A formative evaluation of LPC's Montessori Preschool Programme

Amosse Francisco Ubisse

(UBSAMO001)

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COMPULSORY DECLARATION:

This work has not been previously submitted in whole, or in part, for the award of any degree. It is my own work. Each significant contribution to, and quotation in this dissertation, from the work or works of the other people has been attributed, cited and referenced.

Signed by candidate

Signature: Date: 24.06.2019.

The UCT Knowledge Co-op facilitated this collaborative project between Learn and Play Centre and the University of Cape Town.
See http://www.knowledgeco-op.uct.ac.za or
Contact us at barbara.schmid@uct.ac.za / 021 – 650 4415

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EXECUTIVE SUMMARY

This dissertation reports on the formative evaluation of an early childhood programme (ECP) targeting learners from farmworkers' families, implemented by Learn and Play Centre[1] (LPC) in the township of Mfuleni, located in Cape Town, South Africa. The ECP comprises four programme components implemented at nursery, crèche, preschool and grade R levels. This evaluation focuses on the programme implemented at the preschool level. It applies the Montessori approach to deliver educational services to learners between the ages of three to five years. It also provides support services to caregivers/parents who cannot afford the school fees.

This evaluation seeks to unpack the implementation of the preschool programme component and assess its the fidelity to the Montessori model. It also seeks to assess its effectiveness in producing the desired academic and social outcomes. The evaluation addresses the following evaluation questions relating to service utilisation, service delivery, and programme outcomes:

1. Did the intended target beneficiaries participate in the programme? If so, did they receive the intended programme services and dosage?
2. Was the programme implemented with fidelity to the classical Montessori approach?
3. Did the programme satisfactorily develop the beneficiaries' academic and social skills?

The evaluation used data derived from administrative records, surveys and the Early Learning Outcomes Measure (ELOM) to address the evaluation questions. At the time of the evaluation, LPC did not have a well-articulated programme implementation plan or performance indicators. As such, the evaluator derived implementation parameters specific to the Montessori education model/approach from the literature to assess the service delivery and service utilisation. Furthermore, the organisation did not have a monitoring system, with well-defined outcome indicators. Primary data was therefore collected using the ELOM instrument, administered to a non-random sample of 37 learners. Results were benchmarked against those of a comparable group of learners from Quintile 1-3 schools.

The following findings emerged from the evaluation:

[1] The name of the implementing organisation and its base of operation has been altered to retain the organisation's anonymity.

- Although the programme is in its formative years, there is evidence to suggest that it effectively assists caregivers/parents to apply for financial assistance.
- Keeping in mind that a full roll-out of the Montessori model is still underway, the evaluation confirmed weak fidelity to the classical Montessori model.
- Learners in the programme were not found to outperform the ELOM age validation sample, in any of the domains measured.
- Age, gender, programme dosage, and the financial source of school fees were identified as significant predictors of ELOM performance.

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LIST OF ABBREVIATIONS

ATE : Average treatment effect

CAPS : Curriculum Assessment Policy Statement

ECD : Early childhood development

ECP : Early childhood programme

ell : *emergence of literacy and language*

ELOM : Early learning outcome measure

enm : *emergence of numeracy and mathematics*

M&E : Monitoring and Evaluation

NELDS: National Early Learning Development Standards

NCF : National Curriculum Framework

OLS : Ordinal Least Square

PSM : Propensity score matching

LPC : Learn and Play Centre

SACE : South Africa Council for Educators

SAEP : South Africa education and environment project

SAMA : South Africa Montessori Association

SES : Socio-economic status

SETA : Sector Education and Training Authority

SPSS : Statistical package for the social science

RCT : Randomized control trials

INTRODUCTION

Background to Evaluation

Early childhood development (ECD) programmes are critical interventions implemented before learners (under 6 years) enter primary school, with the aim of improving the learning outcomes associated with subsequent schooling. The impact of ECD interventions extend beyond childhood as they boost the social and economic outcomes of their beneficiaries in adulthood (Gertler et al., 2014; Heckman et al., 2010, 2016). In addition, the returns on investment in ECD exceed those of short-term, piece-meal remedial interventions implemented in the course of the academic life of a child or young adult (Heckman & Carneiro, 2003; Temple & Reynolds, 2007).

The positive impact of early interventions has been confirmed in both developed countries (Havnes & Mogstad, 2011; Kisker et al., 2002; Ludwig & Miller, 2007) and developing countries such as Asia (Pholphirul, 2017), Latin America (Berlinski & Galiani, 2005; Cortazar, 2015), and African countries (Hazarika & Viren, 2013; Martinez et al., 2012; Raine et al., 2003).

However, in African and sub-Saharan countries, the results are mixed, with a higher percentage of learners repeating the school year compared to other developing countries (UNESCO, 1996), or failing to attain the final grade of primary school (UNESCO, 2006). This situation can be partly attributed to the poor quality of existing ECD programmes or the lack of access these programmes (Louw et al., 2011; UNESCO, 2006; Zoch, 2017).

In South Africa, the poor academic performance of learners from disadvantaged communities can also be explained by the socio-economic status (SES) gap created by apartheid (Moloi & Strauss, 2005; Reardon, 2011; Spaull, 2011; Van der Berg, 2008, 2015). In an attempt to address this problem, the government offers to all learners aged between five and six an early childhood intervention (Grade R) (Atmore, 2013; Kotzé, 2015; Rensburg, 2015), expected to be compulsory by 2019.

However, the number of eligible learners (0-6 years) attending ECD programmes[2] in South Africa continues to be low. The ECD attendance in 2016 was estimated at 35.7% at national

[2] Governmental ECD programmes are, for the most part, synonymous to Grade R, while those implemented by NGOs and private organisations typically include other early interventions before the learner enrols in Grade R.

level and 33.7% in the Western Cape (ETDPSETA, 2018, p.57). In an urban[3] informal area, such as Mfuleni (a township in Cape Town), learners are less likely to attend ECD programmes and those who do are likely to be enrolled in unregistered ECD centres (Bidwell & Watine, 2014; Kotzé, 2015). Unregistered ECD centres are typically constrained by their lack of access to financial resources. This situation limits the investment that can be made in adequate nutrition for learners, improvement of infrastructure, acquisition of appropriate preschool material, or the training of teachers, all of which constitute a major challenge for ECD centres in South Africa (Atmore, 1998, 2013; Rensburg, 2015).

Due to low uptake and participation in ECD interventions and the general poor quality of these interventions, South African learners continue to perform below international levels (Howie et al., 2017; Van der Berg & Louw, 2007). The situation is more pronounced for learners from low SES families (Kotzé, 2015; Spaull, 2011; Zoch, 2017) who continuously repeat a number of school grades (Louw et al., 2011; Van der Berg, 2015).

It is in this context that a structured early childhood programme (ECP), which is the focus of this evaluation, is implemented in the Mfuleni township. This programme has the potential to offer an affordable early intervention to learners from low SES families in the Mfuleni township.

Characteristics of the Mfuleni Township – the setting of the study

Mfuleni[4] has 191,025 inhabitants, of which 12.8% are learners between the ages of 0 and 4 years old (City of Cape Town, 2011, p.3). The working population is estimated at 41.41% and is distributed across elementary occupations (43.49%), craft and trade activities (14.64%), and services-shops and market sales (15.54%) (Anderson et al., 2009, p.15). A large portion of Mfuleni population is unemployed (58.59%) and the average income per year (R16 718) is 5.55 times below the Western Cape average (Anderson et al., 2009, p.13).

Although most of the Mfuleni population has access to electricity (84.50%), the township is characterised by informal dwellings, limited access to piped water and flush toilets, and lack of rubbish disposal (South Africa Stats, 2011). These precarious sanitary conditions favour the

[3] The problem of unregistered ECDs occurs in both urban and rural areas. However, statistics from Kotze (2015) reveal that, while there is an increase in the number of learners attending ECD programmes in rural areas, this is not the case in urban areas.
[4] The name of the implementing site has been altered to retain the organisation's anonymity.

development of diseases which, when affecting the learners, compromise their participation in educational programmes, including their academic performance (Ndlovu, 2008).

Learn and Play Centre

The premises of the Learn and Play Centre (LPC) were inherited from the former Mfuleni Primary School which, before the 1920s, used to offer education services to European farmers and later to white and coloured people from Mfuleni. The school was closed in 1989 due to a reduction in the number of pupils. In the 1990s, in Mfuleni township, there was a significant number of learners left unattended while their caregivers/parents were farming. This phenomenon encouraged a prominent politician, Dr Trudy Thomas, to design an ECD programme targeting the learners from farmworkers' families. Based on the premises of Mfuleni Primary School, the Dr Trudy Thomas Centre was officially opened in 1992. Later, in honour of the active involvement of the community in the management and construction of the new infrastructure and, due to an increase in the learners, in 1998 the centre changed its name to Learn and Play Centre (LPC) and, in 1999, it became a non-profit organisation.

Currently, the organisation also admits learners with mental and physical disabilities. The learners are required to pay a monthly school fee of R380 and an additional R120 for transport services. ECD programmes implemented by other non-governmental organisations, such as the South Africa education and environment project (SAEP), typically charge R100-R150 per month for each child. The employed population in Mfuleni earn below R1600 a month (Anderson et al., 2009). Therefore, the school fees may constitute a barrier to the learner's access to ECD education in Mfuleni township. In the ECP, those learners whose caregivers/parents face fee payment challenges during the year are not expelled from the school. They are placed on a sponsorship list, from which they are later selected and granted financial support for their education. Many learners in the ECP receive the child support grant from the Department of Social Development (n=104), or the Western Cape Education Department (n=60), and some receive financial support from individual sponsors (n=60). Figure 1 represents the financial sources of the early childhood programme implemented by Learn and Play Centre (LPC).

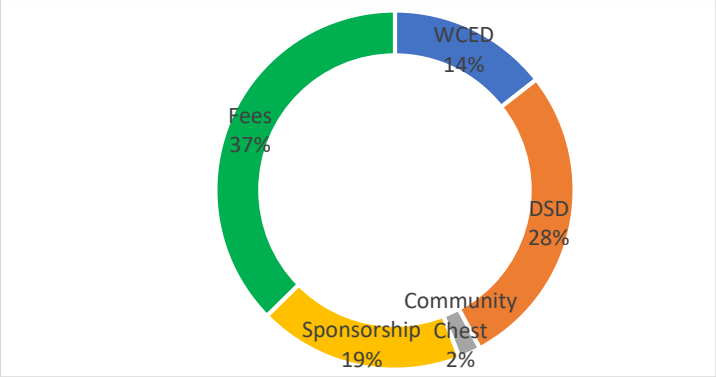

Figure 1. Financial sources of the ECP.

Early childhood programme

With the objective of reducing the SES gap in South African society, and of creating a society with a strong academic and social foundation to enable citizens to succeed in life, the LPC implements an early childhood programme (ECP) that targets learners from farmworkers' families. The low SES of learners' families has led the organisation to complement the programme with a nutritional component, together with a supportive structure for caregivers/parents to obtain government subsidies or sponsorships to fund the education of their learners. Although all learners are encouraged to have breakfast at home and bring snacks to the school, the programme provides breakfast, lunch and snacks in the afternoon.

The programme comprises four programme stages: nursery, creche, preschool, and Grade R. Figure 2 presents these four ECP programme stages, including the number of learners that have participated over the last five years.

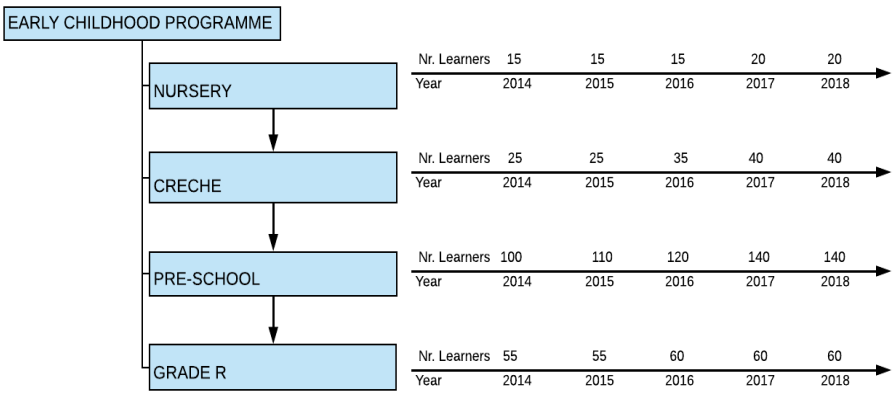

Figure 2. The ECP programme stages.

The nursery admits learners aged three months to two years. Using the Grassroots curriculum, the nursery takes care of the babies of the caregivers who have come to the end of their

maternity leave and must return to their economic activities. This component includes feeding services, changing nappies, provision of sleeping nurseries. The objective is to create a safe environment where babies grow up healthy and are respected.

The crèche receives learners from the nursery aged two to three years. Using also the Grassroots curriculum, it provides a foundational development of learning through play before the child moves to the preschool component. The crèche aims to build respectful, potty trained learners who can ask for help if in need.

The preschool offers education services to learners who have transited from crèche with ages ranging from three to five years. This preschool component is markedly different from other preschool programmes in that it is based on the Montessori education model. The classrooms of the preschool are equipped with Montessori materials and the educators are trained and certified for the Montessori learning process. The programme aims to equip learners with reading, writing, numeracy and social skills.

The fourth programme stage is the Grade-R. The teaching activities in this component follow the Curriculum Assessment Policy Statement (CAPS 2011). Grade R focuses on reading, comprehension, numeracy, understanding, and logical deduction skills.

The learners admitted into the nursery programme stage generally progress to subsequent programme stages. However, external learners (learners not already in the programme) can be admitted to any ECP component depending on their ages. The learners are exposed to three languages: English, Afrikaans and Xhosa.

Evaluation Focus

The ECP comprises the different programme stages of child development. However, the evaluation conducted in the current study focuses on one component, the preschool programme stage. The rationale for choosing the preschool programme stage as the focus of the evaluation is as follows:

i. The preschool programme stage uses the Montessori education model, which is at the heart of LPC's identity.
ii. The use of the Montessori education model is unique to the Mfuleni township and surrounding areas. Therefore, this highly unusual situation offers an unprecedented opportunity to explore whether a Montessori approach to ECD education is effective for learners from socio-economically disadvantaged backgrounds.

iii. The other ECP programme stages, namely, the nursery and crèche, are not well structured (in terms of design and delivery) compared to the preschool. Furthermore, their goals and objectives are not easily measurable.

iv. The Grade R programme stage uses the curriculum assessment policy statement (CAPS), which is also implemented by other independent schools in the Mfuleni township.

The aim of the preschool programme stage is to equip the learners with academic and social skills to improve their performance at primary school.

Preschool and service utilization

The evaluator found that there is no clear, consistent or well-structured process for the caregivers/parents of potential learners to get information to register their learners for the ECP. A discussion with the programme staff indicated that, to register in the preschool programme stage, caregivers/parents living in Mfuleni and the surrounding area must collect information on the programme website, or from the school bus, or are referred by the organisation staff, neighbours, families or local leaders to the programme on site.

Admission to the preschool programme stage is twofold. The first intake consists of learners coming from a preceding programme stage, the crèche, and the second consists of learners who have not previously attended any ECP programme stage. During contact with the programme, staff and the caregivers/parents receive specific information about the services offered, including the requirements for monthly payment and an option of school bus services. The learners are registered in the preschool programme stage and are organised in classrooms equipped with Montessori materials. The activities take the form of the learners engaging with the Montessori materials, and interacting with their classmates, while the educators observe and annotate the learners' mastery of the learning process. Once they reach five years of age, the learners graduate and transit to the Grade-R programme stage. Figure 3 below summarises the ways in which the services are utilised by the beneficiaries – the learners.

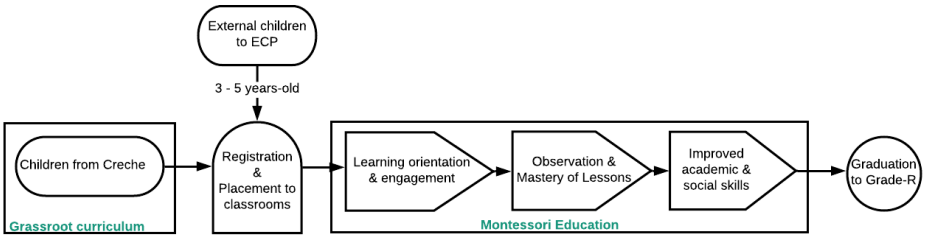

Figure 3. Service utilisation for the preschool programme stage.

The structure of the preschool programme stage

The preschool programme stage is structured to accommodate a maximum of 150 learners, grouped and organised into three classes. Each class has at least one trained and certified educator to facilitate Montessori education and one assistant. The main educators have been trained and certified by institutions accredited by the Sector Education and Training Authority (SETA) and by the South Africa Council for Educators (SACE). The assistants are trained and certified by institutions that were also accredited by SETA and/or by Grassroots.

The day's activities, starting at 8h00 and lasting until 15h00, are preceded by a snack when the learners arrive. After the snack, the learners engage with the Montessori material. According to the school principal, the length of engagement with materials is 2 to 2.5 hours, followed by snack time at 10h30. After the snacks, the learners have playground time. At 11h30, the learners are provided with extension activities until the lunch time, which is at 12h30. The rest of the day is divided into resting time (13h00-14h00) followed by the afternoon snack which takes the timetable up to 15h00, when they line up for the school bus that takes them home.

Preschool Programme Theory

LPC does not have a document that describes explicitly how the programme is structured and what specific outcomes are expected from it. This makes it difficult to determine the quantity and quality of those inputs seen as necessary to achieve the expected outcomes. The programme theory presented in Figure 4 was elicited and constructed based on qualitative inputs provided by LPC board members and the school principal, during preliminary consultations.

The preschool programme stage is based on the South Africa Montessori Association (SAMA) curriculum. The classrooms for the preschool programme stage are physically organised according to five learning areas: practical life, sensorial, languages, mathematics, and cultural.

