
Meaningful teaching and learning: Children's and teachers' content knowledge

Helen Hedges and Joy Cullen

This paper reviews recent research that demonstrates that young children are deeply interested in and capable learners of content knowledge. It also discusses research on early childhood teachers' subject content knowledge. In order to be responsive to children's prior content knowledge, the authors then argue that content within teaching and the subject content knowledge of teachers both require more explicit attention in order to extend children's learning in early childhood settings. Implications for early childhood teaching practice and teachers' professional development are drawn.

Awareness of subject content knowledge in teaching and research

Beliefs about child development, holism, integrated curriculum and play have dominated western early childhood teaching. Early childhood curricula documents worldwide commonly neglect or underemphasise subject content knowledge (MacNaughton, 1999). In this regard, *Te Whāriki*, (Ministry of Education, 1996) is no exception. The philosophy of integrated curriculum central to *Te Whāriki* means that the document was developed on the premise that the curriculum would not divide learning into subject or knowledge areas. Some writers assert that a subject-based approach to curriculum is inappropriate as it is contrary to the ways children think and learn (Hurst & Joseph, 1998; Nutbrown, 1999). A further concern raised is that where subject knowledge is emphasised in early childhood, the effect will be that of a "push-down" curriculum and pedagogy (Curtis, 1998). These philosophical beliefs appear to have been used to exclude specific teaching and learning of content, have left teachers without clear guidelines for content selection in curriculum and excused them from the responsibility to be knowledgeable about children's interests.

Such beliefs have recently been critiqued (e.g., Cannella, 1997; Dahlberg, Moss & Pence, 1999). The authors of the present paper argue that the basis of teaching practice ought not to be just philosophically-driven, but also grounded in research

evidence of children's learning and teachers' professional knowledge. It is now timely therefore to consider recent research that may provide guidance with regard to new directions for early childhood education. This paper draws attention to research on children's and teachers' content knowledge which demonstrates that a lack of emphasis on subject knowledge can no longer be justified in early childhood education in New Zealand. This conclusion has implications for teaching practice and teachers' professional knowledge.

Recent challenges to consider subject knowledge in early childhood education have occurred. The New Zealand best evidence synthesis on quality teaching in early childhood (Farquhar, 2003) identifies as one of seven pedagogical principles that "effective teachers use content knowledge confidently to support and extend children's learning in interactive and play-based situations" (p.2). Similar support for teachers' subject knowledge is provided in the best evidence synthesis on professional development (Mitchell & Cubey, 2003) with an emphasis on appropriate cultural and contextual pedagogical content knowledge. A significant body of New Zealand literature argues that the subject knowledge of teachers requires more explicit attention in order to extend children's learning (Cullen, 1999, 2000, 2003; Garbett, 2003; Haynes, 2000; Hedges, 2002, 2003a). For example, Cullen (1999) asserts that, in addition to understanding of children's development, experiences and interests, teachers need to have pedagogical and subject knowledge in order to extend children's knowledge. These challenges are supported by international research that demonstrates the depth and richness of children's existing prior knowledge.

Children's knowledge and interest in content

Early childhood settings have been the site of much research on children's knowledge. As experienced learners, children bring applicable and effective knowledge to new learning situations. Cullen and Allsop (1999) observed that three and four-year-old children brought a range of prior knowledge to their outdoor play, such as how to make concrete, the ability to tie knots, and types of insects and weapons. Dilkes

(1998) conducted a study that demonstrated that children bring knowledge of sounds and songs to their early childhood learning. Toyama, Lee and Muto (1997) observed and recorded children's prior and subsequently learned knowledge of biological concepts related to procedures for animal care. In Hedges' (2002) study about a kindergarten's excursion to an aquarium, one child's prior knowledge about marine biology was extensive. This child provided evidence that children can have deep interests and that their knowledge can be more comprehensive and accurate than adults, particularly when it is domain or discipline-specific. His knowledge also demonstrated a form of competence that could be associated with a sociocultural view of children's capabilities.

