Does an integrated, wrap-around school and community service model in an early learning setting improve academic outcomes for children from low socioeconomic backgrounds?

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ABSTRACT

Many children start school developmentally vulnerable and struggle to keep up with their peers. Children experiencing socioeconomic-disadvantage are at higher risk of poor developmental outcomes. A high-quality education and wrap-around community-service model, such as the Doveton Model, at Doveton College, Australia, may improve outcomes for families experiencing entrenched disadvantage. This study focussed on the effect of this model on early-learning (pre-formal schooling) for school entry readiness and academic achievement over the subsequent four years. Students who did/did not attend the Doveton Model Early-Learning-Centre were compared using standard reading, oral-language, writing and numeracy tests from school-entry to Year 3. There was a trend towards higher academic achievement for students who attended Doveton early-learning compared to students who had not. Many tests showed statistically significant differences, despite low sample sizes. This study provides preliminary evidence that attending early-learning within a high-quality, wrap-around service model may have significant academic benefits for disadvantaged children.

KEYWORDS

Early learning; pre-school education; academic outcomes; disadvantage; children; child development

There are large inequalities in health and education across the developed world, and many children in the United Kingdom (U.K.) and United States (U.S.) have been identified as requiring additional care on entry to school (Oberklaid, Baird, Blair, Melhuish, & Hall, 2013). In Australia, one in five children are estimated to commence their first year of schooling vulnerable across one or more developmental domains, such as physical health and well-being, social competence, emotional maturity, language and cognitive skills, communication skills and general knowledge (AEDC, 2018). These children face considerable challenges in catching up with their peers. Studies from the U.K. and the U.S. have found that children experiencing socioeconomic disadvantage are particularly at risk of poor developmental and educational outcomes, including delayed social-emotional functioning and behavioural problems (Briggs-Gowan, Carter, Skuban, & Horwitz, 2001; Huaqing Qi & Kaiser, 2003; Shonkoff & Phillips, 2000; West, Denton, & Germino-Hausken, 2000). The disparity in learning and academic performance between these children and their wealthier peers (the achievement gap) is evident early, and this gap grows when there is no effective intervention (Hart & Risley, 1995; Melhuish et al., 2015).

Children's social, emotional, cognitive and physical development is shaped by the experiences and relationships formed in the first years of life (Center on the Developing Child, 2016; Centre for Community Child Health., 2011), and many important and established mental and behavioural patterns are difficult to change once children enter school (Heckman & Wax, 2004). Competencies that emerge in early childhood and into preschool years are related to a range of outcomes throughout childhood such as literacy and numeracy, self-regulation and social and emotional development (Allen & Kelly, 2015; Denham & Brown, 2010; Fantuzzo, Bulotsky, McDermott, Mosca, & Lutz, 2003). These early competencies positively predict wellbeing in later life (e.g. general well-being, physical and mental health, educational achievement and employment) and influence later income and socio-economic status (Shuey & Kankaraš, 2018).

High-quality home learning environment (available to children long before formal schooling) is a key predictor of a child's future success in many parts of the developed world, particularly in relation to early language ability (Melhuish et al., 2008; Taggart, Sylva, Melhuish, Sammons, & Siraj, 2015). From a young age, parents may utilize a range of activities to effectively support language development in children, from exposure to rich, every-day conversations, imaginative play and consistent reading activities, to providing nurturing parenting and communicating high, yet reasonable, expectations for achievement (Hillman & Williams, 2015; National Literacy Trust., 2011). Enriched home learning environments are more highly associated with children from middle- and upper-income families than lower-income families, leaving the latter at an educational disadvantage from a young age (Oberklaid et al., 2013). Like home learning, access to high-quality early learning is a strong predictor of later academic success, particularly for disadvantaged children.

The quality of early learning programmes are generally defined by process and structural quality components (Howes et al., 2008; Sylva et al., 2006). Process quality refers to the direct interactions and experiences that children have with teachers and the instructional content within the early learning classroom. Structural quality includes educator-to-child ratio, space, resources and staff qualifications. Outcomes from a major research project conducted in Australia on the early childhood system suggested a strong need for policy reform and that the opportunity to intervene and act early is clear (Tayler, 2016). Providing quality early childhood education was noted as a matter of social justice as well as a profound way to build a better life for all children, and thus improved social and economic wellbeing nationwide. With regards to process quality components, recent Australian research found universal programmes that address social and emotional learning for children in centre-based early childhood settings can improve learning outcomes, social competence, emotional competence, behavioural self-regulation, and emotional and behavioural problems compared to controls (Blewitt et al., 2020). However, Australian and international research suggests that the high-quality interactions required for social, emotional and cognitive learning are not being consistently offered to children within early learning programmes (Blewitt et al., 2019).

