Strengths approaches in early childhood mathematics education

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This symposium discusses the use of strengths approaches in early childhood mathematics education. *Strengths approaches* can be conceptualised as educational practices that recognise, and utilise, children's strengths. Strengths approaches originate in the social work sector, but are growing in recognition in early childhood education. This symposium considers how strengths approaches might be adopted in early childhood mathematics education, specifically, encouraging pedagogical approaches that recognise, and build upon, young children's strengths in mathematics. This symposium presents theorisation and a case illustration of how strengths approaches can be meaningfully utilised in early childhood settings in order to enhance mathematical learning opportunities for young children. The symposium addresses three aspects: (1) Overview of strengths approaches; (2) Application of strengths approaches; and (3) Leadership to promote strengths approaches; illustrated within the context of early childhood mathematics education.

The symposium format is as follows:

Chair: Amy MacDonald

Paper 1: Fiona Collins & Angela Fenton *An introduction to the strengths approach*

Paper 2: Amy MacDonald & Steve Murphy *A strengths approach to birth-to-3 mathematics education: The case of Banjo Childcare Centre*

Paper 3: Matt Sexton & Joce Nuttall *Leadership of strengths-based approaches for early years mathematics education: Using CHAT as a framework for educational leaders' professional learning leadership*

Discussants: James Russo & Toby Russo

2021. In Y. H. Leong, B. Kaur, B. H. Choy, J. B. W. Yeo, & S. L. Chin (Eds.), *Excellence in Mathematics Education: Foundations and Pathways (Proceedings of the 43rd annual conference of the Mathematics Education Research Group of Australasia)*, pp. 83. Singapore: MERGA.

A strengths approach to birth to 3 mathematics education: The case of Banjo Childcare Centre

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This paper contributes to the Research Symposium, *"Strengths approaches in early childhood mathematics education"* by providing an illustration of how an early childhood centre adopts a strengths approach to mathematics education for birth to three-year-old children. A case illustration is drawn from a current Australian Research Council-funded study focusing on mathematics education for children under three years of age. The case is analysed and described using a five-step strengths-based framework.

Introduction

It is well-established that young children, prior to starting school, are capable of engaging with a range of mathematical ideas (Gervasoni & Perry, 2015; MacDonald & Carmichael, 2018). However, most of this research has focused on children aged four years and older, with birth to three mathematics education receiving very little attention (MacDonald & Murphy, 2019). However, a current Australian Research Council-funded study being conducted by the lead author of this paper is addressing this dearth of research through a national study of mathematics education for children aged under three years. As part of the larger study, case studies of birth to three education settings are being conducted in order to examine mathematics education opportunities afforded to very young children, and the beliefs and practices of their educators which influence these opportunities. Drawing from the larger study, this paper presents a case illustration of the birth to three learning environment at Banjo Childcare Centre (pseudonym), a long day care service located in regional New South Wales (NSW), Australia. Six early childhood educators and 17 children participated in the case study, and the children ranged from 13 to 40 months in age. The authors of this paper spent two days in the site, gathering data in the forms of continuous video recordings; video and photographic observations; documents such as learning stories and daily reflections; and anecdotes from educators. This case has been selected as it illustrates how a strengths approach to mathematics education can help an early childhood service overcome a range of challenges and barriers, and utilise their unique strengths and resources in order to provide high-quality mathematics education for very young children. In the case illustration that follows, we apply the Column Approach as described by Collins and Fenton (under review) (Paper 1 in this Symposium) in order to analyse how Banjo Childcare Centre are taking a strengths-based approach to mathematics education for the birth-to-three-year-olds in their centre. The case is structured according to the five-step framework, namely: (i) Stories and issues; (ii) The picture of the future; (iii) Strengths and capacities; (iv) Other resources; and (v) Plans and steps.

The Case of Banjo Childcare Centre

Stories and Issues

As noted in Paper 1 in this symposium (Collins & Fenton), a strengths approach does not only focus on the positives; rather, the use of the approach generally starts from clearly

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exploring a challenge, complex issue, or need. Banjo Childcare Centre, and the community it serves, experience a range of challenges and complex circumstances. The service has a maximum of 50 approved places; however, at the time of this study, only 42 of these places were filled. The community receives a relatively low score on the *Socio-Economic Indexes for Areas* (SIEFA) - 869 compared to the NSW average of 1001. This score indicated a disadvantaged socio-economic position characterised by attributes such as low income, low educational attainment, and high unemployment (Australian Bureau of Statistics, 2011). According to the 2018 Australian Early Development Census (AEDC; Commonwealth of Australia, 2019), 38.1% of children in this community are developmentally-vulnerable on one or more AEDC domains; a figure nearly double the NSW average (19.9%). Moreover, 23.8% of children are developmentally-vulnerable on two or more domains, compared to the NSW average of 9.6%. The centre itself experiences challenges in the current early childhood reform climate, receiving a 2018 *National Quality Standard* (NQS; Australian Children's Education and Care Quality Authority, 2019) rating of "Meeting" the NQS, a decline from their 2013 rating of "Exceeding" the NQS.

