodology, conclusion) and sorted within relevant subtopics when meeting the inclusion criteria (*n* = 27).	Studies excluded based on fuller reading and application of quality assurance assessment criteria or due to irrelevance for inquiring/question-asking (*n* = 26).
INCLUDED STUDIES	Complete empirical study read and included in the results (*n* = 1).	

3.4. Applying the Matrix of Four Perspectives

Each of the studies included in this working paper is positioned within the Matrix of Four Perspectives. This positioning answers the question to what extent conceptual and empirical evidence supports the L4WB hypothesis. The placement of the studies in the matrix was supported by the L4WB inquiring definitions (*see Table 1*) and the types of studies identified (*see Table 4*). After the matrix was applied, two authors compared the matrix, discussed the placement of articles that raised questions and made necessary adjustments. When disagreeing, the authors rechecked the application of the matrix and discussed the questioned papers until reaching agreement. Overall, 41 articles were placed in the matrix (two articles could not be placed). Of these 41 articles, seven articles were replaced after the review process described above: four articles changed position on the continuum (e.g., 'emotional how' to 'emotional what'); one article changed category ('mental what' to 'physical what'), and two articles changed category and position on the continuum (e.g., 'emotional what' to 'physical how').

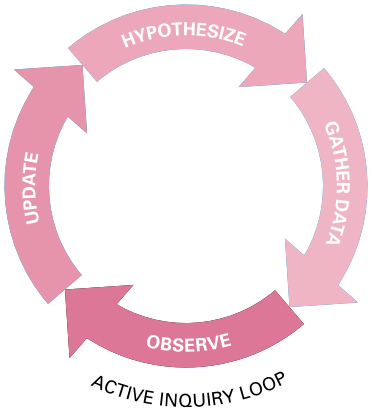
Table 4: Types of studies for the Matrix of Four Perspectives

			SPIRITUAL (S)
	content **'what'**	***process*** **'how'**	***intention*** **'why'**
MENTAL (M)	Studies on inquiring in children.	Studies that explore how inquiring develops throughout childhood/ in response to specific individual interventions.	Studies that focus on why children inquire and studies that focus on spirituality explicitly.
EMOTIONAL (E)	Studies on the relationship between inquiring and feelings/interpersonal relationships.	Studies on how relationships or feelings influence inquiring.	
PHYSICAL (P)	Studies that focus upon the physical aspects of inquiring or on doing the action.	Studies into how doing the action or the physical environment can affect inquiring.	

4. RESULTS

Since 'inquiring' is an elastic term, studies in various disciplines conceptualize it in different ways (Capps et al., 2012). Kachergis et al. (2017) distinguish a process of active inquiry to include hypothesizing, gathering data, observing and updating (*see Figure 1*). Similar is an understanding of inquiring as the process of asking questions to gather information (Mills and Landrum, 2016, p. 1). Many studies use 'question-asking' almost interchangeably with 'inquiring' (Mills et al., 2011; Ruggeri and Lombrozo, 2015). The relationship between inquiring and question-asking in this working paper is based on understanding inquiring as dependent upon asking a successful question to gain information (Kachergis et al., 2017, p. 408). Kachergis et al. (2017) built on early research into the developmental change in the ability to ask questions by Mosher and Hornsby (1966). They differentiated between types of questions asked, such as hypothesis-scanning questions and constraint-seeking questions.

Figure 1: Active inquiry loop *(Kachergis et al., 2017, p. 408)*

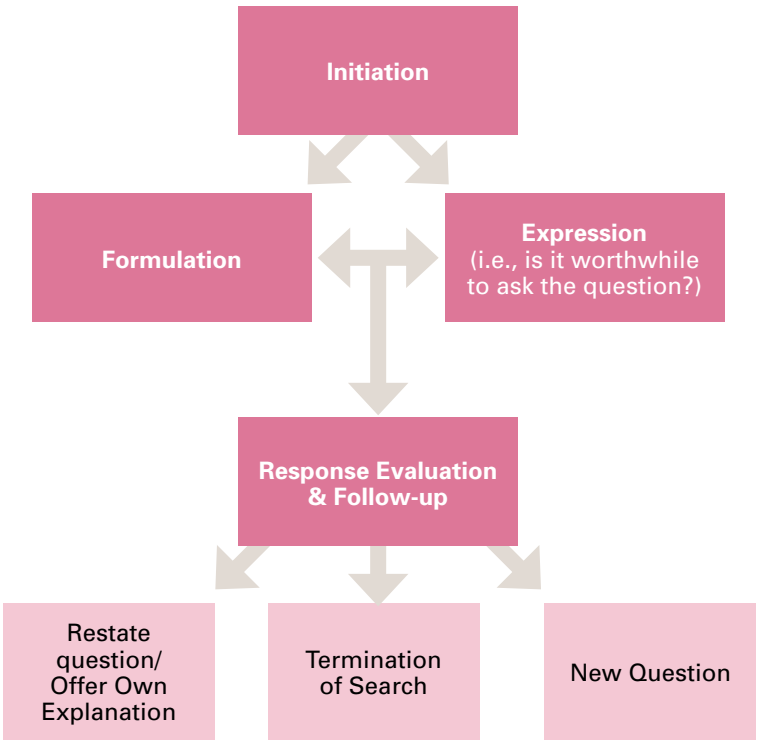


Chouinard (2007) saw children's questions as a force in cognitive development. In four studies, question-asking was conceptualized and analysed as part of the Information Requesting Mechanism, which includes question-asking and other behaviours for gathering information, such as "gestures, expressions and vocalizations" (p. vii). Chouinard recognized various approaches to studying children's questions, including linguistics (the ability to form questions), education (how questioning can improve academic achievement), and psychology (measuring what children know in various domains). However, she only explored the educational and psychological approaches since, she argued, only these are relevant for knowledge development:

> Unlike information that children might come across while engaged by something else, or information that other people offer when children are not ready for it (information that might be ignored or misinterpreted based on the children's current conceptual structures), in theory children's questions get answers exactly when the children can use them most, when they are open to the information, and when they are trying to resolve a state of disequilibrium (p. 3).

Questions as means for knowledge development overlap considerably with inquiring. This type of questions has been described as the "epistemic function of questions – the intentional use of questions to seek information that bridges a knowledge gap or resolves uncertainty" (Ronfard et al., 2018, p. 102). Ronfard et al. recognized various other functions of questions, such as social, pragmatic or educational functions, but focused purely on reviewing studies that explored the epistemic function of questions (p. 102). They proposed a framework for epistemic questions (*see Figure 2*).

Figure 2: Framework for epistemic question-asking *(Ronfard et al., 2018, p. 103)*



Initiation: Triggered by the realization that information is lacking and needed.

Formulation:

1. Identifying what information to ask for (and what possible answers might look like).
2. Phrasing the question so that is understood.

Expression: Deciding whether it is worthwhile to ask the question to someone.

1. Identifying whether someone is available to provide reliable information.
2. If such a person is available, whether it is acceptable to request information from this person given the context.

Response, Evaluation & Follow-up: Assessing the answer and deciding whether additional information is needed.

Capps et al. (2012) showed the complexity of finding a shared understanding of what inquiry is within the educational field. Relevant concepts they used were: 'scientific inquiry', 'inquiry-based learning', and 'inquiry-based teaching'. They understood scientific inquiry as research carried out by actual scientists who "study the natural world and propose explanations based on evidence derived from their experience" (p. 293). In their study, they differentiated scientific inquiry from classroom inquiry (pp. 293–295). The implication for the present study is that certain studies that explore scientific inquiry are not directly insightful for furthering knowledge about the development of inquiry as a core capacity in children and adolescents. Studies that explore the relationship between education based on or centred on inquiry were considered but only included if they provided an actual insight into children's inquiring.

Moreover, from a constructivist perspective, inquiry can be understood as a meaning-making process. An example is the literature review about the relationship between play and inquiry in young learners (Pistorova and Slutsky, 2018). Table 5 provides an overview of the various concepts related to inquiry, showing how some definitions clash or overlap and some differences are unclear. For instance, the concepts of active inquiry, scientific inquiry and authentic inquiry might all refer to the same type of inquiry.