High-quality early childhood education is the most consistently effective early childhood intervention, and can significantly reduce developmental vulnerability and the gap between advantage and disadvantage that is evident at school entry (Fox & Geddes, 2016; Goldfeld et al., 2016; M. N. McCain, Mustard, & McCuaig, 2011). Programmes that intervene prior to age 3 years appear to have significant lifelong benefits. The Effective Provision of Preschool Education (EPPE) in the U.K. measured the effects of early learning environments at ages 3 and 4 and measures on primary school entry for 3000 children, and found positive effects of high quality preschool on children's cognitive development and social behaviour development from lower primary school onwards (Melhuish et al., 2015). In another longitudinal study, Schweinhart (2007) followed a cohort of children born into poverty who were randomly allocated to a high-quality preschool programme or a comparison group. At 40 years of age, adults who had participated in the preschool programme outperformed non-participating peers on a number of well-being measures, including educational attainment and earning capacity. Further, similar research finds that the effect of high-quality preschool can also protect a child from low effective schooling (Sylva, Melhuish, Sammons, Siraj-Blatchford, & Taggart, 2004). Impacts from strengthening children's cognitive development, and supporting children's prosocial

behaviour and emotional wellbeing through attendance at high-quality, focussed early learning programmes also appear to be sustained into adolescence (Melhuish et al., 2015; Taggart et al., 2015).

From an economic perspective, the importance of intervention in early childhood education for children experiencing disadvantage is clear. Studies from the U.S. have found that high quality early education from birth to five years resulted in substantial return on investment across education, health, and social and emotional development, with considerably greater benefits seen for children experiencing disadvantage and when interventions are in place before school commences (Cunha & Heckman, 2008). An economic benefit has been found for investing early, to allow a greater number of children to develop and succeed, enhancing productivity and producing savings for society as a whole and this is particularly important in disadvantaged areas (Heckman, 2006, 2017).

High-quality early learning combined with a supportive environment that focuses on education may help to address issues of disadvantage in a community setting, and enable children and families to fundamentally change the trajectory of their lives. Such an approach was demonstrated by the Canadian Toronto First Duty project, an evidence based and integrated early learning and care programme in school-based hubs (McCain et al., 2011). The Toronto First Duty project commenced in 2001 and sought to implement recommendations from the first *Early Years Study* (McCain & Mustard, 1999) to demonstrate why early education is important for every child. Toronto First Duty combined a traditional school programme with day-long kindergarten, childcare and parenting supports to meet the developmental needs of children, while supporting parents to return to work or study (Corter, Janmohamed, & Pelletier, 2012). Parental support and outreach were core concepts in the model, with parent's involvement in the programme providing input into service design as well as improving educational outcomes in the home. The model was a universally accessible service that integrated existing parts of the system into a high quality programme that could reach users that were underserved in the population. Using schools as a platform, the Toronto First Duty project has undergone extensive evaluation, and this has been instrumental in translating scientific evidence into community action and public policy. The evaluation process has enabled parts of Canada to move from a fragmented early childhood service platform to a coherent early childhood model (Corter et al., 2012).

The focus of the current study is the Doveton Model, an approach for best practice in early childhood education similar to the Toronto First Duty Project. The Doveton Model is based on the premise that opening up local schools and growing and supporting the whole community is one of the best ways to turn around communities experiencing entrenched disadvantage (Corter et al., 2012). The model features long-day early learning from birth to kindergarten (pre-school) with a focus on play-based, intentional learning, best-practice structural quality with appropriate group size, education qualifications and practitioner-to-child ratios that exceed the highest quality standards. Professional learning for educators is an essential ingredient of the Doveton Model, alongside pedagogy continuity that transitions from early learning into primary school. Strong partnerships with families are integral to the model, to support a positive learning environment at home. Providing the best possible early learning experience for children has been a cornerstone of the Model's philosophy since its inception (Doveton College, 2013).

Study aim

A wide-ranging approach is required to evaluate the broad range of outcomes from implementing the Doveton Model, and in this study we look at only one specific outcome, which was children's academic outcomes to Year 3. The overall aim of this study was to evaluate the effect of attending an early learning setting that implemented the Doveton Model on children's academic achievement, where academic achievement was measured from the first year of formal schooling to Year 3 principally for reading, writing and numeracy outcomes. The first specific aim was to investigate whether students who attended Doveton Model early learning setting in 2013 showed improved academic outcomes at school entry in 2014 compared compared with students in the same cohort who did

not attend the Doveton Model early learning setting. If academic advantage was found for the first year at school, the second aim was to determine whether students who had attended the Doveton Model early learning setting maintained an academic advantage compared to students who did not in the subsequent four years (to 2017).