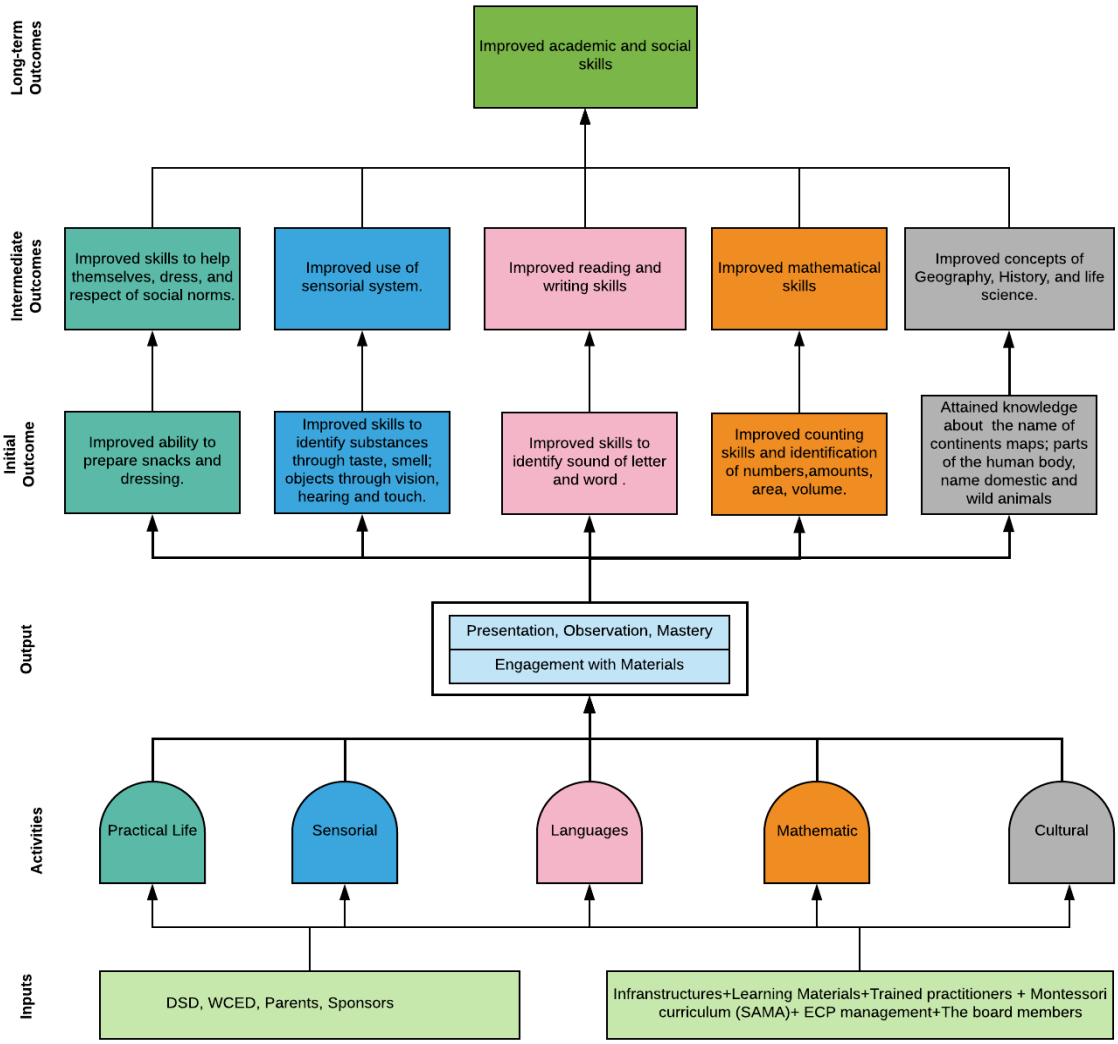

Figure 4. The preschool programme theory.

Within the learning areas, learners are free to choose the activity to work with, and/or to repeat the activity and to move on to another activity when they need or want to do so. The educator introduces the learner to the learning process. If the chosen activity is new to the learner, s/he supports and guides the learning process and, if necessary, registers the mastery of the activity, and provides an extension activity.

While some of the learning areas overlap and/or are interrelated, each learning area has its own objectives and expected outcomes. The practical life learning area helps the learner to develop respect for social norms and self-sustainable practices (e.g., dressing up, preparing snacks, tidying up independently); the sensorial learning area encourages and helps the learners to use their sensorial system (vision, hearing, touch, taste and smell); in the language area, the learners

are taught to recognise the letter sounds, read and write simple words; the mathematics area teaches the learners to count and quantify amounts; the cultural area aims to teach the learners history, geography, and natural science (in ways that relate to their own lives). The overarching goal is to improve the academic and social skills of targeted beneficiaries.

In addition to presenting the learning process, the educators facilitate and promote peer-to-peer learning (Salazar, 2013). During circle time, the educators read, converse with learners, and give whole-class lessons in grace and courtesy (Lillard, 2012).

Plausibility of the programme theory of the preschool programme stage

When implementing the preschool programme stage, LPC assumes several causal linkages that will lead to improved academic and social skills, as well as other implicit assumptions, namely:

1. ECD interventions improve academic and social skills of the participants;
2. The Montessori approach is more effective than the traditional ECD approach;
3. Fidelity to the classical Montessori approach is critical to produce the desired outcomes.

Based on the literature review, this section assesses the plausibility of each of these assumptions. It firstly presents the findings of research and evaluations done on programmes implemented in developed countries. This is followed by early childhood interventions from developing countries. The review also includes the factors that contribute to the preschool programme's effectiveness.

Do ECD interventions lead to improved academic and social skills?

Research shows that ECD interventions not only improve academic and social outcomes of beneficiaries (Bakken et al., 2017; Camilli et al., 2010; Gertler et al., 2014; Heckman et al., 2010, 2016; Hill et al., 2015; Magnuson et al., 2007; Moore et al., 2015; Mwaura et al., 2008; Schweinhart, 2013), but also play a critical role in reducing SES gaps in the long run, especially when targeting participants from underprivileged backgrounds (Heckman & Masterov, 2007; Karoly, 2016; Temple & Reynolds, 2007). Moreover, the early investment generates long term returns that exceed the returns of short-term piece-meal remedial interventions, such as the reduction of class sizes, implemented later in primary school (Cunha & Heckman, 2009; Heckman et al., 2010; Heckman & Carneiro, 2003).

The academic and social impact of early intervention extends from developed countries (Dumas & Lefranc, 2010; Felfe & Lalive, 2012; Jensen et al., 2013; Ludwing & Miller, 2008; Muening et al., 2009; Ramey et al., 2000) to developing countries (Berlinski & Galiani, 2005;

Cortazar, 2015; Pholphirul, 2017), and African countries (Krafft, 2015; Martinez et al., 2012; Raine et al., 2003), including South Africa (Hoppenbrouwer, 2011; Moloi, 2010; Van der Raadt, 2010). However, in Africa, the results are mixed with a high level of primary school year repeaters (30%), and a failure to achieve the last grade of primary education (UNESCO, 1996, 2006). This can be explained by the low access to quality early intervention (Reardon, 2011; Spaull, 2011; Van der Berg, 2015), especially for learners from low SES families (Louw et al., 2011; Van der Berg, 2015; Zoch, 2017).

The positive impact of an early intervention was found to be associated with process quality and structural quality (Bauchmüller et al., 2014; Dickinson & Porche, 2011; Mashburn et al., 2008; McCoy & Wolf, 2018). Process quality refers to the instructional aspects, to the interaction of the learner with teachers, classmates, and to materials that nurture child development (Howes et al., 2008; Slot et al., 2015). Structural quality refers to the use of trained educators, the maximum level of education of the practitioner, defined maximum class size, the teacher-to-child ratio, use of one curriculum or multiple curricula, the family support services (Mashburn et al., 2008; Thomason & La Paro, 2009), and provision of meals or health services (Vermeersch & Kremer, 2005; Watanabe et al., 2005; Woldehanna et al., 2017).

The findings from developed and developing countries support the power of early interventions to improve the academic and social skills of the participants, especially for learners from low SES families. However, the programme effectiveness depends on the process and structural quality.

Is the Montessori approach more effective than the traditional ECD approach?

The Montessori approach, originated in Italy in 1900 and expanded to different countries, including South Africa (Daoust, 2004; Jassien, 2016; Marshall, 2017). Adaptations to local contexts have created different versions (Lillard, 2012; Salazar, 2013). Nevertheless, research reveals that whichever version is implemented, when compared to traditional education, Montessori learners outperform non-Montessori learners in numeracy, literacy skills, social skills, and the development of fine motor skills (Bauchmüller et al., 2014; Besancon & Lubart, 2008; Bhatia et al., 2015; Chattin-McNichols, 1981; Elcombe, 2017). This has been confirmed not only in developed countries (Lillard et al., 2017; Lillard & Else-Quest, 2006; Manner, 2007), but also in developing countries (Ahmadpour & Mujembari, 2015; Dereli Iman et al., 2017; Kayili & Ari, 2011; Kayili, 2018; Shivakumara et al., 2016).

The superiority of the Montessori approach over traditional ones might be related to the learning material and the self-direction of the participating learners (Manner, 2007; Marshall, 2017). Thus, based on this research, if the preschool programme stage uses the Montessori approach, it is expected to generate significant impacts on learners' academic and social outcomes.

Is fidelity to the classical Montessori approach critical to produce the desired outcomes?

Studies conducted reveal that ECD programmes implemented with high fidelity to the Montessori approach are more effective in improving learner's academic and social skills (Dohrmann et al., 2007; Lillard & Else-Quest, 2006; Lillard, 2012) compared to those implemented with low fidelity (Lillard & Heise, 2016; Lopata et al., 2005; Miller & Dyer, 1975). Therefore, it is expected that a preschool programme implemented with high fidelity to the Montessori approach will effectively build learner's academic and social skills.

Conclusion of the plausibility assessment

The literature review offers evidence of the positive impacts of ECD interventions on academic and socio-economic domains, particularly for learners from low SES backgrounds in both developed and developing countries, including African countries. Studies also confirm that Montessori programmes are more effective than traditional ECD programmes (in building academic and social skills), especially when implementers comply with the principles of the classic Montessori approach.

Aims of the evaluation

Although the ECP programme has four programme stages, for reasons explained before, this evaluation focuses on the preschool programme stage. Learn and Play Centre believes that the preschool programme stage is effective in building learner's academic and social skills. However, the organisation, to date, lacks evidence to support this claim.

Ideally, such evidence could be derived by conducting a summative evaluation, which investigates the long-term impact of the programme after full programme implementation. This kind of evaluation would involve comparing the educational and social outcomes of programme beneficiaries achieved at primary school level to those of a comparable group of learners who did not receive the programme. Implementing such an approach was not feasible because: LPC does not track the beneficiaries who enrol in different primary schools post-programme; the logistics and costs associated with building the tracking system was beyond

the planned evaluation budget and timeline; the difficulty associated with convincing different primary schools to commit to the evaluation and; the anticipated delay in obtaining permission from the Western Cape Education Department to collect the data in different primary schools.

Preliminary discussions with programme implementers also revealed that the organisation had never conducted a process evaluation of the preschool programme stage. Although there is confidence that the preschool programme stage is well-implemented, there is no verifiable evidence about its implementation fidelity. This formative evaluation is therefore a combined process and outcome evaluation.

While a process evaluation investigates fidelity and effectiveness of implementation, an outcome evaluation assesses the short-term outcomes of the programme and the degree to which these outcomes are attributable to the programme (Rossi et al., 2004). As such, the current evaluation seeks to unpack the implementation of the preschool component, assess its fidelity to the Montessori education model, and assess the short-term academic and social outcomes of the beneficiaries.

Participants of the preschool programme

The first aim of the evaluation is to understand how the preschool component is implemented. For this purpose, both the level of participation of beneficiaries and the adequacy of the programme structure to support learners' access the child support grant or sponsorship, will be assessed.

Implementation Fidelity to Montessori approach

The superiority of the Montessori education model over the traditional models might be related to the nature of the Montessori learning materials and the self-directed engagement of the learners with these materials (Manne, 2007; Marshall, 2017). In contrast to traditional education model, which focuses on measurable academic attainment, the Montessori approach aims to holistically develop a child, including his/her intellectual, physical, emotional, and social aspects as a human being (Damore, 2004; Kirkham & Kidd, 2017; Marshal, 2017).

In general, high fidelity to the Montessori approach is characterised by learner engagement with Montessori materials for at least three hours, educator training, classrooms equipped with (un-supplemented) Montessori materials, learner freedom to engage with the materials, and age mixing, whereby learners who are three years apart are grouped together in the same classroom

(e.g. 3-6 years) (Daoust, 2004; Starling, 2018). This evaluation assesses the extent to which the preschool programme stage complies with the best practices described above.

Learner's academic and social outcomes

To gauge the effectiveness of the Montessori model, as implemented by the programme, this evaluation assesses the short-term learning outcomes of beneficiaries, using the Early Learning Outcome Measure (ELOM). Results were benchmarked against those of a comparable group of learners from Quintile 1-3 schools (see methods section).

ELOM measures the developmental status of learners between 50 – 59 months, and 60 – 69 months (Dawes et al., 2016). The ELOM items measure five domains: gross motor development, fine motor coordination and visual motor integration, emergent numeracy and mathematics, cognition and executive functioning, emergent literacy and language. It was specifically designed for use in evaluations of early learning programmes.

Evaluation questions

The following evaluation questions (relating to service utilisation, service delivery, and programme outcomes) were derived based on the stated aims of the evaluation:

1. Did the intended target beneficiaries participate in the programme? If so, did they receive the intended programme services and dosage?
2. Was the programme implemented with fidelity to the classical Montessori education model?
3. Did the programme satisfactorily develop the beneficiaries' academic and social skills?

METHOD

Research Design

This evaluation uses a descriptive research design to address the first and second evaluation question.

A non-equivalent control group post-test only design was used to address the third evaluation question. This design allows the evaluator to compare a non-random sample of ECP learners (in the preschool programme stage) with a comparable group of learners from Quintile 1-3 schools,[5] in terms of outcomes measured by the Early Learning Outcome Measure[6] (ELOM). Figure 5 presents the proposed design used with the ECP preschool programme stage learner group (P) and the ELOM benchmark group (C), tested after the programme (O_1).

P	X	O_1
C		O_1

Figure 5. Diagrammatic presentation of quasi-experiment.

Participants and sample size

Programme records were used to address the first two evaluation questions and their associated objectives (see measure and procedures section). The evaluation used the administrative data of 158 learners and collected primary data from 42 learners whose caregivers/parents consented to their children to participate in this study. Additional data were collected from the educators (n=5) and caregivers (n=42).

To address the third evaluation question, learner participation consent forms were distributed to 74 caregivers/parents who attended the October 2018 annual meeting. After telephonic follow ups, 42 caregivers/parents signed the consent form. Only 37 ECP learners were however present at the school during the ELOM administration. All 37 learners participated in the study. Because the participants were not randomly selected, they may not be representative of all learners in the programme.

The achieved sample size (*n*= 37) is substantially higher than the planned sample size (*n*= 30), and it is powered (0.8) to detect an effect size of 0.47, after controlling for demographic

[5] Quintile 1 to 3 schools are located in low SES communities and receive a subsidy of R1175 per learner per year (Dass & Rinquest, 2017).
[6] ELOM is an instrument developed by the Innovation Edge to compare ECD outcomes with benchmark scores for ages 50-59 and 60-69 months old. It uses the home language of the learner and is tailored to South African context (Dawes et al., 2016).

covariates.[7] This effect size is similar to the one found by Howes et al., (2008) and Lillard and Heise (2016), which was estimated to be 0.26-0.79 and 0.51-0.58, respectively, in ECD programmes that use the Montessori model.

Measures and procedures

Evaluation question 1: Did the intended target beneficiaries participate in the programme? If so, did they receive the intended programme services and dosage?

To answer evaluation question one, the evaluation uses the process data archived by the programme implementers. The specific protocol used to address each of the objectives tied to evaluation question one is presented below:

Objective 1.1: To assess if the current beneficiaries are the intended population

For this question, the evaluation used the registration forms, which are filled by the caregivers/parents when the learners enrol in the programme. The registration form collects selected household demographic data, and information about caregivers/parents' occupation, including their monthly salary.

Objective 1.2: To assess LPC's performance in supporting learners to access government subsidies or sponsorships

The evaluator administered a survey to the caregivers/parents (Appendix C), which collected data on any (i) financial challenges faced to pay the school fees; and (ii) support received from LPC to apply for the child support grant and/or a sponsorship. The evaluator also collected administrative data on the financial source of school fees for each learner.

Objective 1.3: To assess the programme dosage received

Because the preschool programme uses the Montessori model, it does not administer any formal/structured assessment to measure the acquisition of learning content by the learners. Educators are however required to complete session forms, with items relating to service delivery. However, upon close inspection, the evaluator found many of these forms to be incomplete. In addition, some of these forms were filled retrospectively by the educators during the actual data collection. Service delivery information was expected to be captured in real time during the entire preschool programme cycle (i.e., over a period of three years). The evaluator

[7] The process consisted of running a regression of ELOM scores against the covariates age, gender, height, and language, and use the standard deviation of the predicted residuals in the power calculation.

could not use the data collected by educators due to the deficiencies and reliability concerns noted above.

The assessment of the programme dosage is based on the number of years that the learners are exposed to the preschool programme, as captured in attendance records. This means that if a learner was present during the three years of the programme, s/he was exposed to a full dosage of the programme.

Evaluation question 2: Was the programme implemented with fidelity to the classical Montessori model?

To answer evaluation question two, this evaluation used existing process data and relied on primary data collected through a survey, administered to educators (Appendix D) to assess the structural quality of the service delivery. The survey was adapted from Daoust (2004) and Arlington Public Schools (2016) and framed around the standards of South African Montessori Association (SAMA), following a discussion with the programme implementers. The specific protocol used to address each of the objectives tied to evaluation question two is presented below:

Objective 2.1: To assess the time of engagement with materials

To address this objective, the evaluation used responses from selected survey items, which prompted educators to estimate the duration of learner engagement with Montessori materials in their classrooms. No such data was captured in administrative records.

Objective 2.2: To understand the educator-learner ratio

The evaluator accessed administrative records to determine the number educators who are trained and certified to facilitate Montessori education in each classroom. This data was used to determine the educator-learner ratio.

Objective 2.3: To assess the range of Montessori equipment

The evaluation used the checklist embedded in the educator survey to identify the Montessori materials available in the classrooms. The evaluator's aim was to estimate the number of SAMA recommended Montessori material in use by the programme.

