The Early Years Framework – where is the science?
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Australia is embarking on the implementation of Early Years Frameworks at both national and state levels and it is a significant that we investigate the place of science education for our children 0-5 years of age. Where does science education fit into these frameworks? A document analysis of both the national (Australia) and state frameworks (Victoria) will highlight the guidance given to early years practitioners in terms of science education. By comparison, many countries in the western world have trialed and implemented early childhood frameworks. Through an investigation of the frameworks in place in England, a comparative analysis of the introduction of science in early childhood settings is provided. The research in England was comprised of case studies of four centres and data collected through interview from stakeholders from government and educational fields. The research will show how, with a slight change in wording, we can be more inclusive of science as a natural part of early childhood education.

Introduction

It is now well recognised that the early years of a child’s life are crucial for the child’s ongoing development and for setting the course for the rest of their life. In recognition of this research and part in response to the OECD’s report (2006 – which showed Australia lagging behind most other countries in the Western world), the Australian government, in partnership with the state and territory governments, has been working to bring about change in the early childhood sector. The National Quality Framework has been developed to ensure that Australian children get the best possible start.

The National Quality Framework is an important reform which will deliver a higher standard of care for children in the critical areas of education, health and safety and will provide clearer and comprehensive information for families so they can choose the best services for their child. NQF

The Framework is due to be implemented progressively from July 1st 2010. As part of the Framework, standards will be specified to ensure that the delivery of the framework provides a consistent approach across Australia to early childhood education and care. Within the Framework standards, there are seven areas which are considered critical to quality ECE and care.

The quality areas are:

- Educational program and practice
- Children’s health and safety
- Physical environment
- Staffing arrangements, including staff-to-child ratios and qualifications
- Relationships with children
- Collaborative partnerships with families and communities
- Leadership and service management
In considering the 7 areas, there is one which is most relevant to educators – Educational program and practice. This quality area indicates that, “The educational program and practice is stimulating, engaging and enhances children’s learning and development.” (National Quality Framework, 2010).

Figure 1. Extract from National Framework Standards

1.1 The Early Years Learning Framework (or other approved learning framework) informs the development of a program for each child that enhances their learning and development.

1.1.1 The Early Years Learning Framework (or other approved learning framework) guides curriculum decision making and enables each child’s learning in the five outcomes: ***

• Children have a strong sense of identity ***
• Children are connected with and contribute to their world ***
• Children have a strong sense of wellbeing ***
• Children are confident and involved learners ***
• Children are effective communicators. ***

1.1.2 Curriculum decision making is informed by the context, setting and cultural diversity of the families and the community.

1.2 The program for each child takes into account their strengths, capabilities, culture, interests and experiences.

1.2.1 Each child’s current knowledge, ideas, culture and interests provide the foundation for the program. ***

1.2.2 Every child is supported to participate in the program.

1.2.3 Each child’s learning and development is assessed as part of an ongoing cycle of planning, documenting and evaluating children’s learning.

1.2.4 Critical reflection and evaluation of children’s learning and development, both as individuals and in groups, is used as a primary source of information for planning and to improve the effectiveness of the program and teaching strategies.

*** items are assessed as part of the quality assurance

The framework and standards involve all stakeholders and relevant information about the program and their child’s participation in the program is shared with parents.

Methodology

In viewing the Frameworks documents (Early childhood - Belonging, Being, Becoming & Victorian Early Years Learning & Development Framework) I drew on the well established research methodology of content analysis, (specifically document analysis). Content analysis has been described by many researchers but in particular it refers to ‘in depth analysis’ using a range of recognised methods such as attention to objectivity-intersubjectivity, a priori design, reliability, validity, generalizability, replicability, and hypothesis testing (Neuendorf, 2002). Kerlinger’s (1986) definition (Wimmer & Dominick, 2000, p135) seems to be widely accepted, “content analysis is a method of studying and analysing communication in a systematic, objective & quantitative manner for the purpose of varying variables” – it is Kerlinger’s definition that’s used to say that content analysis should
by systematic, objective and replicable. Content analysis is therefore the method I used to assess the content in the two Australian documents.

One aspect of this study will provide baseline data to see if science is an intergral aspect of the new frameworks. While it is a form of content analysis, it is not a sophisticated form. In terms of “uses of content analysis” (Wimmer & Dominick, p 136-7) I am using the technique in a traditional and descriptive manner.