Various studies included related but at times not wholly overlapping concepts, such as curiosity and play. For example, in one study, the definition included for curiosity was: "a desire to acquire new information and knowledge and new sensory experience that motivates exploratory behaviour" (Litman and Spielberger, 2003, p. 75 as cited in Reio et al., 2006, p. 2).

In another study, an evidence-based five-dimensional curiosity scale was developed for describing the various individual factors contributing to curiosity: Joyous Exploration, Deprivation Sensitivity, Stress Tolerance, Social Curiosity and Thrill-seeking (Kashdan et al., 2018). In this study, dimensions of curiosity overlap with inquiring. Moreover, types of curious people include the 'Fascinated' and the 'Problem-solver', who are all seeking new knowledge for various purposes (Kashdan et al., 2018, p. 130).

In a review into curiosity in educational contexts, Grossnickle (2017) examined various definitions and measures of curiosity. These included curiosity as a personality trait but also as "a motivator of exploratory behaviour" (Grossnickle, 2017, p. 23). Especially the latter understanding of curiosity shows a complete overlap with the concept of inquiry. Furthermore, another relevant concept is play, which is a possible manner in which inquiry manifests among young children (Pistorova and Slutsky, p. 495). Overall, curiosity, play, eagerness, inquisitiveness and interaction can be conceptualized as playing a role in the individual inquiry process.

Table 5: Conceptual understandings of inquiry

Concept	Definition/ Insight
Inquiry	the process of asking questions to gather information (Mills and Landrum, 2016, p. 1).
Inquiry	"the process through which we make meaning of our world" (Pistorova and Slutsky, p. 495).
Active inquiry	"unfolds as a sequence of mental steps" (p. 407). These include hypothesizing, gathering data, observing and updating. "Active inquiry fundamentally depends on the ability of learners to construct actions or queries which gain information (e.g. asking a question of a knowledgeable adult)" (Kachergis et al., 2017, p. 408).
Scientific inquiry	Authentic inquiry. "Scientific inquiry has been defined as, '…the diverse ways in which scientists study the natural world and propose explanations based on evidence derived from their work' (NRC 1996, p. 23), 'the process by which scientific knowledge is developed' (Lederman 2004, p. 308), or more simply as the research carried out by actual scientists (Chinn and Malhotra, 2002)" (Capps et al., 2012, p. 293).
Classroom inquiry	"The NSES consider classroom inquiry to have three different meanings; two of which are educational outcomes while the third is a teaching strategy. The educational outcomes of inquiry are composed of one's ability to inquire scientifically, which includes asking and identifying questions, planning and designing experiments, using data, and connecting it with explanations; and inquiry as a content area of study or the knowledge of how scientists do their work, for example realizing that scientists ask questions, perform different types of investigations, and produce explanations based on observations (NRC, 1996, p. 121). The third meaning of classroom inquiry is a kind of pedagogy; inquiry-based teaching concerns the pedagogy of inquiry or one's ability to employ inquiry instruction in the classroom (NRC, 2000)" (Capps et al., 2012, p. 294).
Inquiry-based teaching	"concerns the pedagogy of inquiry or one's ability to employ inquiry instruction in the classroom (NRC, 2000)" (Capps et al., 2012, p. 294).

4.1. Reviews existing in the field

Relevant reviews for this study included literature reviews, systematic reviews and a meta-analysis. Of the studies included in this paper, 11 were reviews.

The development of children's ability to ask questions in early childhood was reviewed by Ronfard et al. (2018). The overall results showed how children's question-asking abilities develop enormously during their early years. In another literature review, Pistorova and Slutsky (2018) focused on young learners and argued that engaging in play naturally develops inquiry.

Another group of reviews focused on inquiring in formal education. Marian and Jackson (2017) built on a literature review for proposing a new assessment model and tool that includes play. However, this model is specifically for assessing science skills in early learning years. Khalaf (2018) built on both quantitative and qualitative studies within traditional and inquiry-based learning and found both application and functional drawbacks for traditional and inquiry-based learning. For inquiry-based learning, these included application difficulties due to school systems, curricula, and the teacher's role. The functional drawbacks included learner's motivation, learner's ability to use technology, background knowledge of inquiry-based learning and managing learning activities. Furtak et al. (2012) conducted a meta-analysis into inquiry-based teaching and student learning in science education. They criticized previous meta-analyses of inquiry-based teaching for applying inquiry-based education as a dichotomy (being present or not). Instead, they treated inquiry as a spectrum defined with two dimensions: "the cognitive and social activities of the student and the guidance provided to students by their teacher, their peers, or curriculum" (p. 305). Their study is discussed further in the section on inquiry in formal education.

Capps et al. (2012) explored empirical studies about inquiry-based professional development interventions within science education. While many professional development features were included, they found exceptions for supporting teachers in developing inquiry-based lesson plans, providing authentic inquiry experiences, and focusing on science content for teachers. The inquiry skills of the teachers were not analysed in the context of the students' inquiry skills.

Raulston et al. (2013) conducted a systematic review into the effect of question-asking interventions for children with autism spectrum disorder in which 21 empirical studies were included. Factors present in all studies were:

> (a) ensuring participants are motivated to ask questions by identifying preferred items and/or activities and strategically arranging the instructional environment, (b) using information and access to preferred items or activities as positive [natural] reinforcement for question-asking, and (c) using systematic prompting and prompt fading (e.g., time delay) (p. 876).

All 21 studies found that the participants acquired or improved the question-asking skills specified. Moreover, the participants seemed to improve other skills by participating in the question-asking intervention, such as expressive labelling after asking for a name of an item and requesting information when challenged by tasks that were too difficult. However, due to the focus on typically developing children, this study was further excluded.

4.2. Inquiry and development across childhood

No studies were identified that applied the term 'inquiry' to describe its development within children or young adults. However, there is a considerable body of literature on the development of the ability to ask questions. Of the 46 studies included in this working paper, 21 focused explicitly on question-asking ability in children and its development.

Various studies included in this working paper referred back to Chouinard's (2007) collection of studies that explored the development of question-asking as a mechanism for cognitive development (Kurkul and Corriveau, 2018; Ronfard et al., 2018). In Chouinard's study, five predictions about the development of question-asking were supported with evidence:

> 1) Children can and do ask questions to gather information. 2) Children get the information they request. 3) Children are motivated to get the information they request. 4) The questions children ask are relevant to their cognitive development. 5) Children can generate questions purposefully to achieve a goal and use the information they get to reach that goal and achieve a change in knowledge state (pp. 98–99).

Based on these five supported predictions, Chouinard (2017) concluded that question-asking can be an appropriate method for cognitive development and is part of the Information Requesting Mechanism. Moreover, Chouinard (2007) focused upon preverbal children and how they recruit information through gestures and vocalizations (pp. 12–13). The ability of very young children to communicate their ignorance and ask for information was explored in a more recent study that found that a very young child can indeed look toward an available adult to "convey ignorance via nonverbal gestures (flips/shrugs), and increasingly produce verbal acknowledgments of ignorance ('I don't know')" (Harris et al., 2017, p. 7884). These studies concluded that asking informative questions to bridge knowledge gaps is innate and mainstream.

Another study explored strategies for gaining answers to questions, such as asking another person for the information or looking for the information by oneself in older children. Fitneva et al. (2013) explored whether children develop a preference for information gathering methods by testing when they ask for information and look for information. From the age of six, children reliably look for visible information and ask for invisible properties. This result suggests a clear development in learning efficacy (Fitneva et al., 2013). The implications are that inquiry does not necessarily mean that the child's inquiry method is asking a direct question to another person, even when the child can speak. At times, a child may choose to look for the information themselves or search for the answer from another available source.

Ronfard et al. (2018) stated that the development of children's ability to ask questions is not researched enough and that existing research is spread over the diverse fields of psychology, education and developmental psycholinguistics. This spread causes a lack of coherent understanding in the development of children's question-asking ability. To combat this lack of understanding, the authors split up early child development into three periods: infancy and toddlerhood (aged 12 to 35 months), preschool (3 to 5 years) and elementary school (6 to 10 years). The review concluded that:

> [E]lementary years are an important developmental period for children's question-asking. In contrast to pre-school children, elementary school children ask more informative questions and can coordinate multiple aspects of the question-asking process. They are also able to adapt their search in real time as they gain information about the likelihood of hypotheses (p. 112).