Objective 2.4: To understand the freedom for engagement with materials

Selected items from the educator survey was used to estimate the degree of freedom of learners have to: choose the working materials, help themselves to snacks, work individually or in

groups, and participate in circle time. Responses were capture on a five-point scale, with 1 representing total disagreement and 5 representing total agreement.

Ideally, this data should have been captured in real time by a trained assessor (APS, 2016). Time and the budget constraints forced the evaluator to rely on subjective perceptions of educators, which might be prone to social desirability bias.

Objective 2.5: To assess the extent of age mixing

Upon enrolment in the preschool programme, selected demographics, including learners' date of birth is captured in the registration forms. The evaluator accessed and used this data determine the extent of age mixing in each classroom.

Evaluation question 3: Did the programme satisfactorily develop the beneficiaries' academic and social skills?

Objective 3.1: To assess mathematics and reading outcomes

Objective 3.2: To assess the social and emotional skills

Objective 3.3: To assess development of fine and gross motor skills

To address objectives 3.1-3.3, two trained assessors administered the ELOM to programme leaners. The ELOM is aligned with the performance expectations of the National Early Learning Development Standards (NELDS) and National Curriculum Framework (NCF) for Learners from birth to four years.

This measure was chosen because it is an aged-normed South African preschool child assessment tool, with strong psychometric properties. In addition, the evaluator was given access to the validation sample data, which was used to construct the comparison group.

The administration of ELOM was overseen by the Innovation Edge (the instrument developer). It was administered in the home language of the learners (isiXhosa, English, and Afrikaans), over the period of 7-23 April 2016. The full protocol lasted 45 minutes and took into account the standards specified in ELOM technical manual available on http://elom.org.za/wp-content/uploads/2017/06/ELOM-Technical-Manual.pdf. The social and emotional assessment of each learner (objective 3.3) was conducted by the LPC educators, who were required to complete the ELOM teacher assessment instrument.

Objective 3.4: To identify the determinants of preschool performance

The evaluator used a combination of survey data, administrative data and ELOM data (total score for each learner) to assess the contribution of selected factors to preschool performance: learner characteristics (age, gender), home background characteristics (home language, household income), and preschool programme characteristics (programme dosage, source of school fees).

Ethical clearance

Permission was sought from the University of Cape Town's Faculty of Commerce Ethics in Research Committee before collecting the data for the evaluation. Consent forms (which were signed by the relevant data providers) are presented in the Appendices. Each details the purpose of the evaluation and the nature of the data collection, the rights of the participants (including voluntary participation and the right to withdraw from the study without any consequences) and the measures taken to safeguard the data and the identity of the data providers. A memorandum of understanding was first signed between the University of Cape Town and the Learn and Play Centre to access administrative/programme records and to collect data from learners and educators on site. The administrative records supplied by LPC were used only for the purposes of this evaluation. The copies made were discarded upon completion of the evaluation. Access to programme records (and any other data collected in this evaluation) was restricted to the evaluator and his supervisor.

Parental/Guardian consent (Appendix B) was sought before trained and accredited assessors (fluent in the learners' home language) administered the ELOM. Learners were only assessed if they were willing to participate following a verbal explanation of the procedure to participate.

There were no known risks to the administration of this measure (ethical clearance and permission from provincial education departments were obtained for the age-validation study).

Informed consent (Appendix C) was also secured from the caregivers/parents before collecting additional data on their educational backgrounds and support received from LPC to access funding and from educators (Appendix D). Data files were password-protected. In order to facilitate the merging of administrative data (routine data collected by the programme on learners and their caregivers/parents and educators) and primary data collected by the evaluator, an identification code for each participant was assigned. The dataset was stripped of personal identifiers such as surnames and physical addresses.

Data Analysis plan

The data analysis for the evaluation was performed using the IBM statistical package for the social science (IBM SPSS) and the Stata package.

Evaluation question 1: Did the intended target beneficiaries participate in the programme? If so, did they receive the intended programme services and dosage?

Objective 1.1: To assess if the current beneficiaries are the intended population

The preschool programme targets learners from farmworkers' families. A learner is considered to be from a farmworker's family if one of his/her caregivers/parents is identified as a farmworker. Theoretically, if the preschool programme reaches the intended population, the percentage of learners from farmworkers' families in the programme beneficiaries would not be statistically different from 100 percent.[8] Based on this parameter and using a simple one-sample t-test, the evaluation assesses whether or not the percentage of learners from farmworkers' families who are benefiting from the preschool programme is statistically different from 100, 75, 50, and 25 percent. If the test is not significantly different from:

- 100 percent, all the programme beneficiaries are the intended population;
- 75 percent, a quarter of the programme beneficiaries was not the intended population;
- 50 percent, half of the programme beneficiaries are the intended population;
- 25 percent, a quarter of the programme beneficiaries are the intended population.

The evaluator used the above analytic and interpretation approach (i.e., refrained from dichotomous characterisation of success or failure) because it has the advantage of revealing to programme implementers how far the programme is in terms of reaching its acceptable or desired level of targeted population.

Additionally, using a two-sample t-test, the evaluator assessed whether or not there is a statistical difference between the household income of farmworkers' families and non-farmworkers' families. This could indicate if the learners from the target population are more/less financially constrained to access to the preschool programme, compared to other learners.

[8] While the analysis was based on the proportion, the term percentage is used for reporting purposes to facilitate interpretation. Because the proportion (p) is valid in $0 < p < 1$, the value of one (100%) was set to be equivalent to 0.99 (99%).

Objective 1.2: To assess LPC's performance in supporting caregivers/parents to access the child support grant or sponsorship

The preschool programme supports caregivers/parents with financial difficulties to apply for the child support grant and/or sponsorship. In theory it is expected that the percentage of learners who obtained such financial assistance (specified in programme records) would not be statistically different from the percentage of caregivers/parents who received application support. Only an estimation of the latter could be made based on the responses from the parent survey. Any statistical difference between the two estimates were identified using a simple two-sample t-test.

Objective 1.3: To assess the programme dosage received

The evaluator used attendance as a proxy for dosage received. This means that if a learner did not miss any days of the preschool programme stage over the entire delivery cycle (three years), s/he is expected to have been exposed to the full programme.

Furthermore, if a learner is absent for a minimum of 10% of programme days of the preschool, this was considered as an instance of chronic absenteeism (Balfanz, 2017; Chang, 2008). The preschool programme stage was implemented over a period of 191 days in 2016, 185 days in 2017, and 190 days in 2018. Based on data collected and using a one-sample t-test, the evaluation assessed if the estimated absenteeism for learners is statistically higher than 10% of the planned preschool days in 2016, 2017, and 2018.

In a second analysis, the evaluator applied a one-sample t-test to gauge if the percentage of learners exposed to an entire programme dosage is significantly different from 100, 75, 50, and 25 percent of the programme beneficiaries. If the percentage is not significantly different from:

- 100 percent, all the programme beneficiaries were exposed to entire programme dosage;
- 75 percent, a quarter of the programme beneficiaries was not exposed to entire programme dosage;
- 50 percent, half of the programme beneficiaries was exposed to entire programme dosage;
- 25 percent, quarter of the programme beneficiaries was exposed to entire programme dosage.

Again, this analytic approach was adopted as an alternative to a dichotomous analysis of failure and success, because it has the advantage of revealing how far the programme is from reaching the intended programme dosage.

Evaluation question 2: Was the programme implemented with fidelity to the classical Montessori model?

To address this question, data derived from the educator survey and selected administrative records were compared to theoretical parameters, which characterise the essential characteristics of the classical Montessori model.

Objective 2.1: To assess the time of engagement with materials

The evaluator used a one-sample t-test to assess if the estimated learner engagement with Montessori material is statistically different from standard of two to three hours of uninterrupted engagement, established in the literature.

Objective 2.2: To understand the educator-learner ratio

The structural quality of the preschool programme stage was determined based on the educator-learner ratio. According to APS (2016), a ratio 1:23 is deemed optimal. The evaluator used a one-sample t-test to test if the estimated educator-learner ratio of the programme is statistically different from the APS standard.

Objective 2.3: To assess the range of Montessori equipment

Theoretically, if LPC classrooms are equipped with the full range of Montessori equipment, the percentage of items checked by the educators would not be significantly different from 100 percent (based on a one sample t-test). If this percentage is not significantly different from:

- 100 percent, the classrooms are equipped with the full range of Montessori equipment
- 75 percent, a quarter of the Montessori equipment is lacking;
- 50 percent, half of the learning materials is expected to be Montessori materials;
- 25 percent, a quarter of the Montessori equipment exist in the classrooms.

Objective 2.4: To understand the freedom for engagement with materials

Theoretically, if the programme provides learners with the complete freedom to engage with the Montessori equipment in the classroom, the average response on this educator survey item would be five (total agreement). The evaluator used a one-sample t-test to test if the actual mean on this item is significantly difference from five.

Objective 2.5: To assess the extent of age mixing

If the preschool programme stage complies with the Montessori age mixing standard (i.e. the grouping of learners between the ages of 3-6 years), it is expected that each age group will be represented in the different classroom. The evaluator verified if all ages are represented in the preschool programme. If a certain age has a missing value, this means the preschool programme does not comply with the Montessori model in age mixing.

Evaluation question 3: Did the programme satisfactorily develop the beneficiaries' academic and social skills?

Objective 3.1: To assess mathematics and reading outcomes

Objective 3.3: To assess development of fine and gross motor skills

The evaluation used a non-equivalent group design to address this question. Thirty-seven learners from the preschool programme stage represented the treatment group and 126 learners from the ELOM age validation sample were considered for the control group.

Control group participants were learners from Quintile 2 schools and were comparable to the treatment group participants in terms of key covariates. The evaluator applied logit regression to derive the propensity score used to construct the control group. The outcome variable was treatment status, and the covariates specified were gender, age in months, and home language of the participants.

The evaluator used the Kernel and Nearest Neighbour Matching algorithm with replacement, the propensity score for distance measure, and regression adjustment to address the bias of matching between the two groups.

The post-estimation diagnosis confirmed that the matched cases share similarities. The standardised difference of the covariates gender (*StdDiff* = .0075), age (*StdDiff=0.0479),* and language *(StdDiff=0.151)* is less than 0.25 (Stuart & Rubin, 2008).

The balanced diagnosis can also be confirmed visually from Figure 6 which estimates the density of the propensity score for the two groups; Figure 7 which shows the cumulative distribution of the propensity score; and Figure 8 which presents the box plot of the propensity score for the two groups.

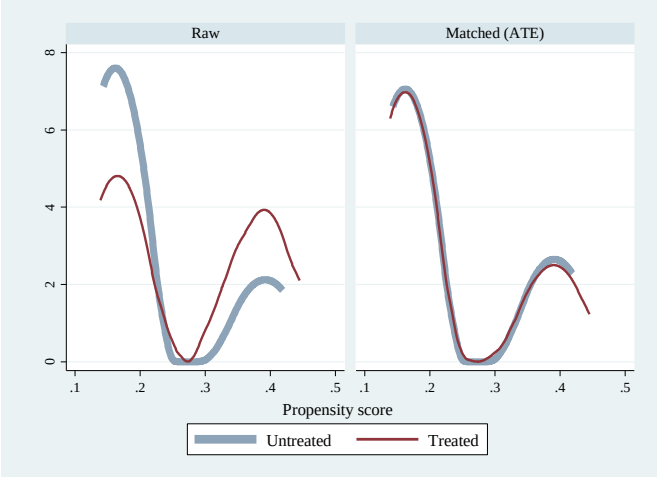

Figure 6. Density estimation of the propensity score for the two groups.

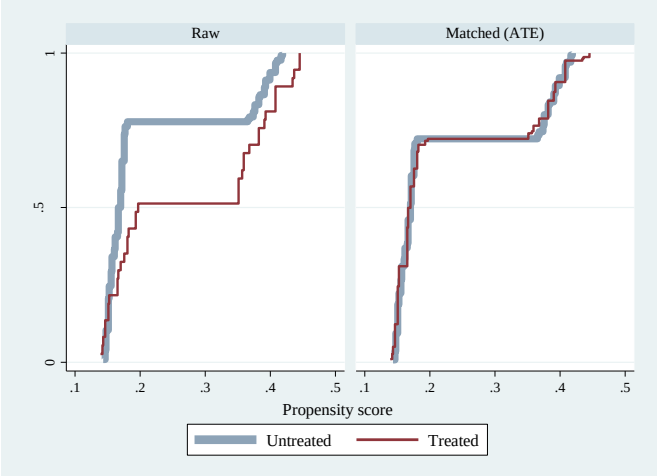

Figure 7. Cumulative distribution of the propensity score for the two groups

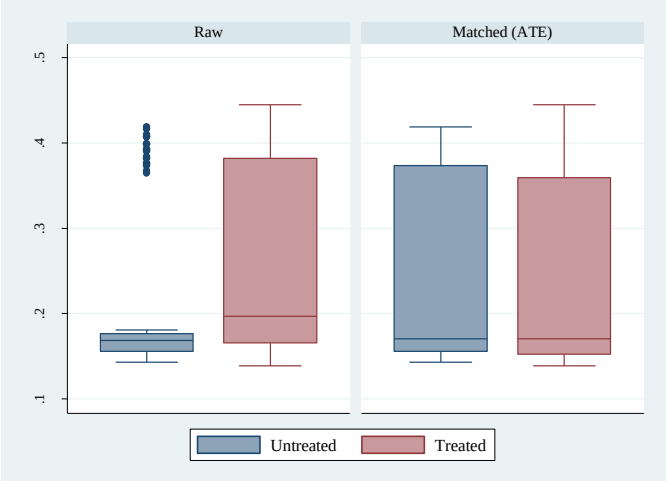

Figure 8. Box plot of the propensity score for the two groups.

Therefore, the matched cases are reasonably balanced. The matched groups were used to

address objective 3.1 and 3.3, more specifically to estimate the average treatment effect (ATE[9]).

Only the treatment group was used to address objective 3.2 and 3.4 because relevant data was not available for the control group. The analytic plan for these two objectives are described below:

Objective 3.2: To assess social and emotional skills

The maximum score on the ELOM teacher assessment is 24 for the social skills component and 12 for the emotional skills component. The following benchmarks were set:

- Medium achievement: a score of 12 for the first component and a score of 6 for the second component.
- High achievement: the maximum score of 24 for the first component and 12 for the second component.

Any statistical differences between the actual score of learners and the above benchmarks were identify using a one sample t-test.

Objective 3.4: To identify the determinants of preschool performance

The evaluator used ordinal least square (OLS) regression (performed in SPSS) to identify the predictors that significantly contributed to the preschool performance. The factors expected to determine the total ELOM scores were learner characteristics (age, gender), home background characteristics (home language, household income), and preschool programme characteristics (programme dosage, source of school fees). The predictors were entered hierarchically based on their importance (Parinduri 2014; Gray, 2011; Kirkham & Kidd, 2017; Van Huizen & Plantenga, 2018), with the objective of assessing the overall contribution of each set of variables in the model.

[9] The calculation of ATE is based in the following statement: if y_1 is the outcome variable of programme learners and y_0 is the outcome variable of non-programme learners, the ATE= E ($y_1 - y_0$).

RESULTS

The results of the evaluation are organised under each evaluation question, and relevant objectives in this section.

Service utilisation

Evaluation question 1: Did the intended target beneficiaries participate in the programme? If so, did they receive the intended programme services and dosage?

Objective 1.1: To assess if the current beneficiaries are the intended population

The intended target population are learners from farmworkers' families. Figure 9 shows that, out of 158 learners in the preschool programme stage in 2018, 12.03 % were from farmworkers' families.

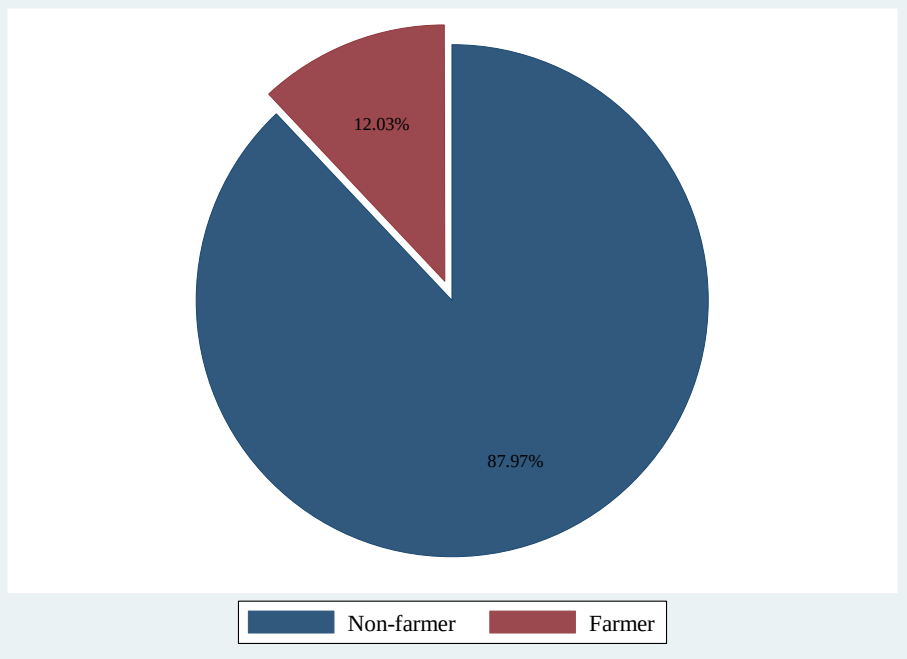

Figure 9. The learners' caregivers/parents are farm workers.

This percentage was found to be significantly ($p<0.001$) different from 100 percent. This means that there is no evidence to support the claim that the preschool programme is reaching its intended population. The evaluation also tested the hypotheses that at least 75, 50, and 25 percent of the programme beneficiaries come from farmworkers. These hypotheses were also rejected ($p<0.001$), indicating that the intended population of the programme is significantly different from 25 percent of the total programme beneficiaries.

One might suspect that the school fees are prohibitive for learners from farmworkers' families. A two-sample t-test however revealed that the monthly income of farmworkers' families (*M*=7.9, *SE*=0.23) is not statistically different (*p*=0.0614) from that of non-farmworkers' families (*M*=8.5, *SE*=0.12), after log transformation.[10] Therefore, the reduced participation of the intended population might be related to other phenomena not identified in this study.