Materials and methods

Setting

The study setting was an Early Learning Centre located at Doveton College, in an outer suburb of Melbourne, Australia. The community in this area is one of the most disadvantaged in the state, with many of the children at Doveton College coming from families who struggle with long-term unemployment, intergenerational poverty, social isolation, and complex health and wellbeing issues. The population tends to be transient, with more than 50 different languages spoken, and over 75% of residents eligible to hold a health-care card (an index of poverty).

Doveton College was established in response to the needs of this community and the desire to make lasting change, and includes a high-quality early learning centre and school-based programme to Year 9 (age 16 years). The model incorporates wrap-around services intended to integrate high-quality early learning, alongside supporting families through on-site maternal and child health services for children from birth to age five. Teaching and learning spaces are provided for first year of schooling students to Year 9 students (Doveton College, 2013). Support is provided for parents and community members to engage in volunteering, educational and employment opportunities. The Early Learning Centre has received excellent ratings from governmental authorities, and features high child-to-educator, teacher-qualified staff in each early learning room regardless of children's age, and sustained commitment to professional development for educators. Children experience multiple educators in the Centre led by an experience team leader. The Doveton Model for the Centre is governed by the School, so that the philosophy of pedagogy and leadership is consistent across educational areas, and educators have a shared vision.

The Early Childhood component of the Doveton model aims to provide children with strong, stable and trusting relationships with skilled educators, so that children can manage their emotions develop friendships, exercise agency and make choices, and to have their decisions respected. The Early Learning Centre provides quality space and resources. Activities and curriculum provision is across literacy, mathematic science and the environment, and diversity as measured by the Early Childhood Environmental Rating Scale — Extension (ECERS-E; (Sylva, Siraj-Blatchford, & Taggart, 2011b)). The College trains early learning educators in the provision of high quality intentional and relational pedagogy that supports children's shared thinking and emotional wellbeing, self-regulation, focused thinking and problem solving that is supported and extended by sensitive interactions with others; as measured by the Sustained Shared Thinking and Emotional Wellbeing Scale (SSTEW; (Siraj, Kingston, & Melhuish, 2015)).

Participants

Participants were 56 students (27 girls, 29 boys) who attended Year 3 at Doveton College in 2017. Most children were born in Australia ($n=42$, 75.0%) and spoke a language other than English as their primary language at home ($s = 47$, 83.9%). Of the students who attended Year 3 at Doveton College, 17 (30.4%) had attended the Early Learning Centre at Doveton College ('Attended ELC'), and 39 (69.6%) students attended early learning elsewhere, or not at all ('Did not attend ELC'). Two students in the 'Did not attend ELC' group and one student in the 'Attended ELC' group identified as Koorie (Indigenous Australian). There were no statistically significant differences between groups for maternal and paternal occupation, or maternal and paternal education. T-tests indicated that there were no significant differences between 'Attended ELC' vs 'Did not attend ELC' groups on

the following variables: days late to school (each year from 2014 to 2017), days absent (each year from 2014 to 2017) and months attending Doveton College.

Materials

Students were tested from their first year of schooling to Year 3 on a range of standard tests as part of ongoing student assessment on reading, oral language, writing, and numeracy outcome measures. Two types of assessments were used: (1) standardized tests; and (2) teacher judgement. Testing for reading was measured using the Fountas & Pinnell letter test, NAPLAN – Reading, and the English Online Interview - school entry testing. Oral language was measured using a modified version of the Record of Clays Oral Language. Writing was measured using the NAPLAN writing test, and Numeracy was measured using PATMaths and the NAPLAN Numeracy scores. Teacher judgments were completed and recorded using AusVELS reading, writing, and numeracy measures.

AusVELS. Victorian Essential Learning Standards (VELS) reflects the set of curriculum for the first year of schooling to Year 10 in Victoria (Victorian Curriculum and Assessment Authority, 2017). When the new Australian Curriculum subjects were integrated into the Victorian Essential Learning Standards, the acronym became AusVELS, and this curriculum was used across Victoria. From January 2017, AusVELS was replaced by the Victorian Curriculum for the first year at school to Year 10, incorporating AusVELS and reflecting Victorian priorities and standards. Reporting against AusVELS provides a mechanism for teachers to judge the performance of a child based both on objective student assessments (as described in above measures) together with their own observations of student performance and ability over the teaching period. AusVELS judgements of the student's achievement are scored from A to E and can be categorized to consider performance as above, at or below standard given their comparative year at school and the time of year when judgements are made. AusVELS teacher judgement data were available twice yearly from 2014 to 2017 for Reading and Viewing, Writing and Numeracy (except for Semester 1, 2015 where data was not available for Reading and Viewing or Writing).

