

Missed opportunities? Inspiring mathematics in the early years

Jana Kovtun

WESTERN SYDNEY
UNIVERSITY



Early Childhood Australia
A voice for young children

Early Childhood Australia National Conference 2016
THIS IS CHILDHOOD Pedagogy and practice
in the early years



Framing the study

“Early mathematics teaching has seldom been studied, perhaps because it is seldom done”

(Ertle, Ginsburg, Cordero, Curran, Manlapig, & Morgenlander, 2008, p.67)

“In many early childhood programs, mathematics makes only fleeting, random appearances”

(National Association for the Education and Young Children and the National Council of Teachers of Mathematics, 2000, p. 9)



Early Childhood Australia
A voice for young children

Early Childhood Australia National Conference 2016
THIS IS CHILDHOOD Pedagogy and practice
in the early years



Framing the study

- Mathematics **is** important, but where does it happen? Is it happening at all? If it does happen, does it happen enough?

“[we] don’t do any mathematics at all”

- Pre-service teachers’ misconceptions, personal experiences and fear

“I did early childhood so I wouldn’t have to do maths”





Framing the study

Pre-school teachers place mathematics as the third most important educational goal for children

(Ginsberg, Lee & Boyd, 2008)

BUT

“Many early childhood teachers are quite uncomfortable teaching early years mathematics”

(Ertle et al., 2008, p. 67)

“Teachers seldom exploit the mathematics in children’s everyday behaviour”

(Ginsburg & Ertle, 2008, p. 60)





Frequency of maths experiences

- How often do maths experiences occur in the setting?

“I would say planned and spontaneous maths experiences happen on a daily basis.”

“At least once a week I do maths..... I still think it should be more, maybe three times a week or maybe five times a week like literacy. I comply with what I have to teach”





Framing the study

Addressing research question 1:

What factors allow early childhood teachers to establish that a Teaching and Learning Material (TLM) has Mathematical Pedagogical Potential (MPP)?

TLM

Any everyday concrete equipment made available for the use of both teachers and students in the context, with or without the intent of attaching explicit mathematical pedagogical aim.

MPP

Identifying possible mathematics teaching and learning opportunities; the teacher's assessment of the possibility of being able to teach with a resource that will assist learners in acquiring new understanding of a mathematics concept.





Mathematics **does** happen, so what's the issue?

Identifying opportunities for mathematics

- Limited teacher knowledge
 - Mathematics content knowledge
 - General pedagogical knowledge
 - Mathematical pedagogical content knowledge
- Training, professional development, experience and pedagogy





Preliminary findings

- Mathematics is important
- Mathematics ideas are everywhere
- Identifying mathematics is a challenge
- Extending mathematical ideas is a challenge

“Nobody notices all the maths that goes on. Yes, identifying that’s the hardest, and that’s what I do...that’s my problem. I identify, I teach and then I don’t know how to extend on it”

“I suppose I teach [maths] everyday...even when we do gardening, how many spoons do we need, how many seeds do we need. I’m always sort of developing that thinking but I don’t realise...now that you came. Probably I would have never realised if you never came. We are teaching it....I suppose we’re teaching it more”





Preliminary findings

- Incorporating mathematics into everyday experiences
 - Specifically planning
 - Didactic approach
- Researcher interaction effect:
“Oh, I need to get a mathematics experience ready because Jana’s coming!”

“...now that you came. Probably I would have never realised if you never came. We are teaching it.....I suppose we’re teaching it more”





Preliminary findings: Teacher knowledge

Mathematics content knowledge (MCK)

- Possessing understanding of mathematics subject matter, in particular the mathematics being taught at the time. (Shulman, 1986)

Number, counting, shapes, colour, weight, length, volume, matching numbers/items, matching shapes, classifying, measurement, data, geometry, timing, position, language of 'bigger' and 'smaller', one-to-one correspondence, problem solving, number recognition, identify written numbers.