From their review, Ronfard et al. (2018) concluded that the ability to ask questions develops with age.

Various recent studies explored elements included by Chouinard (2007) and Ronfard et al. (2018) and extended their studies to a broader population. In a collection of two studies on how children adapt their questions to achieve a desired result, Ruggeri and Lombrozo (2015) found a developmental shift. They compared problem-solving questions from young children, older children and young adults. The younger children used more hypothesis-scanning questions (which ask to test a hypothesis directly), whereas older children and especially young adults used constraint-seeking questions increasingly (which reduce the options in the hypothesis) (Ruggeri and Lombrozo, 2015). Interestingly, both studies consistently revealed that age did not heavily influence solving the problem successfully: "neither study found a consistent boost in overall performance with age" (p. 213). The most critical variable was related to the nature of the task rather than the child's individual characteristics (p. 214). Thus, factors besides age can be more decisive for successfully solving a problem.

In various articles, Mills and colleagues explored different aspects of the development of question-asking (Legare et al., 2013; Mills et al., 2012; Mills and Landrum, 2016; Mills et al., 2010; Mills et al., 2011). Mills et al. (2010) built on previous research that showed how generally very young children ask questions to find out information. Furthermore, they established three component skills of the cognitive process that need to be successfully developed to solve a problem through question-asking: "determining whom to question, formulating effective questions, and applying information" (p. 537). The researchers concluded that preschool-aged children are able to use questions to solve problems and can direct these questions to the right person (based on expertise). This ability develops dramatically with age and experience. In addition, children can identify appropriate sources of information before they can ask effective questions (2010). In Mills et al. (2011), these findings were further explored, and the focus was on children who could distinguish between a knowledgeable informant and inaccurate or ignorant ones. The findings showed that increasing age and distinguishing

between types of informants helped with problem-solving; however, asking enough questions influenced success more. Another study found that the amount of constraint-seeking questions for accurate problem-solving increased from age 4 to 6 (Legare et al., 2013). Mills et al. (2012) examined whether children learned from listening to somebody else's questions in a *Guess what is in the box design* experiment. Generally, children learned from overhearing answers to questions asked, even when not instructed to do so and when occupied with other tasks (Mills et al., 2012). Mills and Landrum (2016) concluded that children learn from new information when directing their questions to reliable and less reliable sources of information. The individual difference between children in asking enough questions mattered more for their success than how the children learnt about the reliability of the source of information.

Kachergis et al. (2017) adapted the *Guess Who* paradigm to a tablet-designed game in which children had to find out which insect was hidden. The researchers manipulated the complexity of the task by including an automatic update after a constraint-seeking question and studied the effect on question-asking behaviour. In one condition, children had to select the insects that did not match the answers themselves, while this was done automatically in the automatic condition. They suggested that the children's question-asking improved due to the increased difficulty of the task:

> We suggest that the greater mental effort required by manual updating actually led to more careful consideration of which feature query to use, and ultimately a better choice. This is a type of desirable difficulty in the sense that aspects that made the learning task ostensibly more difficult led to more sophisticated question-asking behaviour (p. 415).

This study was limited to the specific age group of children aged 5 to 10 years and was conducted in the United States. The researchers concluded that for children aged 5 to 10, some active inquiry skills improve when a task is made more difficult.

Original aspects of question-asking behaviour were studied in another group of studies. A study with preschoolers considered what children genuinely want to know when they ask "What is it?" about an unknown artefact (Kemler Nelson et al., 2004). Children aged 2, 3 and 4 years were interested in the function of the unfamiliar item rather than just its name (p. 384). In a study on genuine and test questions, very young children differentiated test questions from genuine questions, and thus the "two-year-olds understand something of the communicated intentions behind test questions" (Grosse and Tomasello, 2012, p. 192). Test questions, which aim to test the knowledge of the child rather than ask a genuine question, make up one third of the questions that children experience (p. 193). Situational factors can also influence question-asking. In an earlier study, the classroom seating arrangement conditions showed that students asked more questions in a semi-circle seating arrangement than in a row-and-column setup. In addition, there were specific zones of action in both arrangements where children were seated who asked questions (Marx et al., 2000).

Another noticeable aspect of the question-asking literature is that most empirical studies considered the development of question-asking ability in preschool children (aged 3 to 5 years). Out of the 21 question-asking development studies, 9 studies included empirical data from children aged 3 to 5 years, 3 from children aged 0 to 35 months, 5 from children aged 6 to 10 years, and only 3 from children aged 10 years to adulthood. While most studies were on younger children, a study into the question types of early adolescents, middle adolescents and young adults also showed that information-seeking by asking questions develops further and is fundamental to solving some problems for this older population (Drumm and Jackson, 2017). Drumm and Jackson (2017) studied

the question-asking ability of middle school students (average age 14 years), middle adolescent high school students (average age 17 years), and young adult college students (average age 21 years). All participants in the study were enrolled in regular classes in Midwestern North American schools or colleges. The researchers found that for most age groups, conceptual questions took longer than perceptual questions. Only the youngest group took longer for multi-category questions than for perceptual questions, while the older groups did not need more time to generate such questions.

A minority of studies examined question-asking in a natural setting and as part of natural conversations. Ronfard et al. (2018) found that most findings informing the formulation and evaluation stages of question-asking were based on forced settings, as shown from multiple studies above. For instance, as part of the *20 questions* or *Guess Who* paradigms, children asked questions to discover which object was hidden. Due to the nature of the studies, there was less insight into the ability of children to formulate and evaluate questions in more natural settings (p. 113).

4.3. Formal inquiry-based education

A large amount of literature explores formal inquiry-based education, especially in the field of inquiry in science education. Various literature reviews focus on the effectiveness of inquiry-based learning (Khalaf, 2018), inquiry-based learning within science education (Furtak et al., 2012) and the effect of inquiry-based teaching on the inquiry skills of students (Harwood et al., (2015).

In a systematic review, Khalaf (2018) compared the literature of both traditional and inquiry-based learning between 2002 and 2017. In the review, challenges for inquiry-based learning were raised, including "students' inability to access investigative techniques" (p. 557) and "student's background knowledge of inquiry-based learning" (p. 558). Although the review was on inquiry-based learning, the students' ability to inquire was not taken into consideration or explicitly addressed.

Effects of an inquiry-based model for learning in science education were included through a meta-analysis by Furtak et al. (2012). Within the cognitive dimension of inquiry, three categories of inquiry were described: "*conceptual* structures and cognitive processes that are used during scientific reasoning, *epistemic* frameworks used when scientific knowledge is developed and evaluated, and *social* interactions that shape how knowledge is communicated, represented, argued and debated" (p. 305). The framework was based on Duschl's conceptualization of inquiry-based teaching and learning (Duschl, 2003, 2008 as cited in Furtak et al., 2012, p. 305), and proposed a fourth *procedural* domain that includes: "asking scientifically oriented questions, designing experiments, executing procedures, and creating data representation" (p. 305). Through their meta-analysis, they provided evidence of a positive effect of the inquiry-based teaching approach on student learning, especially when the student's inquiry activities were epistemic or combined (epistemic, conceptual and social). The positive effects of the inquiry-based teaching approach were stronger when the activities completed were teacher-led rather than student-led. These findings support the conclusions from another study that unguided inquiry learning in science education is not effective (Lazonder and Kamp, 2012). While inquiry-based education shows positive effects on student learning in general, there are specific conditions where this applies more, such as a higher nature of guidance during the activities.

Guidance of the inquiry activity was also a decisive factor in a study with high-ability children. Eysink et al. (2015) examined whether individual differences between students required different inquiry approaches in the classroom. They built upon research showing that for average children up to secondary school, effective inquiry learning can only occur when teacher support is given.