If we are to be rigorous with our analysis, we need to address the following questions suggested by Dr. Klaus Krippendorff (2004).

Which data are analyzed?
Two documents - Early childhood- Belonging, being, becoming & Victorian Early Years Learning & Development Framework

How are they defined?
They are easily defined by the content which is searched for words, language and content related to science education.

What is the population from which they are drawn?
The documents represent the collective work of Early childhood practitioners, researchers, government agencies and other stakeholders.

What is the context relative to which the data are analyzed?
The data are analysed across a number of contexts. Initially the frameworks are read and classified by a number of aspects. These smaller parts are analysed according to content related to science education – language or specific content.

What are the boundaries of the analysis?
The analysis is bounded strictly to the two documents specified

What is the target of the inferences?
The target relates back to our original questions – where is the science education in the new frameworks documents?

It is anticipated that the analysis of the two documents will include finding significant information embedded in the texts.

Data

Electronic scanning for relevant words, such as science, scientific.

Scanning the document 1 (BBB), the word “science” was found twice in the reference section of the document – Department of Education, Science and Training. Shonkoff, J., & Phillips, D. K. (2000). From neurons to neighbourhoods: The science of early childhood development. The word scientific was located on p 35 and referred to scientific language

Scanning the document 2 (VEYLDF), the word “science”, was found once in the reference section of the document
Department of Education, Science and Training

Scanning both documents for the word “mathematics” provided several ‘hits’ in both documents and scanning for the word “languages”, resulted in multiple occurrences.
However, word scans are a simplistic approach as they do not give the sense of the text of the documents. Further content analysis indicates that looking at the document under the outcome "Children are confident and involved learners" reveals a number of skills and/or areas of learning that fall into "science education".

VEYLDF pg 27 (BBB p 34)

Children develop dispositions for learning such as curiosity, cooperation, confidence, creativity, commitment, enthusiasm, persistence, imagination and reflexivity

Demonstrated when children:

- express wonder and interest in their environments
- are curious and enthusiastic participants in their learning
- use play to investigate, imagine and explore ideas
- follow and extend their own interests with enthusiasm, energy and concentration
- initiate and contribute to play experiences emerging from their own ideas
- participate in a variety of rich and meaningful inquiry-based experiences
- persevere and experience the satisfaction of achievement
- persist even when they find a task difficult

BBB p 34

Educators promote this learning, for example, when they:

- recognise and value children's involvement in learning
- provide learning environments that are flexible and open-ended
- respond to children's displays of learning dispositions by commenting on them and
- providing encouragement and additional ideas
- encourage children to engage in both individual and collaborative explorative learning processes
- listen carefully to children's ideas and discuss with them how these ideas might be developed
- provide opportunities for children to revisit their ideas and extend their thinking
- model inquiry processes, including wonder, curiosity and imagination, tries out new ideas and takes on challenges
- reflect with children on what and how they have learned
- build on the knowledge, languages and understandings that children bring to their early childhood setting
- explore the diversity of cultures and social identities
- promote in children a strong sense of who they are and their connectedness to others – a shared identity as Australians

Children develop a range of skills and processes such as problem solving, inquiry, experimentation, hypothesising, researching and investigating

Evident when children:

- apply a wide variety of thinking strategies to engage with situations and solve problems, and adapt these strategies to new situations
- create and use representation to organise, record and communicate mathematical ideas and concepts
• make predictions and generalisations about their daily activities, aspects of the natural world and environments using patterns they generate or identify and communicate these using mathematical language and symbols
• explore their environment
• manipulate objects and experiment with cause and effect, trial and error, and motion
• contribute constructively to mathematical discussions and arguments
• use reflective thinking to consider why things happen and what can be learnt from these experiences

BBB p 35
Educators promote this learning, for example, when they:
• plan learning environments with appropriate levels of challenge where children are encouraged to explore, experiment and take appropriate risks in their learning
• recognise mathematical understandings that children bring to learning and build on these in ways that are relevant to each child
• provide babies and toddlers with resources that offer challenge, intrigue and surprise, support their investigations and share their enjoyment
• provide experiences that encourage children to investigate and solve problems
• encourage children to use language to describe and explain their ideas
• provide opportunities for involvement in experiences that support the investigation of ideas, complex concepts and thinking, reasoning and hypothesising
• encourage children to make their ideas and theories visible to others
• model mathematical and scientific language and language associated with the arts
• join in children’s play and model reasoning, predicting and reflecting processes and language
• intentionally scaffold children’s understandings
• listen carefully to children’s attempts to hypothesise and expand on their thinking through conversation and questioning