English Online Interview. The English Online Interview (EOI) was developed to assess the English skills of children in Victoria as they enter school. Victorian schools conduct these interviews with children in their first year of schooling, usually within the first few weeks of school, to determine children's learning needs on entry to school in relation to reading, writing and speaking (Department of Education and Training, 2019). Texts and downloadable resources are utilized, with teachers recording the child's response directly into an online system. Data generated from this system is provided to assist with planning and programming. Scale scores range from 0 to great than 173, and are converted to AusVELS equivalent year level achievement standards.

Fountas and Pinnell. The Fountas and Pinnell Benchmark Assessment Systems comprises tools designed to objectively test instructional and independent reading levels (Fountas and Pinnell Literacy, 2019). Instructional reading is the highest level at which a child has sufficient knowledge for a topic, can access text quickly with few errors, but cannot read independently. In comparison, independent reading (where a child can read with minimal assistance) is the highest level of proficient reading. The teacher records a raw benchmark score while a child reads, as per the tool guidelines, and this score is then converted into an AusVELS grade-level goal (scores and expected target). For this study the raw scores were used, and data was available over 6 monthly time-points from 2014 to 2017. Scale scores range from 0 to 173, and are converted to AusVELS equivalent year level achievement standards. Letter benchmarks are scored from A to Z based on performance. Letter scores are converted to AusVELS equivalent letters and targets relevant to year level of each child to identify those performing above, at or below standard.

Clays Oral Language. The Clays Oral Language test applied at Doveton College is a slightly shorter version of the Marie Clay Record of Oral Language (Clay, Gill, Glynn, McNaughton, & Salmon, 2007). The test aims to assess student's proficiency with oral language, so as to measure what a student is able to listen to, understand and retain of the complex structure of English as spoken by adults. The

21-item test was developed from the original 15 item Record of Oral Language, which presented a sample of different grammatical structures of oral English, with growing complexity in each item. Both versions of this assessment lack Australian norms, and the validity in the modified form is unknown. The tool is applied in the first year of school and may be repeated several times until a child obtains a perfect score, reaching the ceiling of 21. Data for this test was available only from the students' first year at school (in 2014), due to the ceiling effect, and is scored from 0 to 21. This test was used to supply complementary data to the standardized tests. It was only conducted at school entry, and was not used to investigate change over time.

PATMaths is the abbreviated name for the Progressive Achievement Tests in Mathematics (PAT-Maths). This test provides objective, norm-referenced information about the level of achievement of students from Year 1 to Year 10 based on assessments of student's skills and understanding across a range of key areas, including numbers and algebra, geometry, measurement, statistics and probability. The data provided for analysis includes PATMaths data collected on children in Semester 2, 2015. Results are presented across 9 stanines, then converted to AusVELS equivalent letters and targets relevant to year level of each child to identify those performing above, at or below standard (ACER assessment, 2019). The skills assessed by each question in this test are also mapped against the Australian National Curriculum for Mathematics. This measure was not used to assess change over time.

NAPLAN. The National Assessment Program – Literacy and Numeracy (NAPLAN) is an Australia wide assessment that is delivered in Years 3, 5, 7 and 9 (National Assessment Program, 2016). The aim of this assessment process is to derive comparative norms across the country in order to determine whether educational outcomes have been achieved. This assessment programme is used as a method for informing government policy and curriculum planning. The cohort under investigation (students in Year 3 at Doveton College) participated in this test in 2017, and data from all three aspects, reading, writing and numeracy, have been included in this study.

Ethics

An application for ethics approval was sought through Monash University Human Ethics. The university granted an ethics exemption on the basis that all data provided to researchers was de-identified. Data used for this project was routinely collected by Doveton College as part of the ongoing monitoring of student outcomes. All data supplied to researchers was de-identified and no published information is identifiable.

Study design

A longitudinal study design was used to compare students who attended the Early Learning Centre (ELC) at Doveton College in 2013 to students in the same school cohort who did not attend early learning at the college, investigating data from 2014 to 2017. Researchers were supplied with a de-identified dataset of 1751 students attending Doveton College in 2018. From this, the sample of 56 students who were attending Year 3 at the school in 2017 were drawn.