Objective 1.2: To assess LPC's performance in supporting learners to access the child support grant or sponsorship

Figure 10 shows that, out of 72 preschool learners who completed the programme in 2018, 9.72% received some form of financial assistance. Amongst the caregivers/parents (42) who participated in the evaluation, 16.67% confirmed that they received support from LPC to submit grant applications. Figure 10 also shows that more than half (54.76%) of caregivers/parents reported experiencing difficulties in paying the school fees.

Analyses confirmed that there is no significant difference (*p*= 0.2758) between the percentage of learners benefiting from the sponsorship and the percentage of caregivers/parents who reported receiving application support.[11] Therefore, there is no evidence to refute the hypothesis that the programme supported the caregivers/parents to apply for sponsorship to pay the school fees when they had difficulties in this regard.

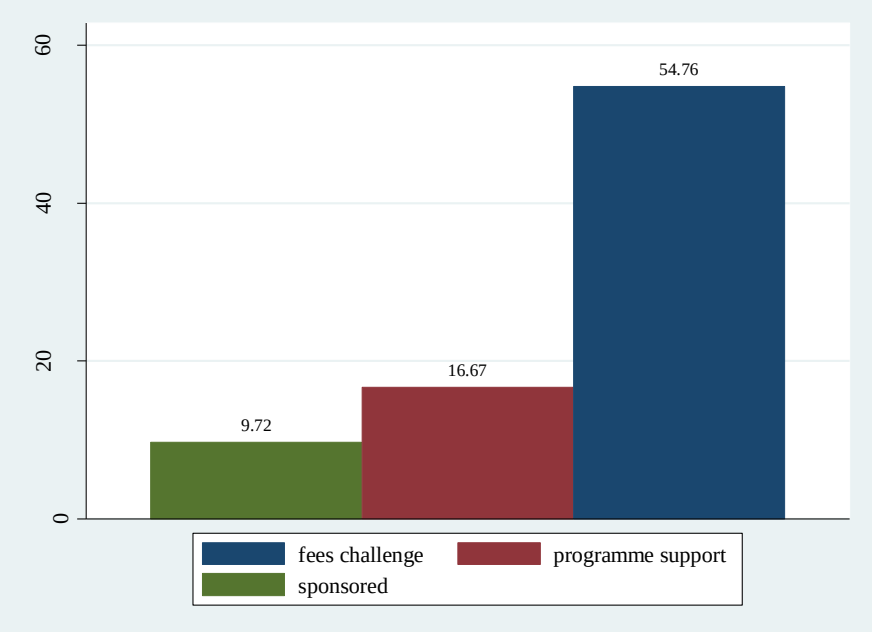

Figure 10. Access to support services for sponsorship

[10] The variable household income is log transformed to approximate a normal distribution.
[11] Although the ECP programme has a significant number of learners who benefit from a the child support grant (60%), the learners are from the grade R, not the preschool programme stage.

Objective 1.3: To assess the programme dosage received

Figure 11 shows the average number of days that the learners were absent from the preschool programme stage in 2016, 2017, and 2018.

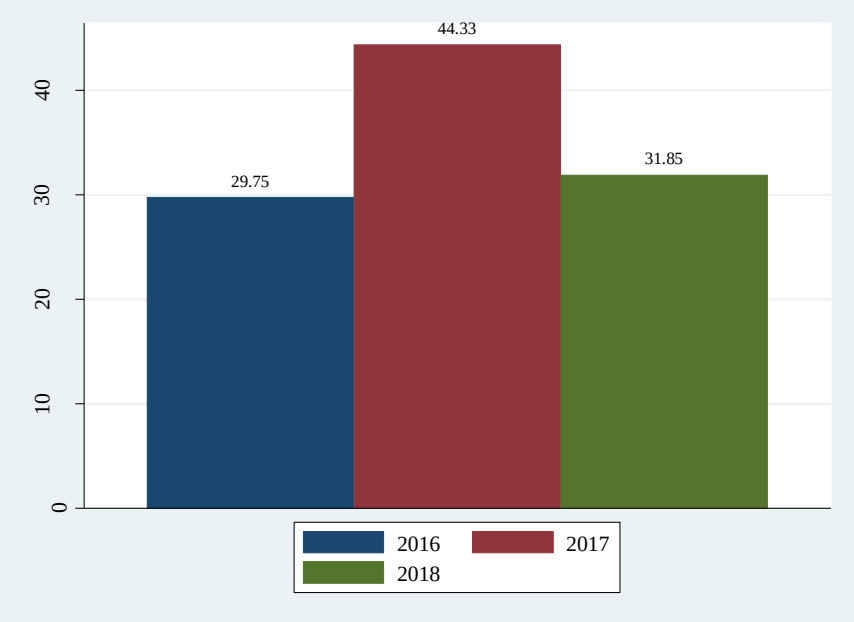

Figure 11. Programme absenteeism in a year.

Theoretically, if the learners experienced chronic absenteeism, the average monthly days of preschool absenteeism is expected to be significantly higher than 19.1 days in 2016, 18.5 days in 2017, and 19 days in 2018 (as discussed in the methods section). Based on the one-sample t-test, the average days of preschool absence in 2016 (M=29.75, SE=5.56), 2017 (M=44.33, SE=3.57), and in 2018 (M=31.85, SE=1.62) is significantly higher than 19.1 days in 2016 (p<.05), 18.5 days in 2017 (p<.001), and 19 days 2018 (p<.001). Therefore, the preschool learners are experiencing chronic absenteeism.

The results also indicate that 89% of the learners who were scheduled to transit to grade R in 2019 were not exposed to three years of the preschool programme. Figure 12 indicates the percentage of learners exposed to entire (three years) preschool programme in 2018.

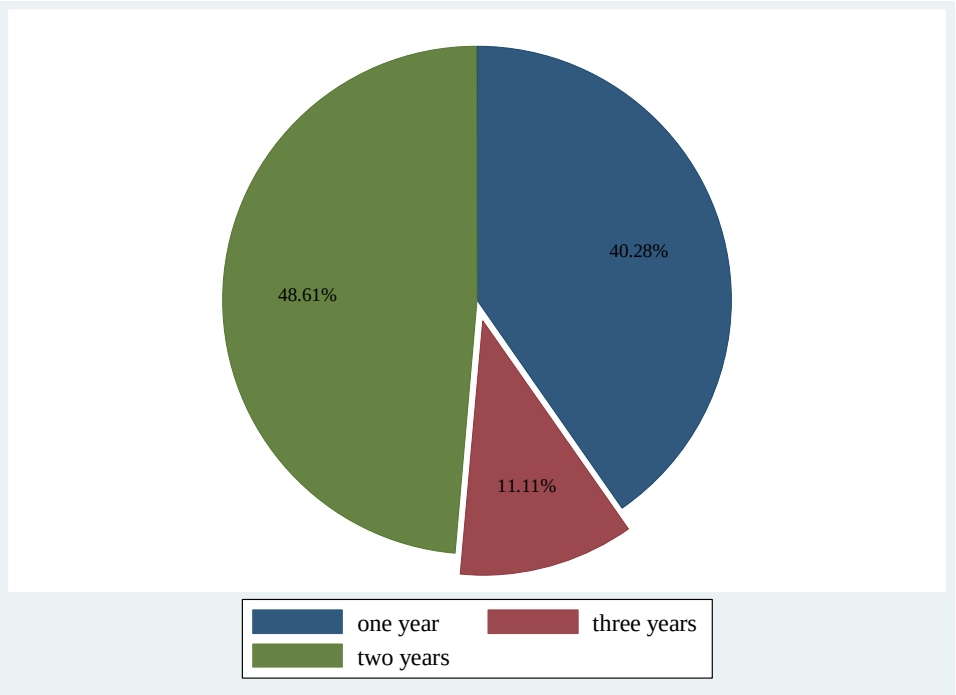

Figure 12. Exposition to three years of preschool programme.

The calculated percentage of 11% (representing learners exposed to the entire preschool programme) was significantly different from 100, 75, 50, and 25 percent of the total programme beneficiaries (p<.001). Therefore (as depicted in Figure 13), the percentage of learners who were exposed to three years of preschool programme is significantly different from 25 percent of the total preschool learners.

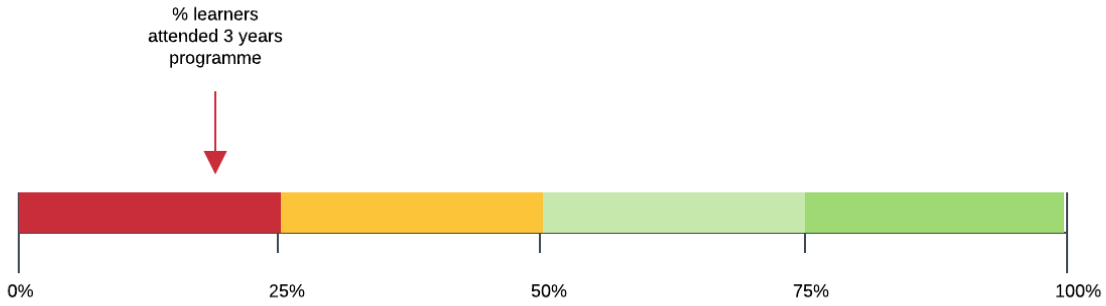

Figure 13. Learners exposed to three years of programme.

Service delivery

Evaluation question 2: Was the programme implemented with fidelity to the classical Montessori model?

Objective 2.1: To assess the time of engagement with materials

Preschool learners spend on average 0.494 hours (*SE*=0.151) engaging with Montessori materials, based on the data from the educator survey.

In the Montessori education model, learners are expected to spend two to three hours daily working with Montessori materials (Marshall, 2017). Using one-sample t-test, the evaluation found that the average time of engagement in the preschool programme is significantly different from two, three ($p<.001$) and from one hour ($p<0.05$). These results confirm that the programme is yet to achieve a full roll out of the Montessori model. Figure 14 shows the state of programme fidelity to the Montessori standard for learner engagement with Montessori materials. The programme implementation would have been considered as true to the Montessori model if the time of engagement had reached the green area and was not statistically different from three hours.

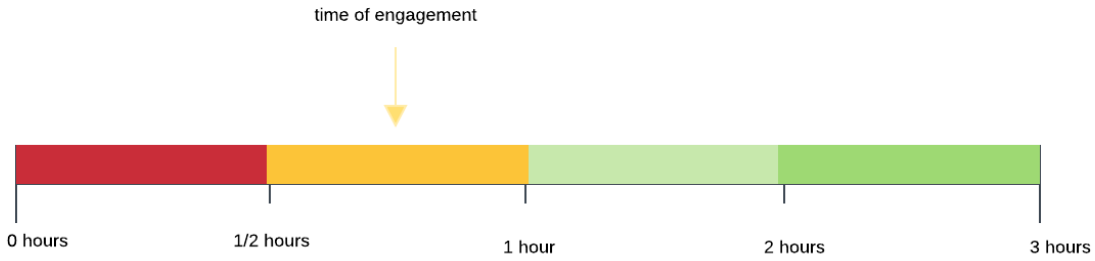

Figure 14. Programme implementation fidelity in time of engagement.

Objective 2.2: To understand the educator-learner ratio and retention of educators

Using the results from the survey of educators, it was found that the preschool programme has 158 learners organised in three classrooms. An analysis of data indicates that the class size is estimated at *M*=47 (*SE*=1.46) learners. Although each class is assigned two educators, only one educator is trained to facilitate the Montessori education. Therefore, the trained educator-learner ratio for the preschool programme is estimated at 1:47, on average. This ratio is significantly different ($p<.001$) to the recommended ratio of 1:23. Therefore, the implementation of the preschool programme does not adhere to the classical Montessori model, in terms of educator-learner ratio.

Objective 2.3: To assess the range of Montessori equipment

Figure 15 presents the percentage of Montessori equipment available and in use in each learning area. The figure indicates that the cultural area is the most well-equipped (61.60%) and the Mathematics area is least equipped (17.86%).

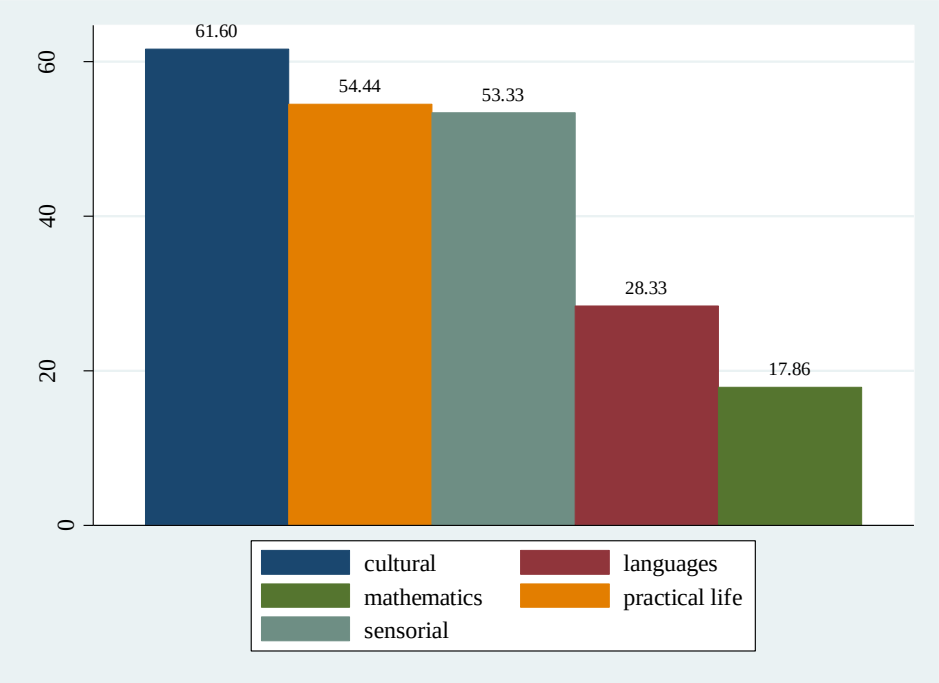

Figure 15. The Montessori material per learning area.

The results of the evaluation revealed that the percentage of Montessori material available and in use in the different learning area is statistically different from one (p<.05). This implies that none of the learning areas is fully equipped with the required Montessori materials, once again confirming that a full roll-out of the Montessori model is still underway. The sensorial (p=.199), practical life (p=.124), and cultural (p=.371) were not found statistically different from being equipped with 75% of the Montessori equipment. Figure 16 below shows the actual state of the Montessori equipment roll-out. The programme implementation would be

considered true to the Montessori model if all learning areas are fully equipped with the required Montessori equipment.

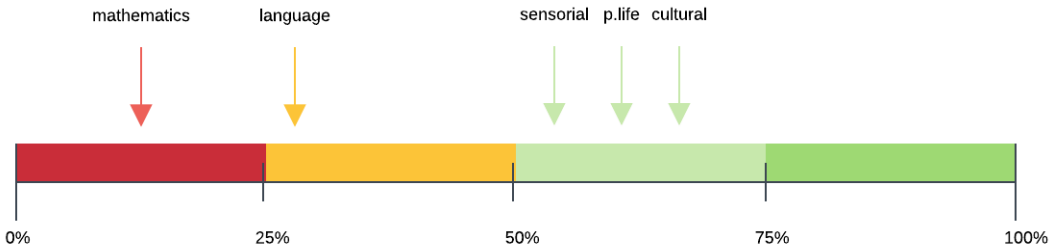

Figure 16. The implementation fidelity in equipping the learning areas.

Objective 2.4: To understand the freedom of engagement with materials

Figure 17 below shows how far the preschool programme is in terms of achieving the ideal state for Montessori education, that is full learner freedom to engage with the available Montessori equipment.

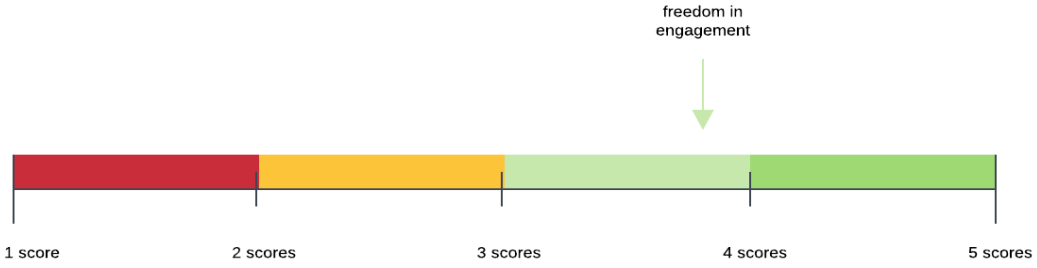

Figure 17. The implementation fidelity in freedom of engagement.

The results of the study show that the mean score of freedom to engage with Montessori material is M=3.94 (SE=0.16) out of 5 scores. This result was found significantly different (p=0.003) from 5 (total agreement that the learners have freedom in the classroom), again confirming that a full roll-out of the Montessori model is still underway.

Objective 2.5: To assess the extent of age mixing

Figure 18 presents the distribution of learners in terms of their ages.

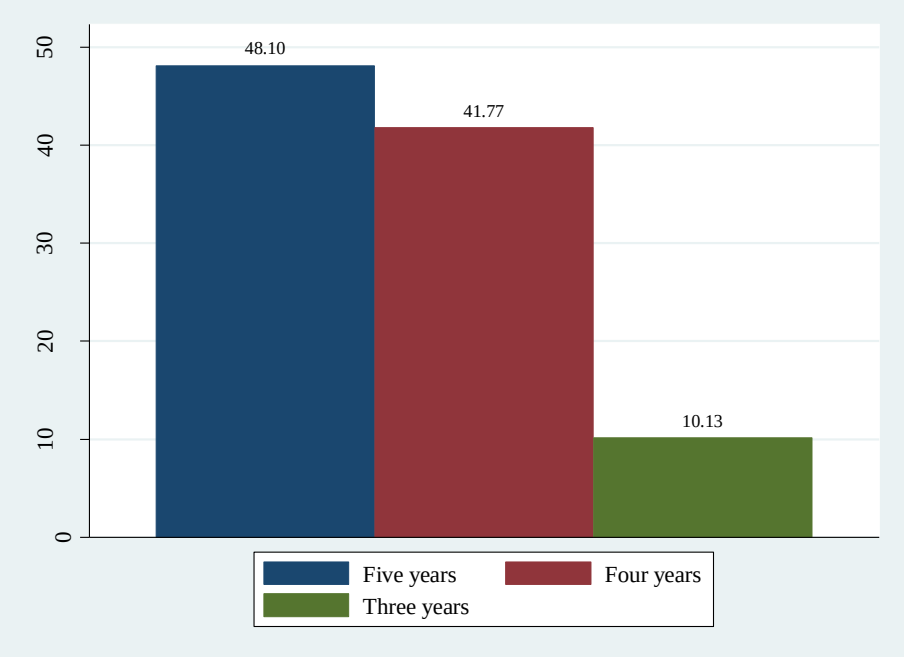

Figure 18. Distribution of learners according to their age.