Children transfer and adapt what they have learnt from one context to another

Evident when children:
• engage and co-construct learning
• develop an ability to mirror, repeat, and practice the actions of others, either immediately or later
• make connections between experiences, concepts and processes
• use the processes of play, reflection and investigation to problem solve
• apply generalisations from one situation to another
• try out strategies that were effective to solve problems in one situation in a new context
• transfer knowledge from one setting to another

BBBp36
Educators promote this learning, for example, when they:
• value signs of children applying their learning in new ways and talk about this
with them in ways that grow their understanding
- support children to construct multiple solutions to problems and use different ways of thinking
- draw children’s attention to patterns and relationships in the environment and in their learning
- plan for time and space where children can reflect on their learning and to see similarities and connections between existing and new learning
- share and transfer knowledge about children’s learning from one setting to another, by exchanging information with families and with professionals in other settings
- encourage children to discuss their ideas and understandings
- understand that competence is not tied to any particular language, dialect or culture

Children resource their own learning through connecting with people, place, technologies and natural and processed materials

Evident when children:

- engage in learning relationships
- use their senses to explore natural and built environments
- experience the benefits and pleasures of shared learning exploration
- explore the purpose and function of a range of tools, media, sounds and graphics
- manipulate resources to investigate, take apart, assemble, invent and construct
- experiment with different technologies
- use information and communications technologies (ICT) to investigate and problem solve
- explore ideas and theories using imagination, creativity and play
- use feedback from themselves and others to revise and build on an idea

BBB p 37
Educators promote this learning, for example, when they:

- provide opportunities and support for children to engage in meaningful learning relationships
- provide sensory and exploratory experiences with natural and processed materials
- provide experiences that involve children in the broader community and environment beyond the early childhood setting
- think carefully about how children are grouped for play, considering possibilities for peer scaffolding
- introduce appropriate tools, technologies and media and provide the skills, knowledge and techniques to enhance children’s learning
- provide opportunities for children to both construct and take apart materials as a strategy for learning
- develop their own confidence with technologies available to children in the setting
- provide resources that encourage children to represent their thinking

English Early Years Foundation Stage – Every Child Matters, pg 46

Knowledge and Understanding of the World
1. Shows curiosity and interest by exploring surroundings.
2. Observes, selects and manipulates objects and materials. Identifies simple features and significant personal events.
3. Identifies obvious similarities and differences when exploring and observing. Constructs in a purposeful way, using simple tools and techniques.
4. Investigates places, objects, materials and living things by using all the senses as appropriate.
5. Identifies some features and talks about those features (s)he likes and dislikes.
6. Asks questions about why things happen and how things work. Looks closely at similarities, differences, patterns and change.
7. Finds out about past and present events in own life, and in those of family members and other people (s)he knows. Begins to know about own culture and beliefs and those of other people.
8. Finds out about and identifies the uses of everyday technology and uses information and communication technology and programmable toys to support her/his learning.
9. Builds and constructs with a wide range of objects, selecting appropriate resources, tools and techniques and adapting her/his work where necessary.
10. Communicates simple planning for investigations and constructions and makes simple records and evaluations of her/his work.
11. Identifies and names key features and properties, sometimes linking different experiences, observations and events.
12. Begins to explore what it means to belong to a variety of groups and communities.

Comments from Interviewees when asked the question, “Where does science fit in the EYFS?”

“There's an enormous creative aspect and creativity in its widest sense of thinking skills and being able to abstract. So I think that there are elements of science in every strand of the Early Years Foundation Stage” JJ

“It's the language they use in here that I sometimes disagree with because I personally believe that investigation is a very particular process that children will very rarely get involved in.” JJ

It will have been because the six areas of learning are essentially a primary and secondary curriculum. It's the same areas, they're just called something different. Knowledge and Understanding of the World is different to the others a little bit because it involves more than Science. It's around the thing that investigative and exploratory. If it isn't in the others, we can stick it in to Knowledge and Understanding [laughter]. But, having said that, the way in which that should be taught and children should be learning in that, is exactly the same as the other areas as well. It's exploratory, it's investigative, it's practical, it's hands on. So it doesn't sit differently and it doesn't sit within a - it won't sit within a topic, alright a title, a Science. It won't be called Science. JD