In such guided inquiring tasks, learners are "guided through the inquiry cycle, but still have to engage in hypothesizing, experimenting and concluding" (p. 64). Similarly, gifted primary school students experienced the highest knowledge acquisition, flow and positive mood in the structured inquiry condition (teacher-led) compared to unstructured and exposed inquiry conditions. In a following study, higher-ability children completed inquiry tasks more successfully but also used available prompts more than children of lower and middle abilities (van Dijk et al., 2016). While desired levels of guidance for successful inquiry tasks may not vary based on individual ability, the use of prompts and success in completing an inquiry task does vary from student to student.

Further studies explored personal characteristics and differences for inquiry in learning. Cremin et al. (2015) explored synergies between inquiry-based and creativity-based approaches to education in Early Years science and found that questioning and curiosity are one of the categories of common pedagogical synergies between the two approaches: "in playful motivating and exploratory contexts, young children, often supported by their teacher, engage with resources, ask questions, collaborate and find and solve scientific problems" (p. 416). Van Schijndel et al. (2018) investigated whether individual differences in children's curiosity related to inquiry-based learning. The results showed that curiosity in science education influenced learning:

> Children's curiosity was found to be positively related to their knowledge acquisition: high curious children learned more from inquiry-based learning than low curious children. Importantly, even though children's intelligence was also positively related to their knowledge acquisition, curiosity had an added positive effect on children's learning. The relation between curiosity and knowledge acquisition was in part explained by the quantity of children's exploration. Against our hypotheses, high curious children were found to play shorter, which was associated with more learning. Thus, being curious was not positively, but negatively associated with playtime, and it was not associated with the number of performed (unique informative) experiments (p. 1009).

The researchers concluded that more curious children spend more time reflecting in order to bridge knowledge gaps (van Schijndel et al., 2018). A theoretical study considered the positive effects of promoting curiosity for science education (Lindholm, 2018). Another personal difference affecting the question-asking ability was the role of prior knowledge (Ibáñez Molinero and García-Madruga, 2011). These studies showed that inquiry abilities are subject to individual differences based on ability, creativity, curiosity and access to prior knowledge.

Another group of studies appeared on the implementation of inquiry-based education. In one study into the role of inquiry-based learning in the early years, a framework to observe and assess children's evolving inquiry skills was proposed (Marian and Jackson, 2017). Another suggested concept was the role of play for developing children's inquiry in education (Pistorova and Slutsky, 2018). More critically, a limited study criticized schools in the Czech Republic where most questions were asked by teachers, who at times even discouraged questions from students (Havigerová and Juklová, 2011). This study explicitly explored sex differences and found a statistical difference, with boys asking slightly more questions aloud compared to girls (Havigerová and Juklová, 2011). They suggest that students should be involved in more supportive activities focused on asking questions. A theoretical paper suggested how teachers could help develop inquiry skills, specifically in science education (Harlen, 2014). Such strategies included providing authentic learning opportunities, asking questions requiring inquiry skills, providing discussion and promoting reflection. However, these strategies were not empirically tested in the paper.

A limited group of studies focused on the use of technology in formal education to promote inquiry. In an ethnographic study, Harwood et al. (2015) explored how inquiry-based learning and the use of tablets in the classroom could intersect. While challenges were identified and the value of mobile technology depended on various factors, opportunities included the flexibility and multimodality of the tablet that created multiple opportunities for demonstrating and applying learning. At the same time, another study criticized the (over)reliance on technology and instead called for a stronger focus on cognitive skills to support inquiry (Kuhn et al., 2000).

Few studies focused on the interaction between teachers' and students' inquiry. Some demonstrated that a more structured inquiry process can help improve the inquiry experience of the student (Eysink et al., 2015; Furtak et al., 2012). In a review, Capps et al. (2012) found that teachers were involved in authentic inquiry experiences that mirror, for instance, the research of science professionals in only 5 of the 183 selected studies (p. 300). The literature does not often explicitly address whether inquiry-based education actually improves the child's inquiring. Another study considered the relationship between two inquiry professional development interventions and students' questioning and inquiry behaviour. The findings were that a philosophical collaborative inquiry approach positively influenced student questioning and verbal inquiring behaviours and that these positive developments lasted over time (Nichols et al., 2015). Another study examined the effects of professional development programmes for inquiry-based teaching within the Nature of Science course in an Irish primary school. The teachers' participation in the professional development programme positively affected the children's experience of scientific inquiry and their understanding of the relevant concepts (Murphy et al., 2019). Thus, some studies show how teachers' involvement in authentic inquiry activities and professional development programmes positively influenced the students' inquiry experience and its effectiveness.

4.4. Inquiry, the family and communities

Children's inquiry in informal learning activities may occur in institutional settings as well. However, it is more commonly associated with a home or family context. Informal learning activities are considered to have specific elements in common: "a nondidactic, meaningful activity that builds on the learner's initiative and interest; an activity that does not involve external assessment, but does include guidance for learners through social interaction, as well as learning of new knowledge and skills" (Vandermaas-Peeler et al., 2019b).

Vandermaas-Peeler et al. (2018) studied how families and parents affect the developing science inquiry skills of their children. Parents were asked to guide the child's inquiry by: "encouraging, observing, questioning, predicting, evaluating, and comparing; affording the child time to think and explore; following the child's interests; asking open-ended questions" (p. 374). The results suggested that a relatively brief exposure to inquiry guidance instruction positively influenced the ways that parents interacted with their preschoolers in order to elicit complex reasoning. Generally, extensive support for mathematics was provided in the home environment. Parents who received inquiry guidance instruction elicited complex reasoning processes, such as predicting, evaluating and comparing, during engaging activities performed at home.

In a second study, Vandermaas-Peeler et al. (2019a) found again that although all parents provided significant support in guiding learning activities at home (such as playing a game identifying animal paw prints or looking at and investigating various types of seeds), only parents who received inquiry guidance instructions were better able to facilitate complex reasoning processes, such as comparing, predicting and evaluating. One of the ways to stimulate inquiry within the children was to ask

open-ended questions, such as: "why do you think so or how do you know" (Vandermaas-Peeler et al., 2019a). Comparisons between parents in both conditions showed that parents who received inquiry training did not give answers away and followed the child's interests more openly. One parent reflected on the inquiry guidance: "it made me be more mindful… of getting her to think about things. Or asking her opinion" (p. 229). Thus, inquiry guidance instructions can positively affect a parent or caregiver supporting a child in developing inquiry skills in a home environment.

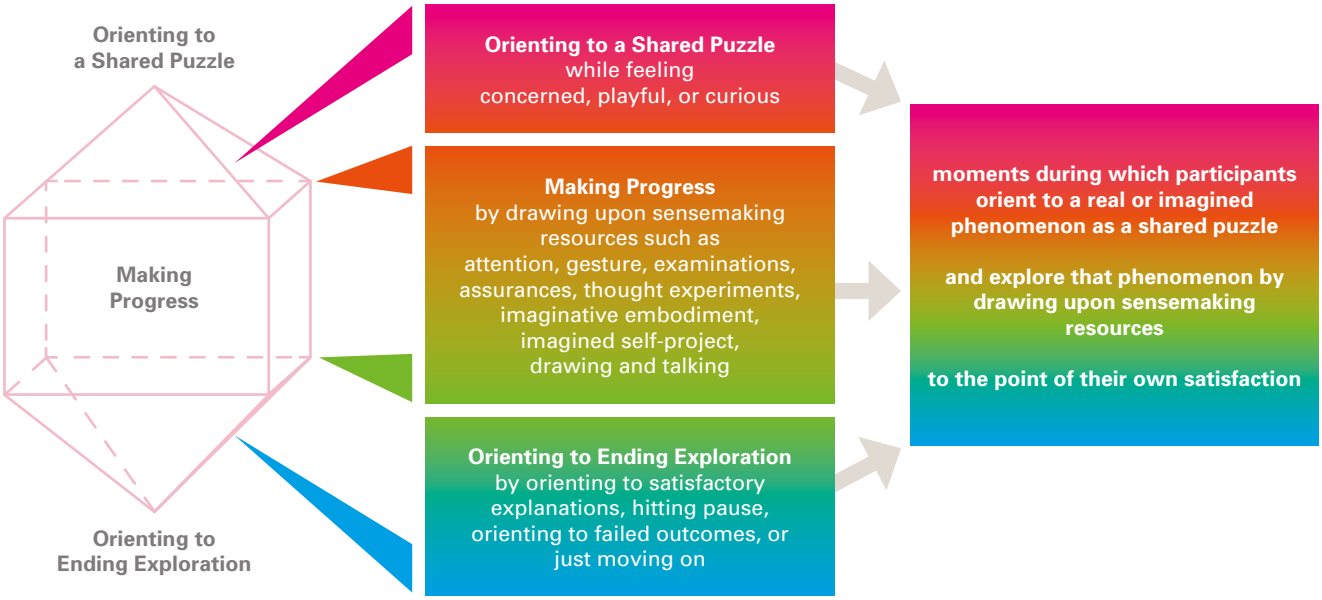
In another study, Vandermaas-Peeler et al. (2019b) analysed the relationship between inquiry, intersubjectivity and bridges. Intersubjectivity was defined as: "a process of meaning-making through which children, peers and adults collaborate and communicate during social interactions" (p. 125). Through case study analyses of various families, they concluded that inquiry guidance interventions helped caregivers and parents ask open-ended questions and stimulate inquiry. "When adults become co-constructors of inquiry rather than experts, they empower children to ask increasingly complex questions and to find answers themselves" (p. 133). Moreover, many families in the study used bridges as a technique for supporting new knowledge construction. Bridges exist when a parent or a child makes a connection between a present activity and something already known or experienced in the past (p. 127).