The programme consists of learners aged five (48.10%), four (41.77%), and three (10.12%). The age mixing standard (i.e.; the grouping of learners between the ages of 3-6 years) is therefore not fully achieved. LPC would need to discard the grade R (six-year-olds), to make the implementation faithful to classical Montessori model. However, this approach seems financially impractical, as explained in the discussion chapter.

Programme outcomes

Evaluation question 3: Did the programme satisfactorily develop the beneficiaries' academic and social skills?

Objective 3.1: To assess mathematics and reading outcomes

The evaluation used the ELOM *emergent numeracy and mathematics* scores and *emergent literacy and language* scores as proxies of mathematics and reading outcomes, respectively. Figure 19 shows that the learners from the preschool programme achieved on average a score of 8.59 (*SE*=0.67) in mathematics and 9.30 *SE*=0.65) in reading. A one-sample t-test revealed that, while there were no statistically significant differences between the performance of learners in the treatment group and that of learners in the matched control group for the mathematics component (p=0.408), statistically significant differences were found for the reading component (p<0.001).

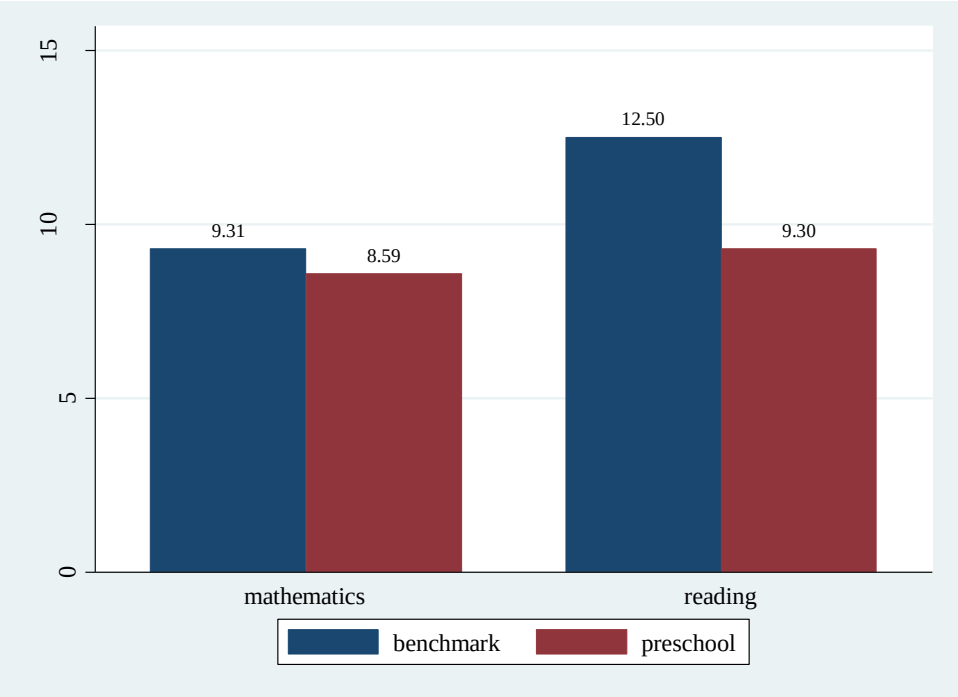

Figure 19. ELOM outcomes in mathematics and reading

In addition, the estimated ATE for mathematics (ATE= 0.175) was not significantly different from zero, *p*=.868. This was however the case for reading (ATE= -1.938), *p*=0.036.

Overall, there is no evidence to support the hypothesis that the learners from the preschool programme stage outperform comparable learners from the ELOM age validation sample in mathematics or reading. In fact, the estimated ATE for reading is negative, indicating that programme beneficiaries are underperforming compared to the matched learners who were not exposed to the programme.

The performance of programme beneficiaries (in relation to the ELOM normed performance bands) is visually depicted in Figure 20.

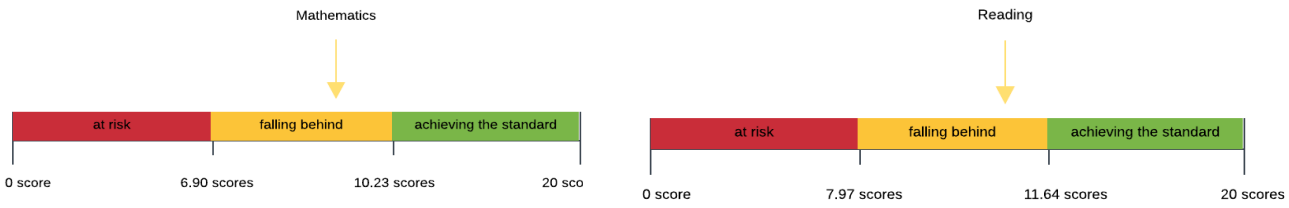

Figure 20. *The preschool performance compared to ELOM age validation performance*

It is clear that, at the time of the evaluation, programme beneficiaries could be classified as *falling behind* in achieving the ELOM mathematics and reading age-validated scores.

Objective 3.2: To assess social and emotional skills

Results show that the learners in the treatment group scored on average *M*=20.27 (*SE*=0.40) for social relations and *M*=10.13 (*SE*=0.44) for emotional functioning. Data for the matched control group was not available.

These scores are statistically different from 24 and 12 ($p<0.001$), the highest score that could be achieved in social relations and emotional functioning, respectively. This is not considered to be problematic as it would be unrealistic to expect a perfect score in those areas.

The figure 21 below shows the preschool programme performance on improving the social and emotional skills of the learners.

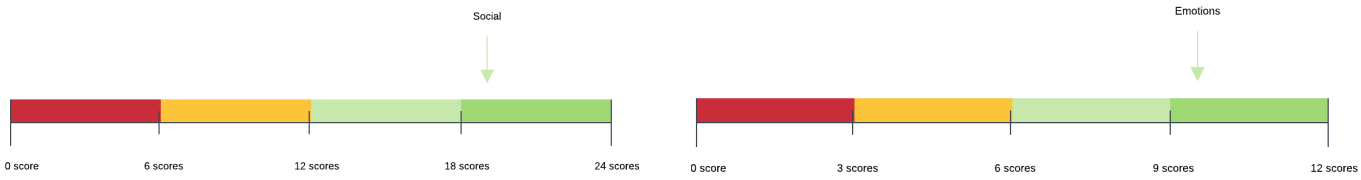

Figure 21. Preschool performance to improve social and emotional skills.

The results show that, although the preschool programme does not improve the social and emotional skills of the learners to reach to the highest scores of 24 and 12, respectively, the learners exhibit accepted (green area) social and emotional skills.

Objective 3.3: To assess development of fine and gross motor skills

Figure 22 reveals that the learners from the preschool programme on average achieved a score of 8.84 (*SE*=0.67) for gross motor coordination and a score of 11.72 (*SE*=0.51) for fine motor coordination and visual motor integration. Compared to learners in the matched control group, the gross motor development of learners in the treatment group is significantly lower ($p=0.006$). No statistically significant differences between the two groups were found for fine motor coordination and visual motor integration ($p=0.073$).

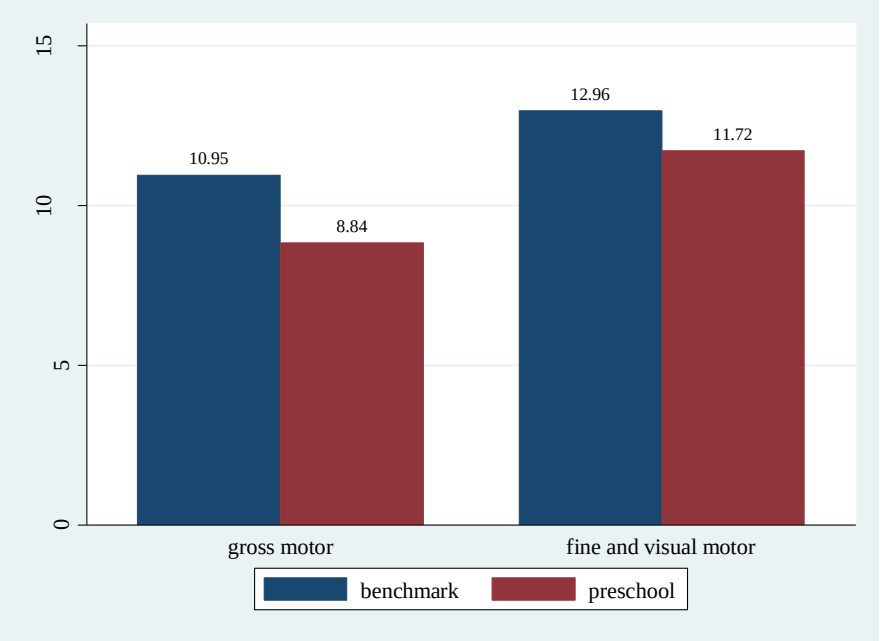

Figure 22. ELOM outcomes in gross motor, fine and visual motor skills

In addition, the estimated ATE for gross motor development (ATE= -2.750) was significantly different from zero, p=0.022. This was however not the case for fine motor coordination and visual motor integration (ATE= -0.498), p=.475.

Overall, there is no evidence to support the hypothesis that the learners from the preschool programme stage outperform comparable learners from the ELOM age validation sample, in gross motor development, and fine motor coordination and visual motor integration. In fact, the negative ATE estimate for gross motor development indicates the contrary.

Figure 23 depicts the performance of programme beneficiaries (in relation to the ELOM normed performance bands) for gross motor development, fine motor coordination and visual motor integration.

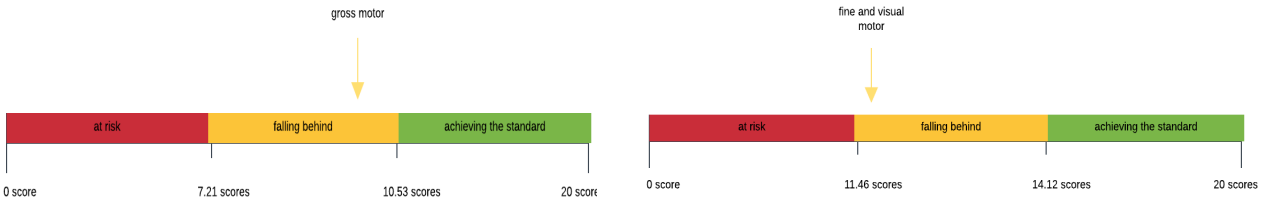

Figure 23. Preschool programme performance in gross motor development, fine motor coordination and visual motor integration.

It is clear that, at the time of the evaluation, programme beneficiaries could be classified as *falling behind* in achieving the ELOM gross motor development, and fine motor coordination and visual motor integration age-validated scores.

Objective 3.4: To identify the determinants of preschool performance

The evaluator used the hierarchical multiple regression to identify significant determinants of programme beneficiaries' overall ELOM performance. Drawing on the literature presented in the introduction section (e.g., Parinduri 2014; Gray, 2011; Kirkham & Kidd, 2017; Van Huizen & Plantenga, 2018), selected variables were entered in the regression model, in order of their importance in predicting the outcome. The first model included learner characteristics (age and gender), the second model included home background characteristics (home language, household income), and the third model included preschool programme characteristics (programme dosage, source of school fees).

The results of regression are presented in Table 1. While the first model uses data from all learners in the sample (n= 37), the second and the third models use the data from only 22 learners. The reduction in the sample size is due to missing data on the variable household income (listwise deletion is the default deletion approach in Stata). This variable was retained in the model because, when deleted, it produces a mis-specified model.

The most common rules of thumb for sample size in regression is 10 or 15 cases per predictor in the model (Field, 2013). However, ELOM data could only be collected from 37cases – many of these cases had missing data on the second predictor variable – which restricted the evaluator from complying to the general sample size requirement (although this requirement oversimplifies the picture- see Field, 2013, p. 313). Furthermore, use of multi imputation methods inflated the standard errors of the coefficients. It should be noted however that other multiple regression assumptions were upheld (see Appendices E1-E5), and the number of observations were still greater than the number of variables in the model (Gujarati, 2000).

Assumption testing results confirmed the following: there is linear relationship between the total ELOM scores and the independent variables; multicollinearity is not a concern, VIF values are below 10; there are no cases exerting undue influence on the regression parameters; the error variance are homoscedastic; the errors are normally distributed and; there is no correlation between the residual.

Table 1. Hierarchical regression analysis

Summary of Hierarchical Regression Analysis for Variables Predicting Preschool performance (N=22)

	Model 1			**Model 2**			**Model 3**		
Variable	B	SE B	β	B	SE B	β	B	SE B	β
Constant	-17.41	38.70		-21.27	63.94		-45.03	46.48	
Age (in months)	0.91	0.60	0.32	0.95	0.73	0.33	1.22*	0.53	0.42*
Gender (female=1)	6.10	4.57	0.28	9.32	5.41	0.42	12.25*	4.27	0.56*
Home language (English=1)				7.39	7.47	0.28	11.79	5.52	0.45
Female whose home language is English				-14.52	11.36	-0.38	-12.93	8.21	-0.34
Log of household income (ZAR)				-0.43	3.09	-0.04	1.23	2.25	0.10
Preschool programme dosage (>1 year)							-13.51*	3.90	-0.61*
Source of school fees (sponsorship=1)							23.50*	8.63	0.45*
$\boldsymbol{R^2}$		.20			.28			.67	
Adj. $\boldsymbol{R^2}$		.11			.05			.51	
F for change in $\boldsymbol{R^2}$		2.32			0.60			8.60*	
Durbin Watson								2.08	
N		37			22			22	

*p<0.05.

Overall fit and cross validation of the model

The results of the regression analysis (Table 1) showed that the third model (with all predictors included) is statistically significant, $F(7,14)=4.11$, $p<.05$), while the first model, ($F(2,19)=2.32$, $p=.13$), and second models ($F(5,16)=1.20$, $p=.35$), were not statistically significant. Because in the second model, the characteristics of the learners and the home background, accounts for 27.3% of the variation, the third model, which adds the preschool programme characteristics, accounted for a large amount of variations (R^2= 40.0%). While the *F-change* is not statistically significant for the first (*F-change*=2.32, $p=.13$) and second (*F-change*=0.56, $p=.65$) models, it was found to be significantly different from zero (*F-change*=8.56, $p<.05$) when it included the preschool programme characteristics. The difference between the R^2 (67.30%) and Adj. R^2 (50.90%) in the third model shows that, if the regression model were derived from the population rather than the sample, it would account for approximately 16.40% less variance in the performance of learners from the preschool programme.

Characteristics of the learner

The learner characteristics considered in this evaluation were age and the gender. Both variables had a positive and linear relationship with the total ELOM score. Furthermore, these two variables were statistically significant predictors, $p<.05$. The ELOM scores of female learners were 12.25 times higher than that of male learners.

Characteristics of the home background

The home background characteristics considered in this evaluation were home language (English=1), female whose home language is English, and the household income (log transformed). The results indicate none of these background characteristics are statistically significant, $p>.05$.

Characteristics of the preschool programme

The preschool programme variables considered in this evaluation were programme dosage (measured by years spent in the preschool programme) and financial source of school fees (sponsorship=1). Both of these variables were statistically significant ($p<.05$). While the financial source of school fees presented the expected sign (positive), the preschool programme dosage exhibits a contrary sign (negative).

DISCUSSION

In this section, the evaluator discusses the results of the evaluation, and pragmatic recommendations for programme improvement. Limitations as well as contributions of the evaluation are also discussed.

Service utilisation

Evaluation question 1: Did the intended target beneficiaries participate in the programme? If so, did they receive the intended programme services and dosage?

Objective 1.1: To assess if the current beneficiaries are the intended population

As evidenced by data derived from administrative records, the preschool programme is facing challenges to reach the population that it was designed for. The results indicate that only 12% of programme beneficiaries are from the intended population.

The programme was originally designed in the 1990s to serve the learners of farmworkers. Most beneficiaries do not fit this description. This might be a result of economic and social dynamics which shifted the population from farm activity to other urban activities, as suggested by Anderson et al. (2009).

According to Whitley and Kite (2012), a programme that does not reach the targeted population fully can pose threats to the internal validity of the evaluation. This is because the population enrolled in the programme differs substantially from the comparison group, and the confounding characteristics compete to explain the difference in the outcome of the two groups. This possibility is not valid in the context of this evaluation, because learners in the matched control group were not expected to come from the farmworkers' families, but from underprivileged families.

The implication of not reaching the intended population is that it is difficult to guarantee that the Montessori approach will have a similar effect on learners from farmworkers' families if implemented in a site different from Mfuleni township.

Objective 1.2: To assess LPC's performance in supporting learners to access the child support grant or sponsorship

The results confirmed the hypothesis that the preschool programme supports the caregivers/parents of learners when they face financial challenges to pay the school fees. The support consists of assistance to apply for the child support grant and/or sponsorship.

Because the programme beneficiaries are from disadvantaged families, this finding has two implications. First, by providing support in accessing financial grants, the programme proactively minimises programme attrition, which could help address the learning outcomes gaps amongst learners from disadvantaged backgrounds (Heckman & Masterov, 2007; Karoly, 2016). Second, by arranging external financial assistance for disadvantaged learners, the programme preserves its financial stability to continue serving the disadvantage population.

Considering that the majority of surveyed caregivers/parents (54.7%) reported facing challenges to pay the school fees, it is critical that the programme implements a systematic procedure to identify caregivers/parents in need of support, if this is not already in place. This would increase the coverage of the intended population, maintain the learners at school and improve the financial stability of the programme. The pre-programme registration forms, which collect data on caregivers' household income, could be used to identify caregivers/parents who are likely in need of financial support and other targeted interventions.