The Picture of the Future

The data presented above paint a deficits-focused picture of Banjo Childcare Centre and their community. However, these data are not how they see themselves nor the future they see for their children. The centre's handbook states that educators "maintain a high level of professionalism through working together, supporting each other and continuously expanding [their] knowledge base", that educators are "confident in children's ability to learn" and that they "encourage the children to develop a positive attitude towards learning". This positive picture of the future extends to mathematics learning at the centre. While not explicitly articulated, a strengths-based picture of the future is communicated in various ways. The importance of mathematics is highlighted through displays and explicit weekly reporting focussed on mathematics learning. There is an expectation that children at the centre, including very young children, can engage in sophisticated mathematical activities. Records showed in one week children three years old and younger were engaged in various activities that involved measuring height and volume, additive thinking, and counting using Wiradjuri words (the local Indigenous language). Analogue clocks were displayed alongside daily events in the toddler's room (see Figure 1). Collectively, this evidence suggests the Centre pictures a future where their children are capable and confident users of mathematics.

Strengths and Capacities

The centre's handbook makes explicit that educators respond to the strengths and capacities of the children to guide learning and teaching. The handbook states that educators use their observations of children "to develop an educational play based program". Further, "children are given the chance to make decisions, experiment, and explore with a wide range of activities." This philosophy was evident in the way educators responded to children's strengths and capacities through their play in order to engage them in mathematical activities. Counting was regularly introduced to children's activities; for example, ball bounces being tallied, and the time before a jump counted. Measuring concepts were incorporated into play, such as big and small when kicking a football, fast and slow when bike riding, tall and taller when measuring each other's heights, and volumes when cooking. Locating language was built into children's play; for example, when children were playing on a pretend horse (see Figure 2) an educator led a discussion of who was in front, on, and

under. Educators helped children develop plans and procedures associated with their games. In one instance, two children were endeavouring to untangle a ball on a rope, with one up the tree and one underneath, and another child playing nearby accidentally impeding the task. An educator supported the children in a complex series of actions to safely and successfully free the ball.

Figure 1. Clock display in toddler's room.

Figure 2. Pretend horse using saddles and pipe.

Not only did educators notice and capitalise on children's strengths and interests as they presented during play, but they deliberately shaped the learning environment so that these mathematical learning opportunities regularly arose. The physical environment was spatially challenging, with winding and intersecting paths, objects of various heights, and spaces of irregular form (see Figure 3). These spaces encouraged children to problem pose and engage in mathematical activity. Further, the learning culture supported children to fully exploit these spaces to exercise their strengths and capacities. Educators did little to structure play, allowing children to structure their own play opportunities. For example, the play space included a rope and pulley system attached to a tree. It was only once a small group of children were engaged in play that involved getting buckets of bark high into the branches did an educator join to discuss alternate ways of using the ropes to move the buckets higher. A culture of permitting risk also supported children to fully engage in this complex learning environment. Rather than discouraging tree climbing, objects were deliberately placed to facilitate it. Similarly, when a group of children were jumping from objects in the yard, the educator nearby did not restrict the activity, but rather supervised and engaged in discussion about the height of objects and the size of the jump.

Figure 3. Spatially complex learning environment.

Other Resources

Banjo Childcare Centre, and its community, does not have significant financial resources. Despite this, they have been able to create a rich environment to facilitate mathematical learning through resourceful behaviours that are both strategic and opportunistic. Reclaimed, recycled and repurposed objects make up the play spaces, including tyres of various sizes, wooden pallets, restored old play equipment, and items such as the pipe and saddle described earlier (see Figures 2 and 3). The centre also makes excellent use of the resources of its local community to enhance children's engagement and learning. In particular, Wiradjuri culture—the culture of the traditional owners of the land where the centre is located—is strongly represented in the displays and practices of the centre, and, as previously mentioned, the Birth to Three program includes the use of Wiradjuri language in mathematical activities.

Plans and Steps

As noted, Banjo Childcare Centre works with a community facing complex issues, and has limited financial resources with which to do this work. The centre adopts a strengths orientation in their aims and planning for the future, including their approaches to mathematics learning experiences for their birth-to-three-year-olds. Children are empowered mathematically through a "secure environment with opportunities for risk-taking and self-regulation" (Centre Handbook). Educators are trusted to constantly develop mathematics education programs "through reflective practice and our commitment to training" (Centre Handbook). Mathematics learning is deliberately and explicitly included in documentation such as programs, learning stories, and classroom displays, thus highlighting the value placed on mathematics education within the Birth to Three program.

Summary

This brief case illustration has highlighted how an early childhood service experiencing challenging circumstances uses a strengths approach to provide a quality mathematics education program for children aged birth to three years. Educators draw on community strengths and their own resourcefulness in order to create a learning environment that encourages birth-to-three-year-olds to pose and solve mathematical problems, engage with complex spatial environments, utilise number and measurement concepts in meaningful ways, and use mathematical language and representations to add meaning to everyday routines and activities.

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