Statistical analysis

All statistical analysis was conducted in STATA (StataCorp, 2017). Descriptive statistics were generated using chi-square and t-tests. Where sufficient data were available, repeated-measures linear mixed models were used to investigate change over time. The analysis allowed for the difference between groups across time whilst also accounting for potential covariates. For each model, a random intercept, random slope model was constructed with time, group ('Attended ELC' vs 'Did not attend ELC'), and eight covariates: language of birth, country of birth, gender, days absent in

2014, 2015 and 2016, age in months and attendance in months at Doveton College. Non-significant covariates were progressively removed from the model.

For letter score tests where outcomes were measured according to the result attained in relation to the year-level (such as the AusVELS judgments), levels were converted to number scoring for the purposes of conducting the statistical tests, as shown in Table 1. Cohen's *d* (Cohen, 1988) was calculated for all significant t-tests as a measure of effect size. Cohen's *d* measures group means in relation to standard deviations, such that if the means of two groups do not differ by 0.2 standard deviations or more, the difference is considered to be unimportant, even if it is statistically significant. Cohen's *d* is considered a small effect at 0.2, a medium effect at 0.5 and a large effect at 0.8.

Data changes/decisions. Two students attended ELC in 2012 instead of 2013. One child repeated the first year of school, and the other repeated Grade 2. Although the ELC year in 2013 was not identical to 2012, these students were retained as it was possible for the comparator group to also contain students who had repeated a year. Two students attended ELC at Doveton College in 2013, and exited the school at the end of the ELC year. One of these students returned at the start of 2016, and one mid-way through 2016. These students were excluded from the analysis for the following reasons: (1) the students had a different schooling experience to the rest of the sample, as most of their schooling was not at Doveton College and (2) there was only a small amount of data for these students (half or all of 2016). A further six students were excluded due to entering the school from 2016 onwards.

Results

Outcomes on entry to the first year at school year

Academic outcomes for all available tests were compared between groups ('Attended ELC' vs 'Did not attend ELC') using independent group t-tests. Entry scores were defined as any score received in the first semester of the first year at school and included Entry tests testing for Reading, Writing and Speech, Fountas and Pinnell scores for Semester 1 and the modified Clays Oral Language test. Academic test outcomes are displayed in Table 2, and teacher judgement outcomes are displayed in Table 3.

In the School Entry tests (based on English Online Interview results) 'Attended ELC' students had significantly higher scores for reading than 'Did not attend ELC' students. Six of the 'Attended ELC' students were reading at a level 1.5 years higher than what was expected for their age, whereas none of the 'Did not attend ELC' students' scores were more than six months higher in online testing for reading. There was a (non-statistical) trend towards higher scores on the Writing and Speaking domains of the School Entry tests, however the writing test had low differentiation, with students only scoring at 0 or .5 on this domain. In Semester 1 of 2014, 'Attended ELC' students had significantly higher scores than 'Did not attend ELC' students on the Fountas and Pinnell letter test of reading, and the Clays Oral Language test. Teacher judgment scores for the 'Attended ELC' group were significantly higher in the first semester of school for AusVELS Numeracy scores but not for AusVELS Reading and Viewing or AusVELS Writing scores than the 'Did not attend ELC' group. Outcomes on these judgement test scores showed a strong trend towards higher scores for students who attended ELC, most of which were significantly different from students who did not attend ELC, with moderate to high effect sizes. The analysis of available data suggested that 'Attended ELC' students entered the first year of schooling in 2014 at a higher academic level than their peers.

Table 1. Scoring to convert 6 month increments into numerical scoring for use in t-tests.

Entry testing	0	.5	F	F.5	1	1.5	2	2.5	3	3.5
Numeric score	1	2	3	4	5	6	7	8	9	10

Table 2. Means, standard deviations, *t*-scores, degrees of freedom, *p*-values and Cohen's *d* for Academic tests by group.