Objective 1.3: To assess the programme dosage received

The evaluation found that the are learners who experienced chronic absenteeism across all three years of the programme. In other words, there are learners who missed more than 10% of the preschool programme days per year. Additional results show that only 11.1% of learners were exposed to the full programme (three years). It is critical that learners start engaging with Montessori materials from a very young age to fulfil their potential (Dohrmann et al., 2007).

Since poor attendance at preschool negatively affects the social and academic outcomes of the learners (Balfanz & Byrnes, 2013; Chang, 2008), it is imperative that LPC investigates the context-specific factors hindering programme participation and provides the necessary incentives to boost attendance. Furthermore, LPC needs to investigate the reasons behind the late enrolment in the preschool programme stage.

There is evidence to suggest that preschool attendance can be improved by: (a) implementing interventions that support both learners and their families (in parallel with the programme), (b) designing attractive preschool programmes; or (c) using a combination of both approaches (Balfanz, 2017; Katz et al., 2016). Therefore, it is recommended that LPC works with the implementers of other community-based intervention and fosters an environment, which actively encourages programme participation. In line with Balfanz's (2017) recommendations, learners suffering from chronic absenteeism could be paired with a mentor from the community who could provide them with additional learning support.

Because research also suggests that learners starting a pre-school programme at a younger age are more likely to benefit from pre-school programmes (Anguilar & Tansini, 2012), it is recommended that LPC expends some of its resources or partner with other NGOs to run awareness campaigns in the Mfuleni township. The objective would be to encourage caregivers/parents to enrol their learners into the programme from the age of 3.

Service delivery

Evaluation question 2: Was the programme implemented with fidelity to the classical Montessori model?

Objective 2.1: To assess the time of engagement with materials

The literature suggests that the time a learner spends in an ECD programme in a given year has long term implications: reduced likelihood of school year repetition, improved education attainment, improved likelihood of high school completion, and improved earning capacity (Aguilar & Tansini, 2012; Parinduri, 2014; Van Huizen & Plantenga, 2018).

In the Montessori education model, learners are given the opportunity to spend dedicated time working with the carefully chosen Montessori material, which estimated at two to three hours per day, and concentrated in the mornings (Marshall, 2017). During this time, the learners uninterruptedly engage in activities of their choosing (Jones, 2005). This happens daily, five days per week, over a period of nine months (Harris, 2007).

The evaluation confirmed the notion that this aspect of the Montessori education model is still under development in the preschool programme. It is recommended that LPC educators assign more time for learner engagement with the Montessori material in order to improve their social and academic outcomes (Anguilar & Tansini, 2012; Parinduri, 2014).

Objective 2.2: To understand the educator-learner ratio

Because the quality of the ECD programmes was found to be critical in developing learner's academic and social skills (Bauchmüller et al., 2014; Mashburn et al., 2008; McCoy & Wolf, 2018), this evaluation assessed the structural quality of the preschool programme stage, which in turn determines process quality.

In the Montessori education model, thorough training and certification of the educators is critical to sound process quality (Biersteker & Kvalsvig, 2007; Pianta et al., 2010). The educators are required to hold a Montessori diploma to be qualified for Montessori teaching (Harris, 2007; Jones, 2005; Lillard & Else-Quest, 2006).

Another key feature of the structural quality is class size. Results from both experimental and non-experimental studies confirm that smaller class sizes are linked to improved academic outcomes in the short and long term (Bowe et al., 2017; Gupta & Simonsen, 2010; Monks &Schmidt, 2010). According to APS (2016), the maximum class size in Montessori education is estimated at 23 learners.

Although each LPC classroom is assigned one educator trained in Montessori education and one assistant educator (not specifically trained in Montessori education), an average of 47 learners per classroom may imply restricted access to available Montessori equipment and more pressure on the trained educator to facilitate the learning process. Having an assistant educator in each classroom does not rule out the need to reduce the trained educator-learner ratio (Bowes et al., 2017; Monks & Schmidt, 2010).

Therefore, it is important that LPC reconsiders the class sizes and takes into account the costs associated with building new classrooms, purchasing additional Montessori equipment, and hiring additional trained educators, if there is a willingness to maintain its current programme size.

Objective 2.3: To assess the range of Montessori equipment

Effective process quality depends on the availability of carefully chosen Montessori learning material (Howes et al., 2008).

The Montessori materials are crafted in such a way that learners are encouraged to "progress from simple to more complex" processes (Jones,2005, p. 29). The "Pink Tower", for example, comprises cubic blocks that increase gradually in size and weight. This design helps the learner to reassemble the pink tower blocks assisted by visual contact, weight, and matching. The cylinder blocks comprise four blocks that vary in dimension and height. The objective is to teach the learner to coordinate her/his fingers when holding pencils, refine voluntary movement, and prepare them for mathematics (Lillard, 2008).

A typical Montessori classroom is fitted with shelves (used to store/organise the Montessori materials), which are at a height easily accessible to small learners. The classrooms are equipped with four to five working tables, which can seat up four to six learners. There is also a circle taped on the floor for circle time (Jones, 2005; Lillard, 2012).

The classrooms are organised according to five learning areas (the practical life, sensorial, languages, mathematics and cultural), all equipped with the relevant learning material (Lillard & Heise, 2016; Harris, 2007; Heise, 2016).

A full roll out of the Montessori equipment is yet to be achieved by LPC, with certain learning areas such as Mathematics, acutely under-equipped at the time of the evaluation. It is therefore recommended that LPC prioritises this particular learning area when funds are available.

Objective 2.4: To understand the freedom of engagement with materials

Full adherence to the Montessori education model involves providing learners with the freedom to choose which learning area to access and which material to engage with (Kirkham & Kidd, 2015; Ruijs, 2017). The learner is free to engage with the same learning activity multiple times or decide to progress to a different learning activity in his/her own time. The activities contain error alerts to inform them when the wrong learning process is being followed. This allows for self-correction with minimal intervention from the educators (Marshall, 2017). When the learner has completed a certain learning activity, he/she is required to assemble and return the materials used to their original location (Marshall, 2017). A learner may choose to work individually, be part of a group, join the circle time, or have the outdoor time at midday. The Montessori education model does not have any system of competition, reward, punishment or formal assessments (Kirkham & Kidd, 2017; Lillard, 2012; Marshall, 2017; Ruijs, 2017;).

In a Montessori classroom, learners may also independently access free snacks and are trained to prepare their own meals, clean their plates, tables and surrounding areas when they are done (Lillard, 2012).

The evaluation results show that learners in the LPC preschool programme stage are not given full freedom within the classrooms. Such freedom is critical to develop the learners' sense of independence, self-discipline, self-confidence, self-mastery, responsibility and accountability (Ruijs, 2017, Kirkham & Kidd, 2015). Minimal financial resources are required to implement this key feature of the Montessori education model. It is thus recommended that LPC educators provide more opportunities for independent learner engagement to achieve the desired outcomes.

Objective 2.5: To assess the extent of age mixing

Another aspect of the Montessori education model that has been shown to be critical for learner development is the age mixing (Brown, 1996; Peterson, 2000). There is evidence to suggest

that mixed age classrooms improve social and emotional skills (Logue, 2006; Wang & Su 2009), strengthen academic outcomes (Cassidy at al. 2005; Skapski, 1960), foster a nurturing environment for learners (French et al., 1986; Gray, 2011; Santos, 2000; Song et al., 2009) which, in turn, improves learners' attitudes to school and school attendance (Veeman, 1995).

In the Montessori education model, learners who are three years apart are grouped together (Marshall, 2017). There are classrooms with learner between three to six-year olds, six to nine year olds, and so on (Dohrman et al., 2007; Marshall, 2017), on account of the developmental goals attained in each age group (Monson, 2006). This specific grouping implies that, while a third of the class exits to next programme level, a group of new learners join the classroom (Salazar, 2013). This process ensures that older learners support the learning of younger ones, thus creating an environment that fosters leadership development, social, emotional, and intellectual skills building (Daost, 2004; Gray, 2011; Kirkham & Kidd, 2017; Salazar, 2013; Santo, 2000; Ruijs, 2017).

The results of this evaluation show that the LPC pre-school classrooms do not conform to the three-year age grouping, expected in the classic Montessori education model. Only learners between the ages of three and five years old are represented in the classrooms. The evaluator acknowledges that it will be challenging for LPC to realistically adhere to this requirement. This is because the full Early Child Programme (ECP), with its four programme stages, includes Grade R. As mandated by the government, this programme stage targets learners who are six years old. Conforming fully to the age mixing criterion would imply modifying the current service delivery plan (i.e., integrate learners eligible for Grade R into Montessori classrooms) and deviate from the government mandated curriculum. This has a number of implications, including loss of the child support grant. This would make the LPC financially unstable, affect staff stability and increase programme attrition (with fewer learners being subsided by the government).

Because there is no evidence to suggest differences in outcomes when different age groupings are used (i.e., learners aged between 3 to 5 years versus learners aged between 3 to 6 years), and on account of the pragmatic implications, the evaluator recommends retaining the current mixed age structure.

Programme outcomes

Evaluation question 3: Did the programme satisfactorily develop the beneficiaries' academic and social skills?

Objective 3.1: To assess mathematics and reading outcomes

At the time of the evaluation, programme beneficiaries underperformed in reading when compared to matched leaners from the ELOM age validation sample. While the differences in mathematics performance of two groups of learners were not statistically significant, programme beneficiaries could be classified as *falling behind* in achieving the ELOM mathematics and reading age-validated scores.

The results of this evaluation confirm that in the absence of the key elements of the Montessori education model, programme beneficiaries cannot be expected to attain he optimal level of mathematics and reading outcomes.

Although, there are different variants of the Montessori education model (Lillard, 2012; Salazar, 2013), learning areas equipped with adequate Montessori materials and self-directed and unrestricted engagement with these materials are at the core of any Montessori education model (Marshall, 2017). The presence of these key elements is what makes the Montessori education model more effective than the traditional model to teaching and learning (Bauchmüller et al., 2014; Miller & Bizzell, 1975, 1983, 1984). At the time of the evaluation, LPC classrooms were not yet fully equipped with the Montessori materials and the learners did not have adequate freedom to engage with the available learning material at the time of the evaluation. The violation of these principles could explain the low performance of programme beneficiaries compared to matched learners from the ELOM age validation sample.

Objective 3.2: To assess social and emotional skills

This evaluation found that the programme supports the beneficiaries to reach acceptable developmental milestones in the areas of social relations and emotional functioning. While these outcomes cannot be attributed only to the programme, they are important ones to highlight. The results are in line with those of Besancon and Lubart (2008), Dereli Iman et al. (2017) and Artega et al. (2014), confirming that the Montessori education model is linked to improvements in social and emotional skills.

Although the results of the evaluation are encouraging, data from a comparable group of learners who have not been exposed to the programme, is needed to conclusively attribute these outcomes to the intervention.

Objective 3.3: To assess the development of fine and gross motor skills

The findings from this evaluation show that programme beneficiaries were significantly underperforming in terms of gross motor development when compared to a matched sample of learners who have not exposed to the programme. At the time of the evaluation, programme beneficiaries could be classified as *falling behind* in achieving the ELOM gross motor development, and fine motor coordination and visual motor integration age-validated performance norms.

The development of learner's fine motor skills is critical as it affects their ability to hold a pencil which, in turn, affects their subsequent academic performance (Elcombe, 2017). There is evidence in the literature that the Montessori education model has the potential to improve the learners' fine motor skills when compared to traditional approaches to education (Bhatia et al., 2015; Elcombe, 2017; Rule & Stewart, 2002). Gross motor development of learners, on the other hand, could be further improved by selected physical exercises (Draper, 2012; Kosari, 2013).

Given these findings, it is recommended that LPC educators (i) incorporate more practical life activities that require concentration, and hand and eye coordination to develop the fine motor skills of learners and (ii) add physical exercise to the programme to improve the gross motor development of the learners.

Objective 3.4: To identify the determinants of preschool performance

This evaluation identified learner characteristics (age and gender) and programme characteristics (years spent in preschool; financial source of school fees) as the main determinants of preschool performance.

As the variable *financial source* changes from non-sponsored learners to sponsored learners, the total ELOM score increases, on average, by 23.50 points of scores. The magnitude of the regression coefficients reveals how important it is for LPC to continue supporting the caregivers/parents to access the financial support for the school fees.

An unexpected result emerged from the analyses: learners who spent more years in the preschool programme stage do not fare better than the learners who spent fewer years. This

finding leads to two important questions that need further investigation: (i) whether the learners who enrolled for the first time in the preschool programme stage in 2018 participated in other ECD programmes before enrolment; (ii) whether the learners who were exposed to the programme for longer actually did not spend more time in the Montessori learning process (it is reasonable to expect the roll out of the Montessori education model was less sophisticated in earlier years).

Limitation of the evaluation

The effectiveness of early childhood interventions depends partially on process quality and structural quality. While structural quality refers to the design of the programme (use of trained educators, materials, etc.), process quality refers to learning processes unfolding within the classroom.

Strong assessment of process quality was beyond the scope of this intervention. To collect reliable data on selected process quality domains, such as learners' engagement with Montessori material, and interaction with their peers and educators, a trained assessor must be hired to conduct real-time observations over a period of 5-10 days. This was not a feasible avenue given the evaluation budget and timeline. The main limitation of the process evaluation is that it failed to capture or measure the actual context and mechanisms of learning transference within the classrooms. The second limitation is that the structural quality assessment was based on a report from the educators – there is always a possibility that certain elements of programme design were underreported or overreported.

Another limitation relates to the quasi-experimental design used to address the third evaluation question. Comparability of the two groups could have been further maximised by incorporating other socio-economic variables when calculating the propensity scores. Data on additional variables were however not readily accessible.

Furthermore, the data from the learners in the treatment group and matched control group were collected at different times. There might be some unknown time-related factors that could have affected one group of participants differently and resulted in differences in the measurement process.

Because LPC did not maintain reliable data on learners' receptivity of the preschool programme (dosage received), attendance was used as a proxy. This limit the assessment that the evaluator could make in this regard.

The sample size for the multiple regression analysis was not optimal, following the listwise deletion of cases with missing data on one variable. As such, the regression coefficients might not be stable. Replication of the analysis with more data points is recommended.

Direction for future evaluations

LPC should maintain process documents and develop measurable indicators, with agreed-upon standards to facilitate the next evaluation. It is recommended that LPC develops a M&E framework to collect regular data on programme implementation at different points in the programme cycle and address any implementation issues as they arise.

Administration of the ELOM to all learners by external assessors would be a costly undertaking, even if this is only done at the end of the programme cycle. The evaluator recommends that LPC considers joining the ELOM learning community initiated by Innovation Edge and train their educators to administer the ELOM in order to assess and strengthen the quality of the preschool programme.

Because LPC faces an excess of demand for their programmes, the organisation should consider implementing an impact evaluation based on equivalent control group design, with random assignment of participants to a treatment group and a (waitlisted) control group. This would allow the organisation to conclusively attribute any short-term and long-term outcomes to the programme and rule out other alternative explanations. Results from this type of impact evaluation could be used to raise funds and encourage the community to enrol their learners in the ECP programme from a young age.

Conclusion

This formative evaluation aimed to provide insight into the functioning of the preschool programme stage of LPC's ECP, both in terms of implementation and outcomes. Programme implementers are encouraged to draw on the evaluation findings to inform future programme decisions relating to service utilisation, service delivery and the outcomes.

The evaluation revealed that although the programme is in formative years, it effectively assists caregivers/parents to apply for financial assistance. However, the evaluator recommends the implementers to consider re-defining the target population and implement a parallel intervention aimed at addressing chronic absenteeism amongst learners, so that they are exposed to full programme dosage.

The evaluation also confirmed that a full roll-out of the Montessori model is still underway in LPC classrooms. There is scope to improve both process and structural quality, including reconsidering the educator-learner ration, and equipping the Mathematics learning area with the full range of Montessori materials. Such improvements will facilitate the development of beneficiaries' academic and social skills.

The evaluation also found learners' characteristics (age and gender) and the preschool programme variables (preschool programme dosage, and financial source of the school fees) to be significant predictors of ELOM performance. The evaluator recommends maintaining the financial support offered to caregivers/parents who cannot afford the school fees.

REFERENCES

Aguilar, R., & Tansini, R. (2012). Joint analysis of preschool attendance and school performance in the short and long-run. International Journal of Educational Development, 32(2). doi:10.1016/j.ijedudev.2011.03.001

Ahmadpour, N., & Mujembari, A. K. (2015). The impact of Montessori teaching method on IQ levels of 5-year old children. Procedia - Social and Behavioral Sciences, ISSN: 1877-0428, Vol: 205, Page: 122-127. Doi: 10.1016/j.sbspro.2015.09.037

Anderson, V., Azari, S., Van Wyk, A. (2009). Philippi Community Profile. Retrieved from http://www.saep.org/media/docs/125810846813.pdf

APS/Arlington Public Schools. (2016). Early Childhood Program Evaluation Report. Prepared by the Office of Planning and Evaluation Response from the Early Childhood Office. Retrieved from https://www.apsva.us/wp-content/uploads/2015/05/Early-Childhood-Evaluation-Summary-of-Findings-and-Actions.pdf

Arteaga, I., Humpage, S., Reynolds, A. J., & Temple, J. A. (2014). One year of preschool or two: Is it important for adult outcomes? Economics of Education Review, 40. doi:10.1016/j.econedurev.2013.07.009

Atmore, E. (1998). Reconstructing Early Childhood Development Services in South Africa: From apartheid to democracy. *International Journal of Early Years Education, 6*(3), 291-298. doi:10.1080/0966976980060304

Atmore, E. (2013). Early Childhood Development in South Africa--Progress Since the End of Apartheid. *International Journal of Early Years Education, 21*(2-3), 152-153), p.152-162. doi:10.1080/09669760.2013.832941

Badiei, M., Sulaiman, T. (2014). The Difference between Montessori Curriculum and Malaysia National Preschool Curriculum on Developmental Skills of Preschool Children in Kuala Lumpur. British Journal of Education, Society & Behavioural Science, 4(10): 1372-1385, 2014

Bakken, L., Brown, N., & Downing, B. (2017) Early Childhood Education: The Long-Term Benefits,Journal of Research in Childhood Education, 31:2, 255-269, DOI: 10.1080/02568543.2016.1273285

Balfanz, R., & Byrnes, V. (2013). Meeting the challenge of combating chronic absenteeism: Impact of the NYC Mayor's Interagency Task Force on Chronic Absenteeism and School Attendance and its implications for other cities. Baltimore, MD: Johns Hopkins School of Education.