Similarly, research has demonstrated that children bring much knowledge from their home experiences to early childhood education. Fler (1997) studied three to five-year-old children's home experiences of technology and the knowledge that developed. The teachers of these children were oblivious to the range and depth of children's understanding of technology. Aubrey (1997) investigated the mathematical knowledge five-year-old children had before starting school, also concluding that teachers were unaware of the richness of these children's prior knowledge. Cumming (2003) studied children's experiences and understandings of the origins of food, its preparation for eating and its destiny once eaten by them. The most common contexts for conversations about food were at mealtimes and during food preparation and cooking. Cumming noted that sometimes a child pursued a topic over a period of time that stretched into months with evidence of a deep interest. Cumming concluded that children learn valuable information from family and friends and that teachers, perhaps unwittingly, overlook this in their planning for teaching.

The research cited provides evidence of the broad prior knowledge children bring to new experiences and learning and that this is knowledge that teachers might be unaware of. These studies use different terminology, for example, "foundational", "domain" and "funds of knowledge". This suggests that young children's prior knowledge and styles of learning and thinking take on certain qualities. The personal

qualities of children's knowledge are based on the unique family and community experiences that contribute to their growing content knowledge. In addition, young children are likely to have a wide range of interests, but relatively limited experience and cognitive and metacognitive abilities. Because of these factors, the qualities of children's knowledge are unlikely to be the same as the conventional sense of subject knowledge as domain or discipline-based. However, the term "subject content knowledge" is adopted here with regard to children's knowledge to be consistent with the literature on teachers' knowledge and to make an argument for an emphasis on addressing the content knowledge of both parties within the teaching and learning process.

In summary, research supports the notion of children moving from novice to expert in different subject content areas and emphasises the importance of constructing new knowledge based on existing knowledge. The studies cited provide evidence for claims that teachers might need subject knowledge in order to extend children's learning, particularly in a play-based learning environment building on children's interests. The importance of teachers being able to respond meaningfully to children is highlighted in such teaching and learning approaches.

Teachers' subject knowledge

Parallel to the research about children's learning there has been some evidence that teachers' subject knowledge is important in early childhood teaching (Hedges, 2002; Peters, 2001; Siraj-Blatchford, Sylva, Muttock, Gilden & Bell, 2002). Some writers have also drawn attention to the necessity for teachers to have a broad general knowledge base to support children's learning (Cullen, 1999; Haynes, 2000; Kallery & Psillos, 2001; Willer, 1994).

Subject knowledge is a form of culturally-valued knowledge that delivers educational, social and economic benefits for individuals and societies. Current emphases on literacy and numeracy in teaching and research are evidence of their cultural value

(see Hedges, 2003b). Subject knowledge in teaching is commonly defined as teachers' knowledge of content. This encompasses the facts and concepts within the disciplines of their teaching subjects, for example, science, mathematics, literature and music, and the relationships between the fact and concepts (Grossman, 1990).

Teacher beliefs about subject knowledge

Teachers' knowledge and beliefs impact directly and indirectly on the curriculum offered to children, in terms of teacher enthusiasm, beliefs and subject knowledge. Studies on teachers' professional development in New Zealand raise the issue of subject knowledge. Jordan (1998) discusses early childhood teachers' use of information and communications technology to increase their subject content knowledge in order to support children's learning. Young-Loveridge, Carr and Peters (1995) conducted a study involving early childhood teachers' professional development which demonstrated that when awareness of mathematics was enhanced, teachers extended children's mathematical knowledge and thinking during play.

Two studies exemplify the argument of this paper. In Hedges' (2002) New Zealand kindergarten case study of beliefs and practices related to subject knowledge, four themes emerged as crucial to consideration of content in early childhood education: subject content knowledge, knowledge of pedagogy and philosophy, knowledge of learners and knowledge of context. The links between beliefs and practices demonstrated that in relation to planned learning experiences, teachers used subject knowledge. However, in most spontaneous learning and teaching interactions, subject content knowledge was not present. In a wider United Kingdom study of effective early learning (Moyle, Adams & Musgrove, 2002), both teachers and management believed that subject knowledge was not as important as knowledge about children and knowledge about pedagogy and philosophy. As a consequence, content learning was underemphasised during teaching and learning interactions. In a play-based, child-initiated curriculum, most pedagogical interactions arise from and respond to children's wide range of interests and inquiries. Again, the role of teachers' professional knowledge of subject content warrants attention: teachers may need

subject knowledge to extend children's learning in the directions of children's knowledge and interests.