	'Attended ELC'		'Did not attend ELC'		M diff	<i>t(df)</i>	<i>p</i>	Cohen's <i>d</i>
	<i>N</i>	M (SD)	<i>N</i>	M (SD)				
School Entry Testing letter test of reading								
Reading	16	2.44 (1.36)	26	1.65 (0.94)	0.79	−2.21 (40)	.03	.68
Writing ^a	16	1.31 (0.48)	26	1.15 (0.37)	0.16	−1.21 (40)	.23	-
Speaking	16	2.38 (1.41)	26	1.69 (1.05)	0.69	−1.80 (40)	.08	-
Fountas and Pinnell letter test of reading								
2014-S1	17	2.29 (1.15)	28	1.29 (0.46)	1.00	−4.12 (43)	<.001	0.49
2014-S2	17	4.82 (1.94)	30	2.63 (1.73)	2.22	−3.99 (45)	<.001	1.19
2015-S1	16	7.69 (3.05)	30	4.73 (2.43)	2.96	−3.59 (44)	<.001	1.00
2015-S2	16	9.13 (2.73)	30	6.77 (2.84)	2.36	−2.72 (44)	.009	0.85
2016-S1	17	11.65 (2.78)	32	9.16 (3.19)	2.49	−2.71 (47)	.009	0.83
2016-S2	17	12.29 (2.73)	34	9.26 (3.99)	3.03	−2.81 (49)	.007	0.89
2017-S1	16	15.88 (3.26)	38	13.50 (3.77)	2.38	−2.26 (52)	.03	0.68
2017-S2	17	18.12 (4.34)	37	15.65 (4.32)	2.47	−1.95 (52)	.06	0.57
Modified Clays Oral Language test								
2014	17	13.88 (6.55)	31	7.65 (8.06)	6.23	−2.72 (46)	.009	0.85
PAT Maths								
2015-S2	16	103.03 (6.92)	34	97.53 (6.20)	5.50	−2.82 (48)	.01	0.84
NAPLAN Numeracy, Reading, Writing, Spelling and Grammar								
Numeracy	15	372.09 (71.23)	38	334.14 (72.71)	37.95	−1.71 (49)	.09	-
Reading	15	410.74 (84.00)	36	380.93 (64.32)	29.81	−1.38 (49)	.18	-
Writing	15	416.75 (53.61)	36	381.78 (84.76)	34.97	−1.48 (49)	.15	-
Spelling	15	410.40 (95.25)	36	370.89 (77.61)	39.51	−1.55 (49)	.13	-
Grammar	15	370.05(148.30)	36	370.86 (90.14)	−0.81	−0.02 (49)	.98	-

Note: ^adifferentiation was low on this variable, with students only scoring at 0 or .5.

Note for Cohen's *d*: Small effect size: *d* = 0.2; 'medium' effect size *d* = 0.5; 'large' effect size *d* = 0.8.

Table 3. Means, standard deviations, *t*-scores, degrees of freedom, *p*-values and Cohen's *d* for Teacher judgement assessments by 'Attended ELC' group.

	'Attended ELC'		'Did not attend ELC'		M diff	<i>t(df)</i>	<i>P</i>	Cohen's <i>d</i>	
	N	M (SD)	N	M (SD)					
AUSVELS Reading and Viewing									
2014-S1	16	2.13 (0.81)	15	1.87 (0.35)	0.26	−1.14 (29)	.26		-
2014-S2	17	3.24 (0.66)	20	2.75 (0.44)	0.49	−2.65 (35)	.01	0.87	
2015-S1	-	-	-	-	-	-	-		-
2015-S2	16	4.44 (1.15)	22	4.32 (0.89)	0.12	−0.36 (36)	.72		-
2016-S1	16	6.13 (0.72)	25	5.20 (1.04)	0.93	−3.11 (39)	.004	1.04	
2016-S2	17	7.41 (1.06)	30	6.40 (1.47)	1.01	−2.48 (45)	.08	0.79	
2017-S1	17	8.00 (0.87)	32	7.40 (1.48)	0.60	−1.52 (47)	.14		-
2017-S2	17	8.71 (1.11)	30	8.17 (1.58)	0.54	−1.24 (45)	.21		-
AUSVELS Writing									
2014-S1	15	2.19 (0.75)	16	1.73 (0.70)	0.46	−1.74 (29)	.09		-
2014-S2	16	3.19 (0.75)	18	2.78 (0.64)	0.41	−1.71 (32)	.10		-
2015-S1	-	-	-	-	-	-	-		-
2015-S2	16	4.44 (1.21)	21	3.76 (0.70)	0.68	−2.14 (35)	.04	0.69	
2016-S1	16	5.69 (0.87)	24	4.83 (1.13)	0.86	−2.55 (38)	.02	0.83	
2016-S2	17	6.64 (1.06)	30	6.13 (1.20)	0.49	−1.45 (47)	.15		-
2017-S1	17	7.47 (1.17)	32	7.09 (1.28)	0.38	−1.01 (47)	.32		-
2017-S2	17	8.41 (1.18)	30	7.90 (1.40)	0.51	−1.27 (45)	.21		-
AUSVELS Numeracy									
2014-S1	17	2.24 (0.75)	27	1.74 (0.59)	0.50	−2.42 (42)	.02	0.74	
2014-S2	17	3.18 (0.64)	32	2.72 (0.73)	0.46	−2.18 (47)	.03	0.69	
2015-S1	17	4.18 (0.73)	36	3.50 (0.65)	0.68	−2.18 (47)	.001	0.98	
2015-S2	17	4.94 (0.83)	37	4.35 (0.59)	0.59	−3.00 (52)	.004	0.82	
2016-S1	17	5.71 (0.59)	37	5.32 (0.78)	0.39	−1.79 (52)	.08		-
2016-S2	17	6.94 (0.75)	38	6.26 (0.98)	0.68	−2.54 (53)	.01	0.78	
2017-S1	17	7.89 (0.86)	40	7.18 (0.98)	0.71	−2.57 (55)	.01	0.77	
2017-S2	17	8.52 (1.12)	36	7.94 (1.04)	0.58	−1.86 (51)	.07		-