Balfanz, R. (2016). Missing school matters. In (Vol. 98, pp. 8-13). Los Angeles, CA: SAGE Publications.

Bauchmüller, R., Gørtz, M., & Rasmussen, A. W. (2014). Long-run benefits from universal high-quality preschooling. Early Childhood Research Quarterly, 29(4), 457-470. doi:10.1016/j.ecresq.2014.05.009

Becker, B. J., Aloe, A. M., Duvendack, M., Stanley, T. D., Valentine, J. C., Fretheim, A., & Tugwell, P. (2017). Quasi-experimental study designs series—paper 10: synthesizing evidence for effects collected from quasi-experimental studies presents surmountable challenges. Journal of Clinical Epidemiology, 89, 84-91. doi:10.1016/j.jclinepi.2017.02.014

Beckmann, J., & Phatudi, N, (2012). Access to and the provision of preschool education: The trajectory since 1994. Southern African Public Law, Volume 27, Issue 2, Jan 2012, p. 472 - 486

Belfield, C. R., Nores, M., Barnett, S., & Schweinhart, L. (2006). The High/Scope Perry Preschool Program.(cost-benefit analysis using data from the age-40 follow-up). Journal of Human Resources, 41(1), 163.

Berlinski, S., & Galiani, S. (2004). The effect of a large expansion of pre-primary school facilities on preschool attendance and maternal employment. In: Institute for Fiscal Studies.

Berlinski, S., Galiani, S., & Gertler, P. (2009). The effect of pre-primary education on primary school performance. Journal of Public Economics, 93(1), 219-234. doi:10.1016/j.jpubeco.2008.09.002

Besançon, M., & Lubart, T. (2008). Differences in the development of creative competencies in children schooled in diverse learning environments. Learning and Individual Differences, 18(4), 381-389. doi:10.1016/j.lindif.2007.11.009

Bhatia, P., Davis, A., & Shamas-Brandt, E. (2015). Educational Gymnastics: The Effectiveness of Montessori Practical Life Activities in Developing Fine Motor Skills in Kindergartners. Early Education and Development, 26(4), 1-14. doi:10.1080/10409289.2015.995454

Biersteker, L, Kvalsvig, J. (2007). Childhood development and the home-care environment in the preschool years. In Dawes, A., Bray, R.,Merwe, A. *Monitoring child well-being: A South Africa Rights-based approach* (pp. 185-190). In: HRSC press.

Bloom, B. S. (1984). The 2 Sigma Problem: The Search for Methods of Group Instruction as Effective as One-to-One Tutoring. Educational Researcher, 13(6), 4-16. doi:10.3102/0013189X013006004

Bowne, J. B., Magnuson, K. A., Schindler, H. S., Duncan, G. J., & Yoshikawa, H. (2017). A Meta-Analysis of Class Sizes and Ratios in Early Childhood Education Programs: Are Thresholds of Quality Associated with Greater Impacts on Cognitive, Achievement, and Socioemotional Outcomes? Educational Evaluation and Policy Analysis, 39(3), 407-428. doi:10.3102/0162373716689489

Brittany, A. B., Sophia, K. A., Sarah, M. G., Adrian, M. S., & Shelley, C. H. (2018). The Role of Executive Functioning and Academic Achievement in the Academic Self-Concept of Children and Adolescents Referred for Neuropsychological Assessment. Children, 5(7), 83. doi:10.3390/children5070083

Brown, J. R., Donelan-McCall, N., & Dunn, J. (1996). Why Talk about Mental States? The Significance of Children's Conversations with Friends, Siblings, and Mothers. Child Development, 67(3), 836-849. doi:10.2307/1131864.

Bujang, M.A., Sa'at, N., Ikhwan, M., Sidik, A.B. (2017). Determination of minimu sample size requirement for multiple linear regression and analysis of covariance based on experimental and non-experimental studies. Epidemiology biostatistics and public health, volume 14, number 3.

Burchinal, M., Vandergrift, N., Pianta, R., & Mashburn, A. (2010). Threshold Analysis of Association between Child Care Quality and Child Outcomes for Low-Income Children in Pre-Kindergarten Programs. Early Childhood Research Quarterly, 25(2), 166-176. doi:10.1016/j.ecresq.2009.10.004

Burger, K. (2010). How Does Early Childhood Care and Education Affect Cognitive Development? An International Review of the Effects of Early Interventions for Children from Different Social Backgrounds. Early Childhood Research Quarterly, 25(2), 140-165. doi:10.1016/j.ecresq.2009.11.001.

Camilli, G., Vargas, S., Ryan, S., & Barnett, W. S. (2010). Meta-Analysis of the Effects of Early Education Interventions on Cognitive and Social Development. Teachers College Record, 112(3), 579-620.

Carneiro, P., Heckman, J. (2003). *Human Capital Policy*. In (Vol. 821): Institute for the Study of Labor (IZA).

Cassidy, K. W., Fineberg, D. S., Brown, K., & Perkins, A. (2005). Theory of Mind May Be Contagious, but You Do not Catch It from Your Twin. Child Development, 76(1), 97-106.

Chattin-McNichols, J. (1981). The Effects of Montessori School Experience. Young Children, 36(5), 49-66. Retrieved from http://www.jstor.org.ezproxy.uct.ac.za/stable/42642922

Christensen, O. (2016). Proving Montessori: Identity and Dilemmas in a Montessori Teacher's Lived Experience. Journal of Montessori Research, 2(2), 35-48. doi:10.17161/jomr.v2i2.5067

City of Cape Town. (2011). 2011 Census Suburb Philppi. Compiled by Strategic Development Information and GIS Department. 2011 Census data supplied by Statistics South Africa. Retrieved from http://resource.capetown.gov.za/documentcentre/Documents/Maps%20and%20statistics/2011_Census_CT_Suburb_Philippi_Profile.pdf

Cortázar, A. (2015). Long-term effects of public early childhood education on academic achievement in Chile. Early Childhood Research Quarterly, 32(C), 13-22. doi:10.1016/j.ecresq.2015.01.003

Cunha, F., Heckman, J. (2009). Human Capital Formation in Childhood and Adolescence. Retrieved from https://www.cesifo-group.de/ on 09.09.2018.

Damore, S. (2004). A Road Map: Montessori Curriculum and Learner Outcomes. Montessori Life, 16(4), 30-35.

Daost, C. J. (2004). An Examination of Implementation Practices in Montessori Early Childhood Education. A dissertation submitted in partial satisfaction of the requirements for the degree of Doctor of Philosophy in education in the graduate division of the University of California, Berkeley.

Dass, S., Rinquest, A. (2017). School fees. In Veriava, F. Basic education rights handbook: education rights in South Africa (pp.141-159). Johannesburg: SECTION27.

Datta Gupta, N., & Simonsen, M. (2010). Non-cognitive child outcomes and universal high quality child care. Journal of Public Economics, 94(1), 30-43. doi:10.1016/j.jpubeco.2009.10.001

Dawes, A., Biersteker, L., Girdwood, E., Snelling, M.J.T.L. & Tredoux, C.G. (2016). *Early Learning Outcomes Measure. Technical Manual.* Claremont, Cape Town: The Innovation Edge. http://www.innovationedge.org.za/

Decicca, P., & Smith, J. (2013). The long-run impacts of early childhood education: Evidence from a failed policy experiment. Economics of Education Review, 36, 41-59. doi:10.1016/j.econedurev.2013.05.003

Deming, D. (2009). Early childhood intervention and life-cycle skill development: Evidence from head start. American economic journal. Applied economics, 1(3), 111-134. doi:10.1257/app.1.3.111

Dereli İman, E., Danişman, Ş., Akin Demircan, Z., & Yaya, D. (2017). The effect of the Montessori education method on preschool children's social competence – behaviour and emotion regulation skills. Early Child Development and Care, 1-15. doi:10.1080/03004430.2017.1392943

Dickinson, D. K., & Porche, M. V. (2011). Relation between Language Experiences in Preschool Classrooms and Children's Kindergarten and Fourth-Grade Language and Reading Abilities. Child Development, 82(3), 870-886. doi:10.1111/j.1467-8624.2011.01576.x

Dohrmann, K. R., Nishida, T. K., Gartner, A., Lipsky, D. K., & Grimm, K. J. (2007). High School Outcomes for Students in a Public Montessori Program. Journal of Research in Childhood Education, 22(2), 205-217. doi:10.1080/02568540709594622

Draper, C. E., Achmat, M., Forbes, J., & Lambert, E. V. (2012). Impact of a community-based programme for motor development on gross motor skills and cognitive function in

preschool children from disadvantaged settings. Early Child Development and Care, 182(1), 137-152. doi:10.1080/03004430.2010.547250

Dumas, C., Lefranc, A. (2010). Early schooling and later outcomes: Evidence from preschool extension in France. In (Vol. 2010-07): THEMA (THéorie Economique, Modélisation et Applications), Université de Cergy-Pontoise.

Early, D. M., Bryant, D. M., Pianta, R. C., Clifford, R. M., Burchinal, M. R., Ritchie, S., . . . Barbarin, O. (2006). Are teachers' education, major, and credentials related to classroom quality and children's academic gains in pre-kindergarten? Early Childhood Research Quarterly, 21(2), 174-195. doi:10.1016/j.ecresq.2006.04.004

Elcombe, E. (2017). Effects of Practical Life Exercises on Fine Motor Development in a Montessori Children's House Classroom. A Master's Paper Submitted in Partial Fulfillment of The Requirements for the Degree of Master of Science in Education – Montessori. University of Wisconsin – River Falls.

ETDPSETA/Education, Training and Development Practices Sector Education and Training Authority. (2018). Early Childhood Development Sector Skills Plan 2019-2020 Update. At the cutting edge of skill development. Retrieved from https://www.etdpseta.org.za/education/sites/default/files/2018-06/Early-Childhood-Development-Sector-Skills-Plan-2019-2020-Update_0.pdf

Felfe, C., Lalive, R. (2012). Early Child Care and Child Development: For Whom it Works and Why. In (Vol. 4043): CESifo Group Munich.

Field, A. (2013) Discovering Statistics Using IBM SPSS Statistics: And Sex and Drugs and Rock "N" Roll, 4th Edition, Sage, Los Angeles, London, New Delhi.

Frede, E. C. (1995). The Role of Program Quality in Producing Early Childhood Program Benefits. The Future of Children, 5(3), 115-132. doi:10.2307/1602370

French, D., Waas, G., Stright, A., & Baker, J. (1986). Leadership Asymmetries in Mixed-Age Children's Groups. Child Development, 57(5), 1277. doi:10.2307/1130450

Gertler, P., Heckman, J., Pinto, R., Zanolini, A., Vermeerch, C., Walker, S., . . . Grantham-McGregor, S. (2014). Labor Market Returns to an Early Childhood Stimulation Intervention in Jamaica. In: ICPSR - Interuniversity Consortium for Political and Social Research.

Gray, P. (2011). The special value of children's age mixed play. American Journal of Play, v3 n4 p500-522 Spr 2011. Retrieved from https://eric.ed.gov/?id=EJ985544.

Gujarati, D. N. (2000). Econometria Básica. Makron Books, Lda, São Paulo.

Harris, M. A. (2007). Differences in Mathematics Scores Between Students Who Receive Traditional Montessori Instruction and Students Who Receive Music Enriched Montessori Instruction.

Hatfield, B. E., Burchinal, M. R., Pianta, R. C., & Sideris, J. (2016). Thresholds in the association between quality of teacher–child interactions and preschool children's school readiness skills. Early Childhood Research Quarterly, 36, 561-571. doi:10.1016/j.ecresq.2015.09.005

Havnes, T., & Mogstad, M. (2011). No Child Left Behind: Subsidized Child Care and Children's Long-Run Outcomes. American Economic Journal: Economic Policy, 3(2), 97-129. doi:10.1257/pol.3.2.97

Hazarika, G., & Viren, V. (2013). The Effect of Early Childhood Developmental Program Attendance on Future School Enrollment in Rural North India. Economics of Education Review, 34(C), 146-161. doi:10.1016/j.econedurev.2013.02.00

Heckman, J. J., & Raut, L. K. (2016). Intergenerational long-term effects of preschool-structural estimates from a discrete dynamic programming model. Journal of Econometrics, 191(1), 164-175. doi:10.1016/j.jeconom.2015.10.001

Heckman, J. J., & Masterov, D. V. (2007). Productivity Argument for Investing in Young Children. Review of agricultural economics, 29(3), 446-493. doi:10.1111/j.1467-9353.2007.00359.x

Heckman, J. J., Moon, S. H., Pinto, R., Savelyev, P. A., & Yavitz, A. (2010). The rate of return to the HighScope Perry Preschool Program. Journal of Public Economics, 94(1), 114-128. doi:10.1016/j.jpubeco.2009.11.001

Hill, C. J., Gormley, W. T., & Adelstein, S. (2015). Do the short-term effects of a high-quality preschool program persist? Early Childhood Research Quarterly, 32(C), 60-79. doi:10.1016/j.ecresq.2014.12.005

Hoppenbrouwer, E. (2011). Introducing a child-centered numeracy play-center intervention in three rural preschools in Dennilton, South Africa. Universiteit Utrecht

Howes, C., Burchinal, M., Pianta, R., Bryant, D., Early, D., Clifford, R., & Barbarin, O. (2008). Ready to Learn? Children's Pre-Academic Achievement in Pre-Kindergarten Programs. Early Childhood Research Quarterly, 23(1), 27-50. doi:10.1016/j.ecresq.2007.05.002

Howie, S.J., Combrinck, C., Roux, K., Tshele, M., Mokoena, G.M, and McLeod Palane, N. (2017). PIRLS LITERACY 2016: South African Highlights Report. Pretoria: Centre for Evaluation and Assessment.

Jassiem, S. (2016). Montessori and Religious Education in Western Cape Preschools. In: University of Cape Town.

Jensen B., Holm A., Bremberg S. (2013). Effectiveness of a Danish early year preschool program: A randomized trial. International Journal of Educational Research, 62 , pp. 115-128. doi: 10.1016/j.ijer.2013.06.004

Jones, A. (2005). Montessori Education in America: An Analysis of Research Conducted from 2000-2005. Retrieved from

http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.601.6249&rep=rep1&type=pdf

Karoly, L. A. (2016). The Economic Returns to Early Childhood Education. The Future of Children, 26(2), 37-55. doi:10.1353/foc.2016.0011

Katz, M., Johnson, M., Adams, G. (2016). Improving Prekindergarten Attendance. School-Level Strategies for Messaging, Engaging Parents, and Responding to Absences in Four DC Public Schools. Urban Institute.

Kayili, G., & Ari, R. (2011). Examination of the Effects of the Montessori Method on Preschool Children's Readiness to Primary Education. Educational Sciences: Theory and Practice, 11(4), 2104-2109.

Kayili, G. (2018). The Effect of Montessori Method on Cognitive Tempo of Kindergarten Children. Early Child Development and Care, 188(3), 327-335. doi:10.1080/03004430.2016.1217849

Kirkham, J. A., & Kidd, E. (2017). The Effect of Steiner, Montessori, and National Curriculum Education upon Children's Pretence and Creativity. *Journal of Creative Behavior, 51*(1), 20-34. doi:10.1002/jocb.83

Kisker, E., Paulsell, D., Love, J., Raikes, H. (2002). Pathways to quality and fullimplementation in Early Head Start programs. Washington, DC: U.S. Departmentof Health and Human Services, Head Start Bureau.

Kotzé, J. (2015). The readiness of the South African education system for the pre-Grade R year.South African Journal of Childhood Education. Priorities and Policy-making in South African Education. Volume 5 (2), 19-27.

Krafft, C. (2015). Increasing educational attainment in Egypt: The impact of early childhood care and education. Economics of Education Review, 46, 127-143. doi:10.1016/j.econedurev.2015.03.006

Kremer, M. (2005). Schools meals, educational achievement and school competition: evidence from a randomized evaluation. In (Vol. 3523): The World Bank.

Lee, V. E. & Zuze, T.L. (2011) School Resources and Academic Performance in Sub-Saharan Africa. Comparative Education Review Vol. 55(3), pp. 369-39

Letseka, M. (2014). The Illusion of Education in South Africa. Procedia - Social and Behavioral Sciences. Volume 116. Pages 4864-4869. ISSN 1877-0428. doi: org/10.1016/j.sbspro.2014.01.1039.

Lillard, A. S., & Else-Quest, N. (2006). Evaluating Montessori Education. Science (Washington), 313(5795), 1893-1894.

Lillard, A. S. (2008). How Important Are the Montessori Materials? Montessori Life: A Publication of the American Montessori Society, 20(4), 20-25.

Lillard, A. S. (2012). Preschool children's development in classic Montessori, supplemented Montessori, and conventional programs. Journal of School Psychology, 50(3), 379-401. doi:10.1016/j.jsp.2012.01.001

Lillard, A. S., & Heise, M. J. (2016). Removing Supplementary Materials from Montessori Classrooms Changed Child Outcomes. Journal of Montessori Research, 2(1), 16-26.

Lillard, A. S., Heise, M. J., Richey, E. M., Tong, X., Hart, A., & Bray, P. M. (2017). Montessori Preschool Elevates and Equalizes Child Outcomes: A Longitudinal Study.(Report). *Frontiers in Psychology, 8*. doi:10.3389/fpsyg.2017.01783

Lin, Y., Magnuson, K. A. (2018). Classroom quality and children's academic skills in child care centers: Understanding the role of teacher qualifications. Early Childhood Research Quarterly, ISSN: 0885-2006, Vol: 42, Page: 215-227. doi: 10.1016/j.ecresq.2017.10.003

Lopata, C., Wallace, N. V., & Finn, K. V. (2005). Comparison of Academic Achievement Between Montessori and Traditional Education Programs. Journal of Research in Childhood Education, 20(1), 5-13. doi:10.1080/02568540509594546

Louw, W., Bayat, A., Eigelaar-Meets, I. (2011). Exploring grade repetition at under-performing schools in the Western Cape. University of Western Cape

Logue, M. E. (2006). Teachers Observe to Learn: Differences in Social Behavior of Toddlers and Preschoolers in Same-Age and Multiage Groupings. Young Children, 61(3), 70-76.