Teacher knowledge and confidence in subjects

Research has also investigated early childhood teachers' knowledge in relation to subject content. Kallery and Psillos (2001) investigated the science content knowledge of teachers of five-year-olds, revealed through teachers' responses to children's questions. Responses were categorised and demonstrated that only 21.9% included sufficient scientific conceptual knowledge. Garbett (2003) investigated first year early childhood student teachers' conceptual knowledge of science through a multi-choice test. Student teachers also self-assessed the adequacy of their knowledge and predicted their test scores. Garbett found that many students had a limited understanding of science but were unaware of this. The findings of Garbett (2003) and Kallery and Psillos (2001) in relation to science are of particular concern for early childhood education, where teachers traditionally have had little grounding in subjects. This may mean that teachers have difficulty responding meaningfully to children's questions and interests.

Teachers' beliefs in terms of self-efficacy (Bandura, 1997) are also relevant in relation to confidence in subject content knowledge. Early childhood teachers who are uncomfortable with their level of subject knowledge may rarely include certain content in the learning environment they provide or extend interactions to their full potential. Therefore, it seems likely that teachers' beliefs and their lack of subject content knowledge will impact both on the curriculum provided for children and on teachers' ability to effectively construct knowledge with children.

Highlighting subject knowledge

Children benefit from teaching embedded in experiences that are meaningful to them such as play. Teachers' participation in children's play and learning forms windows of opportunity to engage children in knowledge construction. The role of teachers'

subject knowledge in enhancing this learning is clearly identifiable in the research cited earlier. Findings from an action research project in the United Kingdom involving mathematics (Anning & Edwards, 1999) support the notion that early years teachers who are confident about their subject knowledge are more likely to recognise and maximise potential learning in children's integrated play experiences.

Te Whāriki's overall goal for children is "to grow up as competent and confident learners and communicators, healthy in mind, body, and spirit, secure in their sense of belonging and in the knowledge that they make a valued contribution to society" (Ministry of Education, 1996, p. 9). If functioning as an adult member of society requires a body of knowledge, then what might that knowledge consist of? A broad knowledge is commonly promoted in a curriculum, including literacy, numeracy, science, health, geography, arts and music (Edwards & Knight, 1994). Willer (1994) claimed ten years ago that general knowledge ought to comprise the content of curriculum for children. These expectations further support the contention that teachers need comprehensive subject knowledge to support children's learning.

Rodger (1995) argues that curriculum based on child development and play leads to the omission of some kinds of knowledge in programmes for young children. She specifically cites subject knowledge. Currently, it appears that subject knowledge may be part of the hidden (i.e., underemphasised), or null (i.e., consciously excluded), curriculum offered in early childhood education. It may also be a missing element of early childhood teachers' professional knowledge. However, we argue that utilising discipline-related subject knowledge is appropriate and vital in order to respond meaningfully to children's content-related interests and inquiries.

Implications for teaching practice

Mainstream discourse has commonly conceptualised curriculum as content. On the surface, the only strand in *Te Whāriki* that indicates significant expectation of cognitive capabilities is exploration. However, this division becomes less arbitrary if teachers view cognition as embedded within the other strands as could be argued from

a sociocultural perspective. From this perspective of situated cognition, learning is more holistic. Rodger (1995) argues that a shift in emphasis to a subject-centred curriculum does not necessarily detract from children's integrated learning. Hence the principle of holism espoused in *Te Whāriki* may not be incompatible with an increased focus on subjects.

Research findings cited in this paper suggest that a lack of emphasis on subject content knowledge in early childhood may limit learning and teaching opportunities and children's inquiry-based learning. This is accentuated by studies that found teachers' conceptual knowledge to be inaccurate and insufficient (Garbett, 2003; Kallery & Psillos, 2001). We contend that early childhood teachers need abundant subject knowledge to teach confidently within holistic, integrated, early childhood contexts.