Preliminary findings: Teacher knowledge

General pedagogical knowledge (GPK)

- Possessing an understanding of generic teaching and learning strategies, for example questioning, communicating, and modelling, required to promote and support students' understanding of mathematical concepts.

(Sperandeo-Mineo, Fazio & Tarantino, 2005)





Children and teacher sang 'One Currant Bun' as part of their transition to the bathroom.

"What do you think will happen with the measurements when the balloons come out of the freezer?"

"Now we need 2 cups of self-raising flour. Here's one cup. So we need 2 cups. So you have to do one cup and then another cup [points to the measuring cup].....Would you like to take the self-raising flour back to C? It's very heavy so you might need to use two hands."



Early Childhood Australia

A voice for young children

Early Childhood Australia National Conference 2016
THIS IS CHILDHOOD Pedagogy and practice
in the early years



Preliminary findings: Teacher knowledge

Mathematical pedagogical content knowledge (MPCK)

- This refers to connecting the relationship between mathematics subject matter and how to represent it in a meaningful way, and utilising effective strategies to teach it in such a way that maximises students' understanding of mathematical concepts.

(Capraro, Capraro, Parker, Kulm, & Raulerson, 2005; Shulman, 1987)





“I held up the amount of fingers relative to the word such as 4 fingers to represent the word four. Child counted my fingers and yelled “four” as she referred back to the word...”

“There are 17 children in class so we’re going to make 17 cookies”

In the sandpit, teacher tipped over the bucket full of sand and gently lifted up the bucket to reveal part of the ‘castle’. Children continued to fill up bucket well over capacity of bucket. Teacher said “oh look, you’ve already filled it!”.



Early Childhood Australia

A voice for young children

Early Childhood Australia National Conference 2016

THIS IS CHILDHOOD Pedagogy and practice
in the early years



Training

University

- Both early childhood teachers (ECTs) working in the Early Childhood Education and Care (ECEC) context completed their degrees via correspondence
- Both teachers reported little mathematics content in their training
 - in birth to five years training, mathematics was combined with two other subject areas, and taught once as one unit only in the course
 - in birth to eight years training, there was “one or two” mathematics units in the whole course





Training

University

- Teachers had difficulty recalling the mathematics resources introduced to them in their university studies

“... [university] gave us lots of units of work that other teachers had done, and that talked about how they extended the mathematics in a lot of topics...but I don't remember [university] introducing any mathematics resources at all actually.”





Training

University

- Belief that training for teachers working with children birth to five years is not as sophisticated as university training for teachers working in a kindergarten classroom:

“I think they have maybe more knowledge than what we have, cause I’m only qualified as zero to five, and most teachers in early childhood field are qualified zero to five so they really don’t have as much knowledge as what a kindergarten teacher would have. And their learning of maths.”





Training/Experience

University

- Teachers were uncertain about how their university training in mathematics linked to their teaching practices, rather recalling that experience was a factor that contributed to their knowledge

“My maths knowledge emerged from my experience in the early childhood field. I cannot connect my knowledge to any specific learning at uni”

“I think that my learning comes more from experience than what I learned through education”



Early Childhood Australia

A voice for young children

Early Childhood Australia National Conference 2016

THIS IS CHILDHOOD Pedagogy and practice
in the early years



Experience

- Both teachers had difficulty articulating how their experience helped them teach mathematics to young children

“You just know by all the different mathematics concepts...you just learn over the years and being an early childhood teacher, the different ways you can use different resources to teach children”

“I just know from experience....this is hard”





Professional development

- Both of the teachers said that, throughout their time working as Diploma trained and qualified Early Childhood Teachers, professional development opportunities for mathematics education had never been offered through their setting

“No, how sad! Now I’m going to look into that. I did music, language, literacy, science, technology....I’ve never done maths.”