There was a general trend towards higher scores in the 'Attended ELC' group than the 'Did not attend ELC' group across all tests, with many of the differences being statistically different. In the Fountas and Pinnell letter test of reading, scores for the 'Attended ELC' group were significantly higher at all of the six-monthly time points, except the final time-point in Semester 2, 2017 where scores were still higher, but the difference was not statistically significant. Effect sizes ranged from moderate to high (0.49–1.19), with most effect sizes in the high range. The PATMaths test from Semester 2, 2015 also showed higher scores for the 'Attended ELC' students compared to the 'Did not attend ELC' students, with a high effect score. With the exception of the grammar scores, NAPLAN scores all showed a non-significant trend towards higher scores for the 'Attended ELC' students compared to 'Did not attend ELC' students. Teacher judgments scores showed a general trend towards higher scores for 'Attended ELC' students compared to 'Did not attend ELC' students, with 11 of the 24 judgements reaching statistical significance.

Outcomes over time

There was sufficient data for three domains to be investigated over time: the Fountas and Pinnell test for reading, AusVELS Reading and Viewing, and AusVELS Numeracy scores. In the model for the Fountas and Pinnell test there were significant changes over time (Coef = 2.09, SE= .08, $p < .001$) showing, as would be expected, that children's scores increased over the three years of schooling. There was a significant main effect for group, with children in the 'Attended ELC' group significantly outperforming children in the 'Did not attend ELC' group (Coef = 1.79, SE= .38, $p < .001$). One covariate was significant in the model, days absent in 2014 (Coef = -.043, SE= .013, $p = .001$), however there were no differences in groups for days absent in 2014 when compared using a t-test ($t = -.05$ (47), $p = .96$). Language at home, country of birth, days absent in 2015 and 2016, and months at Doveton College were not significant predictors in the model. Figure 1 presents the scores and fit-lines for the Fountas and Pinnell letter test of reading by 'Attended ELC' group, showing how the difference between groups was maintained over time. This result suggests that children who in the 'Attended ELC' entered school at an academic advantage for reading which was maintained over four years (8 semesters).

In the model for the AusVELS Reading and Viewing measure, there were significant changes over time (Coef = 0.95, SE= .03, $p < .001$) and a significant main effect for group, with children in the 'Attended ELC' group outperforming children not in the 'Did not attend ELC' group with a small effect size (Coef = 0.42, SE= .18, $p = .018$). Only one covariate was significant in the model, which

Figure 1. Scores and fit-lines for the Fountas and Pinnell letter test of reading by group.

was days absent in 2015 with a very small effect, (Coef = $-.02$, SE= $.01$, $p=.009$) and no statistically differences between groups when using a t-test ($t=0.11(53)$, $p=.91$).

The AusVELS Numeracy model also showed significant changes over time (Coef = 0.91 , SE= $.02$, $p<.001$) and a significant main effect for group, with children in the 'Attended ELC' group significantly outperforming children in the 'Did not attend ELC' group (Coef = 0.52 , SE= $.15$, $p<.001$), after accounting for all the covariates in the model. As in the model for the Fountas and Pinnell test, only days absent in 2014 was a significant covariate in the model (Coef = $-.022$, SE= $.006$, $p<.001$).

Discussion

The purpose of the current study was to explore the effect of the Doveton Model implemented within an early learning setting on children's academic performance, as one contribution to the overall evaluation of the model. Specifically, this study sought to investigate whether Year 3 students in 2017 who had attended early learning at Doveton College in 2013 performed better than peer students who had attended early learning elsewhere or not at all on a range of academic outcomes to 2017. The findings in this study support the contention that there is a significant contribution from an integrated, wrap-around school and community service model embedded within an Early Learning Centre on improving the academic performance of children experiencing significant disadvantage.