Lanphear and Vandermaas-Peeler (2017) examined intersubjectivity and inquiry in a study in a Reggio Emilia-Inspired preschool. The link between inquiry and intersubjectivity was shown through the collaboration between children and their "co-construction of meaning with supportive teacher guidance" (Lanphear and Vandermaas-Peeler, 2017). Moreover, the study gave further insights on influences affecting inquiry-based learning and intersubjectivity, such as activity context, age, and teacher guidance (p. 610).

In a study on caregiver–child interactions, children's information-seeking questions were studied in families of low and middle socioeconomic status (Kurkul and Corriveau, 2018). While no differences were found in the amount or type of questions the children asked, the answers given by parents for causal questions differed. Caregivers of middle socioeconomic status provided fewer circular explanations and significantly more explanatory responses to causal questions than caregivers of lower socioeconomic status. While children's follow-up responses to factual questions did not differ, children of middle socioeconomic status more often provided their own explanation after an unsatisfactory answer to a causal question. Building on their findings, the researchers indicated that "the capacity to ask questions is largely universal and has an epistemic motive" (p. 11). Moreover, they suggested that these greatly differing caregiver–child interactions may influence the child's further learning.

In a critical study, Keifert and Stevens (2018) explored children's inquiry in their daily lives and introduced the concept of 'inquiry as a Member's Phenomenon' (IMP). They based their understanding of inquiry on a constructivist perspective on learning. Their suggested definition of inquiry as a Member's Phenomenon from a child's perspective was: "moments during which participants orient to a real or imagined phenomenon as a shared puzzle and explore that phenomenon by drawing upon sensemaking resources to the point of their own satisfaction" (p. 26). According to the suggested framework, inquiring is a social and emotional activity at its core (*see Figure 3*). Various feelings, such as playfulness, interest and concern, were included in the analysis of how participants start inquiry together (Keifert and Stevens, 2018, p. 16). The study was especially critical of the dominant use of inquiry as synonymous with scientific inquiry in formal education. The importance of understanding the child's experience of being involved in inquiry processes in daily life was emphasized. The study suggested a need for more research into "learning in its naturally occurring contexts" (p. 35).

Figure 3: Inquiry as a Member's Phenomenon *(Keifert and Stevens 2018, p. 26)*



4.5. Inquiry and well-being

None of the empirical studies initially accepted in this review contained explicit links between inquiry and well-being, which was surprising as well-being was one of the search key terms. One study linked observation to well-being which can be meaningfully connected to inquiry (Klemm and Neuhaus, 2017). Two further studies with different limitations included explicit links with well-being (Hedges and Cooper, 2015; Liberto, 2016). These are included here to address the gap in studies focusing upon inquiry and well-being. Further studies included in this section are a study which was described above and included links with well-being (Marian and Jackson, 2017), a study on curiosity described in the conceptual framework (Kashdan et al., 2018), as well as a study with an implicit link to well-being (Baranova and Nikolaev, 2017).

One study came up in the searches linking observation with well-being (Klemm and Neuhaus, 2017). The researchers included questioning as one of the steps of observing and found that well-being and the capability to observe were linked. "Both emotional well-being and involvement are significant predictors of children's observation competency" (p. 1). Thus, well-being could possibly affect observation, suggesting a relationship between inquiry and well-being. Observing is part of various theoretical frameworks on inquiry, such as the active inquiry loop by Kachergis et al. (2017). However, observation does not fully overlap with inquiry and is studied as one of the eight other possible core capacities for well-being using the L4WB framework.

One empirical study with limitations for the sample size and representation included a link with well-being (Hedges and Cooper, 2015). This study explored children's true questions as their "fundamental source of their interests" (p. 303). The study was conducted in New Zealand, where the curriculum statement, named *Te Whārikie,* includes "children's interests, needs, strengths and behaviours" as foundations for curriculum design for children from birth to 5 years (p. 304). Moreover, the education programme was based on principles (empowerment, relationships, family and community, and holistic development) and strands (well-being, belonging, communication, contribution, and exploration).

Thus, well-being was one of the strands to be developed through focusing on the children's interests. In the studied instances of children's inquiry, well-being was indeed one of the aspects focused on. For an application of the early childhood curriculum *Te Whārikie*, "the ultimate goal is to continue the learner's inquiry to ever greater lengths and depths" (p. 318). Moreover, according to this perspective, inquiry is essential for constructing understanding and "developing self and spirit" (p. 318). Although the study did not offer empirical evidence or make causal links between inquiry and well-being, it saw opportunities to focus on child well-being from a child perspective while including the child's interest and inquiry at the centre of curricular decision-making.

A combined theoretical and empirical study included links to well-being as well (Liberto, 2016). This study suggested that child-led and interest-inspired learning had positive effects on well-being within the context of home education (Liberto, 2016). However, this auto-ethnographic study had a limited sample of the author's own family.

Some studies in the previous sections displayed weak links to well-being. In a literature review conducted to inform the completion of a framework for observing and assessing inquiry skills, Marian and Jackson (2017) understood the benefits of inquiry beyond reasoning. Inquiry-based learning was presumed to offer children life-long learning skills and a further understanding of their multiple identities and place in the personal, social and worldwide systems. "[T]he personal involvement of the learner and the excitement that they can gain from self-initiated learning can support the development of their emotional and social well-being" (p.225).

A previously mentioned study on curiosity drew various relevant conclusions for well-being (Kashdan et al., 2018). The study did not focus explicitly on inquiry and was therefore not included in the evidence base of this review paper. Still, the conclusions on well-being may be relevant for eliciting further thought on the link between inquiring and well-being. The evidence-based five-dimensional curiosity scale was developed to describe the various individual factors contributing to curiosity (Joyous Exploration, Deprivation Sensitivity, Stress Tolerance, Social Curiosity and Thrill-Seeking). Some of the dimensions influenced well-being (Kashdan et al., 2018). For instance, Stress Tolerance correlated most strongly with all dimensions of well-being in the study, including "happiness, meaning in life, satisfaction of needs for competence, autonomy, relatedness and positive emotions" (p. 145). Moreover, the dimension of Joyous Exploration had the second highest positive association with well-being. Other dimensions such as Deprivation Sensitivity were linked to exploration but had no evidence of influencing well-being positively while it correlated with anxiety. The latter type of curiosity was described as being "about seeking information to escape the tension of not knowing something" (p. 138). Overall, the authors recognized that some dimensions of curiosity are linked to well-being and positive outcomes while others are not.