Consequently, in order to promote children's conceptual learning, teachers may need subject knowledge included in their teacher education to enhance their own existing knowledge. But how much subject knowledge is required? Willer (1994) asserts that teachers need to know "about everything - science, social studies, literature, math, music, and everything else in their (children's) world of experience" (p. 4). A little is clearly not enough. Teachers need adequate and accurate disciplinary knowledge from a wide range of subjects. Moreover, some depth of knowledge is necessary, as studies cited earlier clearly highlight (Garbett, 2003; Kallery & Psillos, 2001). To maximise children's learning teachers need to have extensive discipline-related subject knowledge. Without sufficient grounding in subject knowledge, teachers may promote inaccurate conceptual knowledge and thinking. Buckingham (1994) notes that specific knowledge about children's drawing is crucial to understanding and supporting children's artistic and creative learning; and Garbett (2003) and Hedges (2003a) argue that the development of a science subject knowledge base to support children's scientific thinking is essential. Future research studies may contribute to identifying

what kinds of subject knowledge, and to what depth, are required to cater for children's learning in an integrated curriculum built on children's interests.

Perhaps it is not subjects per se, but how teachers assist children to construct subject knowledge that is the central pedagogical issue for early childhood education to resolve. The potential of pedagogical content knowledge as a construct to resolve the philosophical impasse in early childhood is raised by Hedges (2002, 2003a). Shulman (1986) identified three components of pedagogical content knowledge: knowledge of a subject; knowledge of children's existing knowledge and beliefs about the subject; and knowledge of effective ways to teach this subject to children. As noted earlier, Cullen (1999) pointed out that early childhood teachers need both confidence with their own subject content knowledge and an understanding of pedagogical strategies to work with young children's knowledge and interests. Siraj-Blatchford et al.'s (2002) study provides examples of teaching practices where teachers' content knowledge extended children's knowledge within a play-based environment and at a level commensurate with children's developing understandings of the world they live in. These ideas have much in common with the sociocultural philosophy and theory that underpin *Te Whāriki*. Where teachers' subject knowledge is deeper teachers are more likely to be confident about integrating curriculum, aware of their own subject knowledge gaps, and more open to children's interests, ideas, contributions, and questions. These are all key tenets of early childhood pedagogical philosophy.

Implications for professional development

Professional development may be an essential strategy to develop teachers' ability to construct knowledge with children that stresses subject content learning. Highlighted areas for proposals for professional development contracts from the Ministry of Education for the 2005-2006 period include "domain knowledge". Working with teacher beliefs by providing access to research findings that support greater emphasis on content learning is necessary.

Ongoing, rather than piecemeal, professional development on subject knowledge, learning theories, pedagogical approaches and curriculum appropriate for early childhood education is recommended by the authors. Limited teacher confidence about subject knowledge can be attended to through professional development. A successful professional development programme in terms of increasing teachers' confidence in science, combined attention to teachers' child-centred beliefs, subject knowledge, pedagogical knowledge and children's prior knowledge (Watters, Diezmann, Grieshaber & Davis, 2001). The approach of this particular programme could be considered for wider application in relation to other subjects. Kirova and Bhargava's (2002) study of professional development related to mathematics in the early childhood sector strongly supports the argument that teachers' conceptual knowledge enables appropriate curriculum planning to occur, guides pedagogical approaches and documentation that facilitate meaningful learning for children, and assists teachers' confidence and professional growth.

Conclusion

An increased focus on content learning is not incompatible with early childhood pedagogy and philosophy, particularly if the content relates to children's interests. Weaving content into interests-based learning is consistent with the pedagogical focus of *Te Whāriki* (Cullen, 2003). Research evidence indicates that purposeful teaching and learning occurs when teachers' subject knowledge contributes to appropriate pedagogical strategies used during authentic learning experiences as children try to make sense of their experiences with the people, places and things in the world around them. Early childhood teachers' professional knowledge of subjects can assist teachers to construct knowledge with children in ways that relate meaningfully to children's prior knowledge and experience and that guide children towards rewarding lives in the contexts of their communities and cultures. The critical importance of teachers having sufficient breadth and depth of subject knowledge in order to respond meaningfully to and extend children's interests and inquiries is highlighted.

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