The findings provide preliminary evidence that students who attended the Early Learning Centre at Doveton College showed significant academic advantage on entry to school compared to students who did not. This result can be compared to other U.S. studies which found only a modest effect of early learning attendance on school readiness indicators (Auger, Farkas, Burchinal, Duncan, & Vandell, 2014). For example, in a study of nearly 3000 children from 700 randomly selected state-funded pre-Kindergarten classrooms across eleven states in the U.S., children showed small gains in pre-academic and language skills when exposed to high-quality interactions and instruction (a component of process quality), and closer teacher-child relationship (Howes et al., 2008; Mashburn et al., 2008). Keys and colleagues (2013) also reported small but significant associations between preschool centre quality and language and mathematics outcomes at kindergarten entry for 6250 children. When compared to this previous research, it is possible that the outcomes found in the current study may be an effect of the Doveton Model, over and above quality early learning that is present in other high performing early learning centres.

Students who attended the Early Learning Centre at Doveton College also had significant academic advantage on many of the tests of reading, writing and numeracy over the four years. In particular, assessments over time for reading variables suggested that there was a significant and sustained academic advantage for students who had attended early learning compared to students who did not, after accounting for potentially confounding factors. Researchers that have examined the long-term outcomes associated with high-quality early learning programmes report gains may be sustained over time for some children. In England, for example, a large scale longitudinal study involving over 3000 children in 141 pre-school settings examined the effects of pre-school quality on cognitive and behavioural outcomes at age 11. The researchers reported that preschool quality was a significant predictor of most outcomes, after accounting for child and familial covariates (Sylva, Melhuish, Sammons, Siraj-Blatchford, & Taggart, 2011a). Similarly, in a meta-analysis from 2010, researchers found that the largest effects of a pre-school education were for cognitive outcomes, with effects also observed on children's progress through school and social skills. They reported, however, a lack of empirical evidence in the included studies to determine the key components for designing interventions (Camilli, Vargas, Ryan, & Barnett, 2010).

The current study demonstrated that the Doveton Model was associated with children's academic outcomes that were significantly better than academic outcomes for children who had not experience early learning based on this Model; however, early learning and development is only one component of the wrap-around learning approach offered at Doveton College. The broader approach spans the elements of high-quality early learning and schooling, wrap around health and wellbeing

support, engagement and enrichment activities for children and families as well as the support of adults in their own educational, learning and employment journey. The wrap-around service model integrates high quality learning with family support and maternal and child health services for children from birth to five, teaching and learning spaces for students from the first year at school to Year 9, and support for parents and community members to engage in volunteering, education and employment opportunities. The holistic approach of this model sets it apart from most previous research where early learning activities are considered separately; hence, it is difficult to determine which factors may be having the most significant effects.

Limitations

A major limitation to this study was the lack of information on early learning education received by the children who did not attend the Early Learning Centre at Doveton College, thereby limiting the conclusions that can be drawn from these results. The sample size in this study was relatively small and because of that the generalizability of the findings may be compromised. Ongoing evaluation using data from subsequent cohorts will enable analysis of larger sample sizes and hence increased reliability. Given the difficulty in obtaining statistical significance in small samples, it is worth reiterating that there was a trend on all tests in favour of the 'Attended ELC' group, with many of the tests showing statistical significance despite the small sample sizes.

As noted above, another limitation was that it was not possible to determine which parts of the early learning programme at Doveton College may have contributed to the results presented in the current study. The results presented here could be attributable to the high-quality early learning programme at Doveton College, specific aspects of the early learning programme, or to high quality early learning in combination with the broader Doveton Model wrap-around service model. In effect, the current study is a small slice of a big picture. Effectively evaluating the influence of different intervention components is a common limitation of early-years programmes; studies consistently show high-quality programmes are very effective for child outcomes, but it is difficult to identify which part of the programme is having this impact.

Finally, it is critical that future research efforts seek to examine the performance of children who attended early learning at Doveton but did not stay at the college for their schooling. Children who had attended the Early Learning Centre at Doveton College and continued at the school could then be compared to those that attended early learning at Doveton College but did not continue at the school. This would enable a comparison of children experiencing similar levels of disadvantage yet without access to an educational model such as Doveton College for their schooling. Such a comparative analysis could support better understanding of which components are of greatest contribution to achieving lasting change.

Conclusion

The findings of this study provide preliminary evidence that the Doveton Model, delivered in an early learning setting providing high-quality education and a wrap-around community-service model for families experiencing entrenched disadvantage, has a positive effect on academic outcomes to Year 3. Study outcomes suggest that the performance improvements identified at school entry may be sustained as children grow, thus contributing to lifelong achievement. Children's academic performance is only one contributing component of children's longer-term success, and ongoing evaluation of the various characteristics of this educational model is important in order to understand which aspects of this programme are of the highest benefit for children.

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