Other studies did not address well-being explicitly but at times included an assumed link between doing well and being successful in the inquiry process. For instance, some studies aimed to improve children's ability to ask questions or the effectiveness of the inquiry process, suggesting some shared belief that doing well in gathering information and inquiring in informal and formal settings are a positive development. While excluded for scientific validity, Baranova and Nikolaev (2017) included theoretical links along these lines, such that: "the lack of question-asking skills can hinder learning, searching and exploration in children" (p. 4). Overall, the limited results showed neither a one-way effect of inquiry on well-being nor *vice versa,* but perhaps an interaction between well-being and inquiry.

The current study set out to explore the empirical evidence of the various core capacities possibly contributing to child well-being following the L4WB theory, defined as "realizing one's unique potential through physical, emotional, mental, and spiritual development in relation to self, others, and the environment" (O'Toole, 2016, p. 16). The understandings of well-being in the empirical studies above were diverse and did not encompass the full conceptualization of L4WB's definition.

4.6. Inquiry from the perspective of spirituality

From the search round into inquiry and spirituality, 46 entire studies were examined. Of all papers searched through, 27 papers seemed to have relevant matches for 'question', and 2 had relevant matches for both 'inquir' and 'question'. Only six studies contained primary data, including four studies on college students and one study on adult educators, which fell outside the criteria for children in this paper. These exclusions meant that only one empirical study was finally included (Benson et al., 2012).

Benson et al. (2012) studied youth spiritual development empirically in nine countries (Australia, England, Wales, Canada, Cameroon, India, Thailand, Ukraine and the United States). They suggested that their study fills various gaps in the spirituality literature, including underrepresentation of youth, a lack of diverse samples and conceptual unclarity (p. 453). There is a clear link with inquiry or question-asking in the conceptual difference drawn between religiosity and spirituality. Spirituality is characterized as individual, active and involving questioning:

> Spirituality implies a more active and engaged process in which some persons choose to shape and create a way of knowing and living that may or may not draw on religion (…) while religiousness may simply be inherited, 'spirituality' involves volition, being, at its most basic level, a conscious choice by some persons seek[ing] to explore, discover, and know themselves, the universe, and the 'big questions' about the meaning of life (p. 454).

Benson et al. (2012) measured a development construct and an engagement construct. Question-asking was mainly relevant for the 'discovering meaning' category in the development construct. From their international surveys, the researchers made various observations about discovering meaning. First of all, "more than 4 in 10 youth in these eight countries are engaged at high levels in the process of trying to discover meaning in their lives" (p. 464). Of the sample of participants aged 12 to 25 years, 42 per cent scored high in the discovering meaning measure of the developmental process, and 46 per cent scored medium in this category and thus still engaged in discovering meaning to a considerable extent. Only 12 per cent fell within the low category for discovering meaning. The authors acknowledged that the samples are not representative of the countries' youth, and the findings cannot be generalized. In a follow-up study, the same data set was explored further, but this study was rejected from the inquiry paper because it did not focus explicitly on inquiring or question-asking (Scales et al., 2014).

4.7. Inquiring and its physical, emotional, mental and spiritual dimensions

Studies included in this working paper are categorized using the matrix of L4WB's four perspectives (Table 1 and Table 2), which reveals those parts of the matrix most and least researched (*see Table 6*). Most studies fall within the mental and emotional categories in the process part of the continuum. Only two studies could be classified towards the end of the continuum. Of all 41 studies placed in the matrix, 15 were placed at the 'mental how' level; 10 were placed at the 'emotional how' level; 7 were placed at the 'physical how' level; 4 were placed at the 'mental what' level; 3 were placed at the 'emotional what' level; 2 were placed at the 'physical what' level and 2 were placed at the 'why' level. Two studies were placed in multiple categories (e.g. 'mental what' and 'mental how').

Some findings are in relation to L4WB's conceptualization of the core capacities for well-being developing at physical, emotional, mental and spiritual levels. Most studies can be grouped within the mental category when combining the content and process levels of the continuum. Within the mental category, studies explore both the presence of inquiry within children and how it develops. Few explicit links to the emotional domain in the form of the presence and role of feelings for influencing inquiry were found. One study showed an explicit link to the emotional nature at the core of inquiry, with different emotions (both negative and positive) serving as drivers for inquiry (Keifert and Stevens, 2018, p. 26). Another study linked inquiry-centred education with social and emotional development (Marian and Jackson, 2017). Yet another study linked inquiry with personal development (Hedges and Cooper, 2015). Moreover, a number of studies focused on the social nature of inquiry and the role of interpersonal relations and cooperation for inquiring in children. Following the theorization of L4WB, such studies would fall within the emotional category as well. The results on the development of inquiry show that inquiry demonstrates clear sensory (observing, listening, experiencing) and cognitive (reasoning, thinking skills) dimensions, but not many studies focus on this explicitly. Following the L4WB theoretical framework, the physical category also includes the context or environment within which the child inquires. Various studies focus on the effect of the environment upon children's inquiry and are grouped within the process level of the physical category.

The L4WB theoretical framework is built on a broad interpretation of the mental, emotional and physical categories, which enables it to accommodate many studies. Different definitions of these categories would have reduced the fit so that fewer studies would have been mapped on the matrix. For instance, the emotional category is understood to include relationships beyond individual feelings, and the physical category includes the material environment beyond the individual actions performed. Had only studies including individual feelings or actions been included, significantly fewer would have appeared in the matrix (Table 4). This implies that these fields are less studied and empirically substantiated than it may seem. This especially affected the emotional process and physical process categories.

Overall, the literature informs the L4WB hypothesis to varying extents. Some categories are well represented with empirical data (such as the mental and emotional categories and their content and process level). Other categories are hardly supported at all (such as the spiritual category).

Table 6: All studies in the Matrix of Four Perspectives

			SPIRITUAL (S)
	content **'what'**	***process*** **'how'**	***intention*** **'why'**
MENTAL (M)	4 studies[1]	15 studies[2]	2 studies[3]
EMOTIONAL (E)	3 studies[4]	10 studies[5]	
PHYSICAL (P)	2 studies[6]	7 studies[7]	

* Not included: 2 studies[8]

1 The four studies placed at the Mental (M) content level are: Chouinard, 2007; van Dijk et al., 2016; Fitneva et al., 2013; Kuhn et al., 2000.

2 The 15 studies placed at the Mental (M) process level are: Capps et al., 2012; Chouinard, 2007; Drumm and Jackson, 2017; Eysink et al., 2015; Furtak et al., 2012; Grosse and Tomasello, 2012; Harlen, 2014; Kachergis et al., 2017; Lazonder and Kamp, 2012; Legare et al., 2013; Mills and Landrum, 2016; Ibáñez Molinero and Garcia-Madruga, 2011; Murphy et al., 2019; Ronfard et al., 2007; Ruggeri and Lombrozo 2015.

3 The two studies placed at the Spiritual (S) level are: Hedges and Cooper, 2015; Kemler Nelson et al., 2004.

4 The three studies placed at the Emotional (E) content level are: Lindholm, 2018; Keifert and Stevens, 2018; Klemm and Neuhaus, 2017.

5 The 10 studies placed at the Emotional (E) process level are: Kurkul and Corriveau, 2018; Lanphear and Vandermaas-Peeler, 2017; Vandermaas-Peeler et al., 2018; Vandermaas-Peeler et al., 2019a; Vandermaas-Peeler et al., 2019b; Mills et al., 2012; Mills et al., 2010; Mills et al., 2011; Nichols et al., 2015; van Schijndel et al., 2018.

6 The two studies placed at the Physical (P) content level are: Fitneva et al., 2013; Harris et al., 2017.

7 The seven studies placed at the Physical (P) process level are: Cremin et al., 2015; Harwood et al., 2015; Havigerová and Juklová, 2011; Khalaf, 2018; Liberto, 2016; Marx et al., 1999; Pistorova and Slutsky, 2018.

8 The two studies not placed are: Benson et al., 2012 (spirituality search); Marian and Jackson, 2017 (categories were not applicable).