“We have not attended any training that focuses specifically on the development of maths skills. This will be a preference for future training”





Pedagogy

- Maths doesn't 'come naturally'
- Prior knowledge and scaffolding identified as key strategies to develop understanding

“Maths is always on my mind but the teaching I think doesn't come as spontaneous as other things”

“Strategies I would use is getting to know what the child already knows and how we can develop them further with learning”





Inspiring more mathematics

- Recognise that mathematics is present in everyday routines and activities, and incorporate these ideas into conversations with children.
 - Songs
 - Books
 - Block play
 - Role-play
- Plan experiences that involve more than number.
 - Shape hunt
 - Sand pit





Future directions

- Mathematics needs to feature as a professional development activity for ECEC settings so ECTs revisit their roles as teachers of mathematics, identify where mathematics is occurring, and develop awareness of facilitating meaningful mathematics teaching and learning opportunities in the early years.
- Given the current emphasis on Science, Technology, Engineering and Mathematics (STEM) subjects, it is possible that pre-service teachers during their university training need enhanced preparation for teaching young children mathematics.
- Further, larger-scale studies may be needed to explore the myriad of ECTs' knowledges that contribute to effective pedagogy of mathematics in the early years.
- Explore the connection between professional identity and beliefs, and the frequency and quality of mathematics education provided in ECEC settings.





Questions, thoughts, feedback?

Jana Kovtun

School of Education

Western Sydney University

P: (02) 9772 6236

E: j.kovtun@westernsydney.edu.au



Early Childhood Australia

A voice for young children

Early Childhood Australia National Conference 2016

THIS IS CHILDHOOD Pedagogy and practice
in the early years



References

- Capraro, R.M., Capraro, M.M., Parker, D., Kulm, G., & Raulerson, T., (2005). The mathematics content knowledge role in developing preservice teachers' pedagogical content knowledge. *Journal of Research in Childhood Education, 20*(2), 102-118. Available online from: <http://proquest.umi.com/pgdweb?index=8&did=1020188131&SrchMode=3&sid=2&Fmt=6&VInst=PROD&VType=PQD&RQT=309&VName=PQD&TS=1247644385&clientId=8429&aid=1>
- Ertle, B.B, Ginsburg, H.P., Cordero, M.I., Curran, T.M., Manlapig, L., & Morgenlander, M. (2008). [The Essence of Early Childhood Mathematics Education and the Professional Development Needed to Support It.](#) In A. Dowker (Ed.), *Mathematical difficulties: Psychology and intervention* (Chapter 4, pp.59-83). Retrieved from ScienceDirect database.
- Ginsberg, H.P., & Ertle, B. (2008). Knowing the mathematics in early childhood mathematics. In O.N. Saracho & B. Spodek, (Eds.), *Contemporary perspectives on mathematics in early childhood education*. USA: Information Age Publishing. pp. 45-66.
- Ginsburg, H. P., Lee, J. S., & Boyd, J. S. (2008). Mathematics education for young children: What it is and how to promote it. *Social Policy Report, 22*(1), 3-11 and 14-23. Available online from: <http://www.srpd.org/spr.html>
- National Association for the Education of Young Children (NAEYC) and the National Council of Teachers of Mathematics (NCTM). (2002). Early childhood mathematics: Promoting good beginnings. Available online from: <http://www.naeyc.org/about/positions/psmath.asp>
- Shulman, L.S. (1986). Those who understand: Knowledge growth in teaching. *Educational Researcher, 15*(2), 4-14. Available online from: <http://links.jstor.org/sici?sici=0013-189X%28198602%2915%3A2%3C4%3ATWUKGI%3E2.0.CO%3B2-X>
- Shulman, L. S. (1987). Knowledge and teaching: Foundations of the new reform. *Harvard Educational Review, 57*, 1-22.
- Sperandeo-Mineo, R.M, Fazio, C., & Tarantino, G. (2005). Pedagogical content knowledge development and pre-service physics teacher education: A case study. *Research in Science Education* volume 36, pp235-268. DOI: 10.1007/s11165-005-9004-3