It was given that range so that children are being able to handle different substance, materials and put all different materials together. For example, we've got magnets and there's all different things and it really is in the national curriculum, exploring and analysing things. So we really like them to explore, look at how things work, how things happen and question what would happen if I do this, why is this working this way, what happens if I - and when they're constructing as well, we use things with gears and levers and pulleys. We have four year olds making little pulleys for their cranes to lift things upwards and with
magnets at the end of the it so they were really looking at how things happen and why things work. KL

I have to say I think it probably has made the preschool do a bit more. But I think that’s not necessarily the curriculum per se I think that is the training. GK

It took to a knowledge and understanding of the world. I think it isn’t, perhaps given the – status is the wrong word, I don’t mean status, but I don’t think it’s been seen as core in any way. LNW

we’ve gone into that more investigative mode which I think is good, isn’t it. So children can push their investigations with things as far as they want to in a good environment, but I don’t know whether that means that the adults are skilled enough to draw out of that. I somehow doubt it. SD

It’s the maths and the science that I know that we’ve got an agenda to make sure that we deliver. So it is about trying to kind of go into that territory, where you maybe need to find out something more yourselves. So that’s an area for development in our sector. RS

I think it has always been there, but I think it’s taught in a broader way basically in the early years because there is so much learning and investigating going on all the – …science to the little children because they’re learning something new every day. Yeah we make sure, don’t we, that they’ve got their …in the water, there’s so much going on all the time. So yeah I think it’s just part of it, naturally. SG

So actually if you’re come from a Piagetian perspective I suppose, that [school and] philosophy of the Foundation Stage, it’s really around that, sort of all about children following their own minds of inquiry and developing some cognitive skills to enable them to think like scientists, yeah. SJ

Discussion

It is clear from the two Australian documents used for this study, that science, as ‘children investigating their world’, is a strong component of each framework. Similarly for the English framework, science as investigation, is also present. The evidence from England is that practitioners do implement an ‘investigation’ approach however, this sometimes is no more than setting up a discovery table and allowing children to make their own discoveries. Other evidence from England suggests that whilst the creative arts are areas most practitioners feel comfortable with, aiding children with their investigations will be a little harder. Some of those interviewed hinted that lack of qualifications, rather than the ‘curriculum’ was the impediment to the successful implementation of children investigating their own world. However, the additional compelling evidence from England is that the way science is implemented varies from practitioner to practitioner.

How does this knowledge impact on our understanding of our Australian documentation? We know the documents are similar in their promotion of children investigating the world around them as their science content. We also know from previous studies, that many EC practitioners in Australia are not confident in their science knowledge (Campbell & Jobling, 2009). Does this mean that science will lose out in the battle for time and consideration with literacy and maths understanding commanding the energies of practitioners? One thing which we do have in our favour is that, in general, more staff employed in early childhood centres in Australia have undertaken some form of qualification, compared to their English counterparts.

In considering the original research proposal which was about ways we can make the frameworks more inclusive of science, it seems that the science is already there. It is just not being called science. Why not? Visual arts is called visual arts, dance is called dance,
mathematics is called mathematics and literacy/language is called literacy/language. What is wrong with labelling ‘children investigating their world’ as ‘science’? Some reasons are discussed here.

Is it because we still have a large proportion of our population who fear science or who think science belongs to a small discrete number science ‘nerds’. Do we have to change people’s perception of science before we can acknowledge its presence in our early childhood frameworks? Or should we be saying to everybody, this is science, when children investigate their worlds, they are acting like scientists. It seems much more natural to do it from this way round, rather than deny its existence by not calling it what it is.

Perhaps there is another reason. We want to keep early childhood learning unique and we certainly do not want early childhood to take on the mantle of a ‘school’ type curriculum. Unfortunately, school curriculum has subjects called science and maths and whilst it also has integrated curriculum, it does not advance the idea of holistic learning. Is this the reason? Our belief in children learning in a natural holistic manner, does not support the idea of pigeon-holing learning into defined learning areas.

References

Department for Education and Skills, (2008), Every child matters: change for children. HM Service
Department of Education and Early Childhood Development & Victorian Curriculum and Assessment Authority, (2009), Victorian Early Years Learning and Development Framework