5. DISCUSSION

Various differences and commonalities in the conceptualization of inquiring were found in this study. While some explored inquiry as the process of gathering information, other studies went beyond this understanding and explained inquiry as meaning-making, building upon a constructivist learning tradition (Pistorova and Slutsky, 2018). Other studies explored similar concepts rooted in meaning-making but focused on inquiry as a social and collaborative process (Keifert and Stevens, 2018; Vandermaas-Peeler et al., 2019). If inquiring is a social process, including the joint construction of meaning between parent and child, their relationship probably has a significant impact on the child's inquiry and can be studied further. The question-asking literature did not take a constructivist approach and at times even focused on elements of question-asking that hardly overlap with inquiring. For instance, a study explored the processing time for young adults from the presentation of a picture to initiated question to solve a task (Drumm and Jackson, 2017). Forced question-asking with the specific goal of solving a task as quickly as possible has little to do with an inquiring need to find out new information. Such insights were largely omitted from this review. These different interpretations point to an unresolved debate about what the origin of inquiry is. The most embraced and explored understanding of inquiry seems to be where the concept overlaps with question-asking and is used as part of the Information Requesting Mechanism (Chouinard, 2007; Legare et al., 2017; Ronfard et al., 2018). The question-asking literature often studied how children find out information by asking direct questions, and yet some studies focused on diverse ways of searching for information, such as looking and observing. These studies provide additional streams to explore inquiry further. This study applied several keywords that may not have captured all these additional streams.

From the review of literature, 'inquiry' showed characteristics of a core capacity for children. First of all, various skills are supporting inquiring to develop during childhood. One review shows that the quality of questions asked increases with age during early childhood (from 0 to 10 years), as does the ability to adjust hypotheses (Ronfard et al., 2018). These findings are relevant confirmations for the present review in which core capacities are theorized as developmental. Several other studies concluded that inquiry is a natural and inherent quality of children not limited to asking questions verbally. Even preverbal children recruit information through gestures and vocalizations (Chouinard, 2007; Harris et al., 2017). Another group of studies concluded that the inquiring skills are influenced by individual differences based on ability (Van Dijk et al., 2016), curiosity (van Schijndel et al., 2018), access to prior knowledge (Ibáñez Molinero and García-Madruga, 2011) and how many questions children tend to ask (Mills et al., 2011; Mills and Landrum, 2016). Some individual differences have hardly been explored in the literature, such as possible sex differences, cultural differences or socioeconomic differences. Interestingly, one study concluded that the ability to ask questions is universal, but the child's environment influences how the skill develops (Kurkul and Corriveau, 2018). These findings confirm studies beyond this review with animals showing that early physical and social experiences affect inquiring (Gottlieb, 2002), and studies suggesting that genetic, neural, behavioural and environmental levels act together for development to occur (Gottlieb and Halpern, 2002). Links with developmental research can be studied beyond this review.

From this review, it is clear that inquiry has been studied in a variety of settings, mostly formal education and family settings. Some studies explored how inquiry could effectively and intentionally be supported through guidance and interventions in both types of setting. Insight into how the complexity of an inquiry task can benefit the child's inquiry behaviour could be relevant for inquiry in varying environments and for all ages. In formal education, few studies have explored teachers' ability to inquire and engage in experiences that may enhance the inquiry of students. In the family setting,

studies suggested how a home environment affected the extent to which children rely on inquiry, even when no inherent individual difference in inquiring ability existed. Additional research can examine the home environment and inquiry further.

There is hardly any empirical or theoretical evidence of inquiry as a core capacity that positively influences well-being. Most studies did not address well-being explicitly, but at times are based on a belief that doing well in gathering information and inquiring in informal and formal education is a positive development. From these studies, it follows that certain types of curiosity can be positively related to well-being while other types of curiosity might not be. For inquiry, it could be relevant to study how various types of inquiry interact with well-being. The current study focused on the L4WB framework, which generally follows a broader or different conceptualization of well-being compared to the literature, and this can be explored beyond this review. For further links to inquiry and well-being, alternative understandings of well-being might be more useful, such as the salutogenic approach according to which well-being is a sense of coherence including comprehensibility, manageability and meaningfulness – which relate to inquiry (Antonovsky, 1996; Mittelmark et al., 2017). Moreover, no studies explicitly linked inquiring or asking questions to being a core capacity. While the term 'life skill' was included to identify more empirical studies, no clear results in the literature supported inquiry as a life skill either.

Regarding L4WB's understanding of core capacities that develop at a physical, emotional, mental and spiritual level, the literature mostly applied to the mental and relational (as part of emotional) categories, with few exploring the physical category. However, the L4WB theoretical framework is built upon a broad interpretation of the categories, while different definitions of these categories would have reduced the fit. The evidence base includes various studies on relationships and interactions (e.g., between children and caregivers and teachers). A few studies also examined how children can learn from each other's inquiring. According to the L4WB theoretical framework, all relational studies are generally grouped within the matrix's emotional process level, which misrepresents this group of studies. The relationships and interactions influencing the capacity do not have to be emotional at the child's personal level. Studies understanding inquiring as a social process do not fit well in the L4WB framework. It would be relevant to explore these research strands and how they fit within the L4WB framework further. For instance, widely used educational models such as Vygotsky's zone of proximal development put the interaction between the teacher and student at the centre of their learning model. Similarly, studies on how the environment influences inquiring did not fit well within the matrix. These studies are now grouped in the physical process level of the matrix. However, environmental influences on the child's inquiry are not necessarily physical for the child itself. Various studies explored how children engage in inquiry through play. The physical category might be exploratory and playful rather than seeking action and movement (Table 1). Overall, the categories and definitions from Table 1 start with the child's experience and centralize the child. However, various studies additionally explored the possible effects of the child's environment. The child's development within a social community and various environments is not represented clearly in the matrix. Perhaps more focus can be put on clarifying relational aspects (between adults and children and children among themselves) and environmental aspects for the capacities to develop.

While feelings influencing inquiry were hardly present in the studies selected for this review, further strands of research beyond this review confirm the importance of inquiry's emotional and process categories. Previous research, for instance, focused on emotions and performance in school, such as studies into school failure inhibiting learning (Jimerson, 1999), the effects of authoritarian teaching on early school leaving (Cefai and Cooper, 2010; Downes et al., 2006), and effects of the fear of success

on school performance for individuals from socioeconomically disadvantaged backgrounds (Ivers and Downes, 2012). Only two studies could be placed at the immaterial end of the spectrum, and no explicit links in the initial empirical or theoretical literature were found connecting inquiry with spirituality. According to the L4WB framework, studies that show intention should be placed at the immaterial end of the spectrum. While intention is arguably not synonymous with spirituality, the fact that few studies were placed at this end of the spectrum highlights another finding that the children's perspectives were largely missing in the evidence base. Hardly any empirical studies examined inquiry or well-being from a child's perspective or answered why children ask questions. At the same time, a theoretical article mentioned the importance of considering a child's perspective. Only one empirical study explored what a child wanted to know when asking a question. More studies are needed that start with the child's perspective since this is a gap in the literature. These studies would be vital in further understanding the L4WB framework, which centralizes the individual child. In the additional spirituality search round, one empirical study on spiritual development was included that found that most adolescent participants engaged in discovering meaning, including existential questioning (Benson et al., 2012). Overall, the literature informed the L4WB hypothesis to a varying extent, with the least empirical evidence of inquiry and other core capacities, well-being and spirituality.

5.1. Further findings

Most studies on children's question-asking were on preschool age children (aged 3 to 5 years) while other segments of the child population are studied less. On the other hand, in the studies on classroom inquiry, the child population is significantly older with most studies featuring children aged 10 years and above. This may be a logical finding as formal classroom inquiry might not be as relevant during preschool. Due to the question-asking literature, there is no clear gap perceived here. However, there is an apparent gap within the empirical data for inquiring in the family and in communities that generally only addressed preschoolers. No empirical studies examined the development of inquiry across the whole of childhood or in a longitudinal manner. One systematic review included studies with participants aged 2 to 25 years (Raulston et al., 2013). Other studies covered considerable periods within childhood (Ronfard et al., 2018; Kachergis et al., 2017; Ruggeri and Lombrozo, 2015).

The question-asking literature most often took a developmental perspective, and the empirical studies were all based on data gathered in experimental settings. Although these studies gave insights into question-asking that could be transferred to solve an inquiry need, they gave little insight into an inquiry wish or need intrinsic to the child. Still, some studies explored what children wanted to know and what truly interested them (Chouinard, 2007; Kemler Nelson et al., 2004). However, these are still limited to a small group of young children. The inquiry literature in formal education classroom settings included both experimental and natural settings. All studies into inquiry in the family were taken from natural settings.

5.2. Complementarity with other core capacities

Other possible L4WB core capacities were explicitly studied and mentioned in studies found through the search on child inquiry. Studies into the inquiry behaviour of young children showed that active inquiry goes hand in hand with L4WB receptive core capacities, such as listening and noticing (observing). For example, listening was explicitly explored in a study into how children learn from listening to others' queries even when involved in an inquiry task themselves (Mills et al., 2012). Moreover, children's capacity for direct observation was, like question-asking, a strategy for gathering

information (Ruggeri and Lombrozo, 2015). The evidence of children's ability to look for information was included in some of the reviewed literature (Fitneva et al., 2013; Klemm and Neuhaus, 2017). In one study, questioning was considered part of observing, linked positively to child well-being (Klemm and Neuhaus, 2017). Certain types of curiosity can be positively related to well-being, while other types of curiosity might not be.

Reflecting was not explicitly included in the active inquiry literature. However, updating beliefs by incorporating understanding from new insights seems to overlap with reflecting. More explicitly, reflecting was one of the skills practised by highly curious children who learned more from inquiry tasks than their less curious peers (van Schijndel et al., 2018). In a theoretical paper, promoting reflecting on children's thinking was a strategy for helping children develop their inquiry skills (Harlen, 2014). Enriching sensory awareness ('embodying') was another possible L4WB core capacity for well-being mentioned in a study about curiosity that was consulted for the theoretical foundation of this review paper. In that study, curiosity was defined as "a desire to acquire new information and knowledge and new sensory experience that motivates exploratory behaviour" (Litman and Spielberger, 2003, p. 75 as cited in Reio et al., 2006, p. 2).

The reviewed studies seemed to suggest that observing, listening, reflecting, and discerning patterns are integral to the successful functioning of inquiring strategies. However, inquiring may go hand in hand with other core capacities, and future work would do well to further explore the linkages among these different capacities in children. Beyond the other eight core capacities, which possibly relate to well-being, other related skills that came up in the literature are engaging in play and being curious. In one study, feeling curious or playful were emotions that can initiate inquiry (Keifert and Stevens, 2018, p. 26). The precise relationship between inquiring and partially overlapping concepts can be further explored through systematic searches, including more search terms.

5.3. Limitations

This study has several drawbacks. A limitation was the selection of key terms that may have influenced the types of studies appearing. For instance, 'inquiry' is often combined with the 'inquiry learning approach' in formal education, and most studies appeared within this area. Studies that do not include the key terms of 'inquiry' and 'question-asking' were therefore overlooked.

Another limitation was the focus on typically developing children. This limitation is important because the included studies represent only a limited group of typically developing children and leave many children unrepresented. Moreover, this is especially relevant since studies on diverse groups of children might shed more light on the role of inquiry for child well-being. Further research can focus on core capacities and well-being in all children.

Another limitation was the lack of global applicability of the selected studies. The language and database restrictions limit the representativeness of the studies, which are mainly based on data gathered in Europe and North America. For instance, all studies about inquiry in the family took place within the USA. Moreover, most studies focused on a single state. This absence of global applicability is especially relevant if core capacities were regarded as contextual, and for instance, inquiring may not have been considered before as a child's core capacity or even a life skill. Another limitation is that this mapping of the literature sought to demonstrate how inquiry can be a core capacity and influence well-being. There was no explicit search for evidence of how inquiry is not a core capacity for well-being. Still, some relevant findings appeared, such as a study on curiosity demonstrating that a particular type

of curiosity (connected to exploration and information-seeking) was not positively influencing well-being but was linked to anxiety (Kashdan et al., 2018).

5.4. Implications

Considerable empirical evidence exists of the development of inquiry and question-asking throughout childhood, but that evidence does not necessarily show that inquiry is a core capacity following the L4WB conceptualizations, while it does demonstrate various characteristics of a core capacity. The relationship between inquiry and well-being might be suggested in some studies, but there is insufficient evidence to support it. Only one empirical study into the relationship between inquiry and spirituality resulted from an additional search round. Overall, there were hardly any results for explicit searches for child well-being relating to inquiring or question-asking. However, in various studies, it was assumed that increased inquiring would be a positive development for children. The relationship between inquiring and well-being should be further explored in additional empirical research. Moreover, future work can add to these perspectives by including evidence of the entire diverse child population. In addition, research is needed to understand better the social environment in which children's inquiring develops. Furthermore, the listed limitations may suggest additional ways to study the complex settings in which a child's inquiring unfolds, such as the natural inquiry setting during early child development and home environments for older children. Diversity of findings at all levels, including geographic, socioeconomic and cultural, is desirable for a more global application.

In many ways, inquiring is already a focus in formal education at various levels. With an evidence base on the effects of certain types of inquiry for well-being, the relevant types of inquiring can be further stimulated. Various programmes already exist that focus on inquiring or on stimulating children to ask questions. In education, this occurs at various levels, including in the classroom, in school-wide attempts and in global examination programmes (Appendix C).

This working paper was a first attempt to review the literature for understanding inquiry as a core capacity within a child's development, which could possibly benefit the child's well-being. In combination with exploring the existence and impact of the eight other suggested core capacities for well-being, this study hopes to contribute to stimulating practices supporting children's well-being.

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APPENDIX A: LISTS OF KEY TERMS

List 1 terms related to the core capacity

Inquiry
Asking questions

List 2 terms related to population

Children
Adolescents

List 3 terms related to research focus (OPTIONAL)

BLANK
Development
Well-Being
Life skill

APPENDIX B: QUALITY INCLUSION CRITERIA

	Criteria	Sub-categories	Description
1	What does it mean for a study to be **Conceptually Coherent**?	Introduction	Topic, purpose, and study rationale are clearly stated.
		Literature Review	The relevant conceptual underpinnings of the issue are fully explained.
		Research questions	Research questions and/or hypotheses are well defined and drawn from sound evidence-based theoretical or conceptual framework.
2	What does it mean for a study to use **Appropriate Methods**?	Methods	The research design and sampling are appropriate for the study. The study includes a well-articulated rationale.
		Theory (especially for studies with a primary theoretical framework)	A sound and established theoretical line is present.
		Data	Relevant data have been employed. Where survey data are used, the sample is well described and clearly appropriate for the task at hand.
		Analyses	The procedures and measures have been selected correctly and applied correctly.
3	What does it mean for a study to be **Scientifically Valid**?	Results	The results of the statistical/empirical tests are fully and correctly interpreted. Basic statistical information, such as probability stats, sample sizes, etc., and coherent explanation of findings are included – avoids overstating the study's importance and generalizability.
4	**Ethics (important but not a requirement to be accepted)**	Ethical review	If the research involves primary data collection and/or the use of sensitive secondary data, ethical considerations are described in the study. For example, the article might include details of the procedures followed to ensure the ethical review of data, an indication that the study received the proper oversight from review board or any mitigation strategies.

APPENDIX C: INQUIRY APPLIED AT VARIOUS LEVELS

InThinking Physics: an example at the classroom-level

An example of learning centred on inquiry is Chris Hamper's approach to teaching physics, in which high school students start with solving problems online and can request explanations themselves before advancing to more complex problems (see: https://www.thinkib.net/physics).

The IB learner profile: a global examination programme

One of the characteristics stimulated in the International Baccalaureate is for students to be inquirers (International Baccalaureate Organization, 2013). Learners within IB programmes would be stimulated to be inquirers through programme elements which, for instance, develop research skills (for example, through the individual research project called the Extended Essay for 16–19-year-old Diploma programme learners).

Lego Foundation promoting play: a global example

The Lego Foundation stimulates play in learning to stimulate holistic learning and skills that children would need in the future. The foundation's aim is "to build a future in which learning through play empowers children to become creative, engaged, lifelong learners" (LEGO Foundation, 2017, p. 4). The LEGO Foundation supports various projects and research, for instance, in cooperation with the University of Cambridge's Play in Education Development and Learning (PEDAL) centre.

for every child, answers

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