Ludwig, J., & Miller, D. L. (2007). Does head start improve children's life chances?Evidence from a regression discontinuity design. Quarterly Journal of Economics,122(1), 159–208.

Magnuson, K. A., Ruhm, C., & Waldfogel, J. (2007). Does Prekindergarten Improve School Preparation and Performance? Economics of Education Review, 26(1), 33-51. doi:10.1016/j.econedurev.2005.09.008

Manner, J. C. (2007). Montessori vs. traditional education in the public sector: seeking appropriate comparisons of academic achievement. Forum on Public Policy: A Journal of the Oxford Round Table.

Marshall, C. (2017). Montessori education: a review of the evidence base. NPJ Science of Learning, 2(1), 1-9. doi:10.1038/s41539-017-0012-7

Martinez, S., Naudeau, S., Pereira, V. (2012). The promise of preschool in Africa. A randomized impact evaluation of Early Childhood Development in rural Mozambique. The World Bank, Save The Children.

Mashburn, A. J., Pianta, R. C., Hamre, B. K., Downer, J. T., Barbarin, O. A., Bryant, D., . . . Howes, C. (2008). Measures of Classroom Quality in Prekindergarten and Children's Development of Academic, Language, and Social Skills. Child Development, 79(3), 732-749. doi:10.1111/j.1467-8624.2008.01154.x

McCoy, D. C., & Wolf, S. (2018). Changes in Classroom Quality Predict Ghanaian Preschoolers' Gains in Academic and Social-Emotional Skills. Developmental Psychology, 54(8), 1582-1599. doi:10.1037/dev0000546

McKay, H., Sinisterra, L., McKay, A., Gomez, H., & Lloreda, P. (1978). Improving Cognitive Ability in Chronically Deprived Children. Science, 200(4339), 270-278. doi:10.1126/science.635585

Miller, L. B., Dyer, J. L., Stevenson, H., & White, S. H. (1975). Four Preschool Programs: Their Dimensions and Effects. Monographs of the Society for Research in Child Development, 40(5/6), 1-170. doi:10.2307/1165878

Miller, L., & Bizzell, R. (1983). Long-Term Effects of Four Preschool Programs: Sixth, Seventh, and Eighth Grades. Child Development, 54(3), 727. doi:10.2307/1130061

Miller, L., & Bizzell, R. (1984). Long-term Effects of Four Preschool Programs: Ninth- and Tenth-Grade Results. Child Development, 55(4), 1570. doi:10.2307/1130027

Moloi, M, Strauss, J. (2005). The SACMEQ II Project in South Africa: A Study of the Conditions of Schooling and the Quality of Education. Pretoria: Ministry of Basic Education

Moloi, M, Chetty, M. (2010). The SACMEQ III Project in South Africa: A Study of the Conditions of Schooling and the Quality of Education. Pretoria: Ministry of Basic Education.

Monks, J. & Schmidt, R. (2010). The impact of class size and number of students on outcomes in higher education [Electronic version]. Retrieved [02.02.2019], from Cornell University, School of Industrial and Labor Relations site: http://digitalcommons.ilr.cornell.edu/workingpapers/114/

Monson, M. (2006). Reconstructing Montessori: On Being an Authentic Montessori School. Montessori Life: A Publication of the American Montessori Society, 18(2), 36-43.

Moore, J. E., Cooper, B. R., Domitrovich, C. E., Morgan, N. R., Cleveland, M. J., Shah, H., Jacobson, L., Greenberg, M. T. (2015). The effects of exposure to an enhanced preschool program on the social-emotional functioning of at-risk children. Early Childhood Research Quarterly, ISSN: 0885-2006, Vol: 32, Page: 127-138. doi: 10.1016/j.ecresq.2015.03.004

Muennig, P., Schweinhart, L., Montie, J., & Neidell, M. (2009). Effects of a prekindergarten educational intervention on adult health: 37-year follow-up results of a randomized controlled trial.(RESEARCH AND PRACTICE)(Author abstract)(Report). The American Journal of Public Health, 99(8), 1431. doi:10.2105/AJPH.2008.148353

Mwaba, S. O. et al. (2016). Montessoriing and Academic Performance of Lower Primary School Pupils in Rural Zambia. African Research Review. Vol 10(2), serial n0.041. http://dx.doi.org/10.4314/afrrev.v10i2.14

Mwaura, P. A. M., Sylva , K., & Malmberg , L. (2008) Evaluating the Madrasa preschool programme in East Africa: a quasi-experimental study, International Journal of Early Years Education, 16:3, 237-255, DOI: 10.1080/09669760802357121

Ndlovu, N.C (2008). Managing the impact of informal settlements on the performance of Learners in Primary Schools in Kagiso. University of Johannesburg.

Nores, M., & Barnett, W. S. (2010). Benefits of Early Childhood Interventions across the World: (Under) Investing in the Very Young. Economics of Education Review, 29(2), 271-282. doi:10.1016/j.econedurev.2009.09.001

Noel, K. K., & Westby, K. C. (2014). Applying Theory of Mind Concepts When Designing Interventions Targeting Social Cognition Among Youth Offenders. Topics in Language Disorders, 34(4), 344-361. doi:10.1097/TLD.0000000000000036

Parinduri, R. A. (2014). Do children spend too much time in schools? Evidence from a longer school year in Indonesia. Economics of Education Review, 41(C), 89-104. doi:10.1016/j.econedurev.2014.05.001

Peng, H.-H., & Md-Yunus, S. a. (2014). Do Children in Montessori Schools Perform Better in the Achievement Test? A Taiwanese Perspective. International Journal of Early Childhood, 46(2), 299-311. doi:10.1007/s13158-014-0108-

Peterson, C. C. (2000). Kindred spirits influences of sibling' perspectives on theory of mind. Cognitive Development, ISSN: 0885-2014, Vol: 15, Issue: 4, Page: 435-455. doi: 10.1016/s0885-2014(01)00040-5

Pholphirul, P. (2017). Pre-Primary Education and Long-Term Education Performance: Evidence from Programme for International Student Assessment (PISA) Thailand. Journal of Early Childhood Research, 15(4), 410-432. doi:10.1177/1476718X15616834

Pianta, R., Howes, C., Burchinal, M., Bryant, D., Clifford, R., Early, D., & Barbarin, O. (2010). Features of Pre-Kindergarten Programs, Classrooms, and Teachers: Do They Predict Observed Classroom Quality and Child-Teacher Interactions? Applied Developmental Science, 9(3), 144-159. doi:10.1207/s1532480xads0903_2

Raine, A., Mellingen, K., Liu, J., Venables, P., & Mednick, S. A. (2003). Effects of environmental enrichment at ages 3-5 years on schizotypal personality and antisocial behavior at ages 17 and 23 years. (Author Abstract). American Journal of Psychiatry, 160(9), 1627. doi:10.1176/appi.ajp.160.9.1627

Ramey, C. T., Campbell, F. A., Burchinal, M., Skinner, M. L., Gardner, D. M., & Ramey, S. L. (2000). Persistent Effects of Early Childhood Education on High-Risk Children and Their Mothers. Applied Developmental Science, 4(1), 2-14. doi:10.1207/S1532480XADS0401_1

Reardon, S. F. (2011). "The widening academic achievement gap between the rich and the poor: new evidence and possible explanations," in Whither Opportunity? Rising Inequality, Schools, and Children's Life Chances, Russell Sage Foundation. Retrieved

from https://cepa.stanford.edu/sites/default/files/reardon%20whither%20opportunity%20-%20chapter%205.pdf.

Rossi, P., Lipsey, M.W., & Freeman, H.E. (2004). *Evaluation. A Systematic Approach* (7th ed.). Thousand Oaks, CA: Sage. (Referred to as RL&F above).

Ruijs, N. (2017). The effects of Montessori education: Evidence from admission lotteries. Economics of Education Review, 61(C), 19-34. doi:10.1016/j.econedurev.2017.09.001

Rule, A., & Stewart, R. (2002). Effects of Practical Life Materials on Kindergartners' Fine Motor Skills. Early Childhood Education Journal, 30(1), 9-13. doi:10.1023/A:1016533729704

Saeed, K., Rasool, H.-T., Elahe, A.-A., & Fatemeh, K. (2013). The Effect of Physical Exercise on the Development of Gross Motor Skills in Children with Attention Deficit / Hyperactivity Disorder. Majallah-i taḥqīqāt-i ʿulūm-i pizishkī-i Zāhidān, 15(2), 74-78.

Salazar, Minerva M. (2013). The impact of montessori teaching on academic achievement of elementary school students in a central Texas school district: a causal-comparative inquiry.

Shadish, W.R., Cook, T.D., & Campbell, D.T. (2002). Experimental and quasi-experimental designs for generalized causal inference. Boston: Houghton Mifflin.

Santos, A. (2000). Multi-age groupings in early childhood education: the affordances and opportunities of a multi-age child care model. A thesis submitted in conformity with the requirements for the degree of Master of Arts. Department of Human Development and Applied Psychology. Ontario Institute for Studies in Education of the University of Toronto. Retrieved from https://tspace.library.utoronto.ca/bitstream/1807/14260/1/MQ53468.pdf

Schweinhart, L. J, Montie, J, Xiang, Z., Barnett, W.S., Belfield, C.R., Nores, M. (2005). The High/Scope Perry Preschool study through age 40. Summary, conclusions, and frequently asked questions.

Schweinhart, L. J. (2013). Long-term follow-up of a preschool experiment. (Report). Journal of Experimental Criminology, 9(4), 389.

Shivakumara, K., Dhiksha, J., Nagaraj, O. (2016). Efficacy of Montessori and traditional method of education on self-concept development of children. International Journal of Educational Policy Research and Review Vol.3 (2), pp. 29-35 April, 2016. doi:10.15739/IJEPRR.16.005

Skapski, M. (1960). Ungraded Primary Reading Program: An Objective Evaluation. Elementary School Journal, 61(1), 41. doi:10.1086/459853

Slot, P. L., Leseman, P. P. M., Verhagen, J., & Mulder, H. (2015). Associations between structural quality aspects and process quality in Dutch early childhood education and

care settings. Early Childhood Research Quarterly, 33(C), 64-76. doi:10.1016/j.ecresq.2015.06.001

Snelling, M., Dawes, A., Biersteker, L., Girdwood, E., Tredoux, C. (2019). The development of a South African Early Learning Outcomes Measure: A South African instrument for measuring early learning program outcomes. https://doi-org.ezproxy.uct.ac.za/10.1111/cch.12641

Song, R., Spradlin, T. E., Plucker, J. A. (2009). The Advantages and Disadvantages of Multiage Classrooms in the Era of NCLB Accountability. Center for Evaluation and Education Policy, Indiana University. Retrieved from: https://files.eric.ed.gov/fulltext/ED504569.pdf.

Spaull, N. (2011). A Preliminary Analysis of SACMEQ III South Africa. Stellenbosch Economic Working Papers

Spaull, N. (2013). South Africa's Education Crisis: The quality of education in South Africa 1994-2011. Report Commissioned by Centre for Development and Enterprise, October 2013

Stahlschmidt, M. J., Jonson-Reid, M., Pons, L., Constantino, J., Kohl, P. L., Drake, B., & Auslander, W. (2018). Trying to bridge the worlds of home visitation and child welfare: Lessons learned from a formative evaluation. Evaluation and Program Planning, 66, 133-140. doi:10.1016/j.evalprogplan.2017.10.001

Starling, D. D. (2018). Fidelity of Implementation of an Urban Elementary Montessori Kindergarten Program. Project Study Submitted in Partial Fulfillment of the Requirements for the Degree of Doctor of Education. Walden University ScholarWorks. Walden Dissertation and Doctoral Studies Collection. Retrieved from https://scholarworks.waldenu.edu/cgi/viewcontent.cgi?article=6267&context=dissertations

Stiggins, R., & Chappuis, S. (2005). Putting Testing in Perspective: It's for Learning. Principal Leadership, 6(2), 16-20.

Stuart, E.A., & Rubin, D.B. (2008). Best Practices in Quasi-Experimental Designs: Matching Methods for Causal Inference. In J.W. Osborne (Ed.), Best Practices in Quantitative Methods (pp. 155–176). Thousand Oaks, CA: Sage

Temple, J. A., & Reynolds, A. J. (2007). Benefits and costs of investments in preschool education: Evidence from the Child–Parent Centers and related programs. Economics of Education Review, 26(1), 126-144. doi:10.1016/j.econedurev.2005.11.004

Thomason, A. C., & La Paro, K. M. (2009). Measuring the Quality of Teacher–Child Interactions in Toddler Child Care. Early Education & Development, 20(2), 285-304. doi:10.1080/10409280902773351

UNESCO Education Sector. (1996). Links between Early Childhood Development and Education and Primary Education.

UNECO/Strong foundations: early childhood care and education. (2006). Paris, France: UNESCO Publishing.

United Nations Convention Rights (UNCR). (1989). 11. Convention on the Rights of the Child. New York 20 November 1989.

United Nations Economics and Social Council. (2016). Progress towards the Sustainable Development Goals. Report of the Secretary-General.

United Nations. (2016). Progress towards the Sustainable Development Goals, Report of the Secretary-General.

Van der Berg, S. (2006). Elusive Equity—Education Reform in Post-apartheid South Africa, Edward B. Fiske, Helen F. Ladd. Brookings Institution Press, Washington, DC (2004), ISBN 0-8157-2480-9 (xiii+268pp.). Economics of Education Review, ISSN: 0272-7757, Vol: 25, Issue: 6, Page: 675-676. doi: 10.1016/j.econedurev.2006.07.008

Van der Berg, S., Louw, M, (2007). Lessons learnt from SACMEQII: South African student performance in regional context. Working Papers 16/2007, Stellenbosch University, Department of Economics

Van der Berg, S. (2008). How Effective Are Poor Schools? Poverty and Educational Outcomes in South Africa. Studies in Educational Evaluation, 34(3), 145-154. doi:10.1016/j.stueduc.2008.07.005

Van der Berg, S. (2015). What the Annual National Assessments can tell us about learning deficits over the education system and the school career. *South African Journal of* Childhood Education (SAJCE), 5(2). doi:10.4102/sajce.v5i2.389

Van der Gaag, J., Tan, J.P. (1998). The benefits of early childhood development programs: an economic analysis. The World Bank.

Van der Raadt, R. (2010). Early Childhood Development: Preschool or No Preschool? A Baseline Study on the Cognitive and Social-Emotional Development of Preschool and Non-preschool Children in Rural Townships in Dennilton, South Africa. Universiteit Utrecht.

Van Huizen, T., & Plantenga, J. (2018). Do Children Benefit from Universal Early Childhood Education and Care? A Meta-Analysis of Evidence from Natural Experiments. Economics of Education Review. doi:10.1016/j.econedurev.2018.08.001

Van Rensburg, O. J. (n.d.). The school readiness performance of a group of Grade R learners in primary schools in the Gauteng Province of South Africa.

Veenman, S. (1995). Cognitive and Noncognitive Effects of Multigrade and Multi-Age Classes: A Best-Evidence Synthesis. Review of Educational Research, 65(4), 319-381.

Vermeersch, Christel and Kremer, Michael R., School Meals, Educational Achievement, and School Competition: Evidence from a Randomized Evaluation (November 2004). World Bank Policy Research Working Paper No. 3523. Available at SSRN: https://ssrn.com/abstract=667881 or http://dx.doi.org/10.2139/ssrn.667881

Wang, Y., & Su, Y. (2009). False Belief Understanding: Children Catch It from Classmates of Different Ages. International Journal of Behavioral Development, 33(4), 331-336. doi:10.1177/0165025409104525

Watanabe, K., Flores, R., & Fujiwara, J. (2005). Early Childhood Development Interventions and Cognitive Development of Young Children in Rural Vietnam1. The Journal of Nutrition, 135(8), 1918-1925. doi:10.1136/tc.2005.012591

Whitley, Jr., B., Kite, M. (2013). Principles of Research in Behavioral Science. New York: Routledge.

Wholey, J.S. (2004). Evaluability assessment. In J.S. Wholey, H.P. Hatry & K.E. Newcomer (Eds.), Handbook of Practical Program Evaluation (2nd ed.) (pp.33-62). San Francisco: Jossey-Bass.

Woldehanna, T, Behrman, J.R., Araya, M.W. (2017). The effect of early childhood stunting on children's cognitive achievements: Evidence from young lives Ethiopia. Retrived from https://www.ncbi.nlm.nih.gov/pubmed/29249889.

Zoch, A. (2017). The effect of neighbourhoods and school quality on education and labour market outcomes in South Africa. Working Paper 08/2017, Stellenbosch University, Department of Economics

Appendix A: CONSENT FORM FOR LEARN AND PLAY CENTRE

Information sheet and consent form-Learn and Play Centre

A Formative Evaluation of the Montessori education

Dear LPC Board of Trustees,

My name is Amosse Ubisse and I am conducting an evaluation in partial fulfilment of my master's degree at the University of Cape Town. As per the Memorandum of Understanding, this evaluation aims to the implementation of the LPC preschool programme and investigate the effectiveness of the programme in producing the desired academic and social skills outcomes.

Please understand that your organization (LPC) is not obligated to participate in this evaluation (i.e., participation is voluntary). If your organisation declines to participate in this evaluation, there will be no negative consequences. Similarly, your organisation may withdraw from the evaluation at any point, without any consequences. However, I would be grateful if you could give me access to your organisation's administrative records and permission to collect data from learners and educators on site. Any electronic or paper-pencil administrative records supplied by LPC will be used only for the purposes of this evaluation. Any copies made will be discarded upon completion of the evaluation. Access to programme records (and any other data collected in this evaluation) will be restricted to the evaluator and his supervisor.

Please note that the Commerce Faculty's Ethics in Research Committee has approved this evaluation. Trained and accredited assessors (fluent in the learners' home language) will administer the ELOM (a South African age-normed and culturally sensitive pre-school child assessment tool developed by Innovation Edge) over a period of two weeks. Learners will only be assessed if they are willing to participate following a verbal explanation of the procedure (assent to participate).

Your organization can choose to be anonymized in the final evaluation report. The responses of LPC educators, learners, and their parents will be anonymised. Data files will be password

protected. The final report will be made public, but any data presented will be stripped from personal identifiers and presented in aggregated form.

LPC will be given a copy of final report (after the dissertation has been examined), including the data collection instruments. LPC would be able to use the evaluations results to refine the preschool programme and mobilize additional funds to expand the programme to other townships, based on empirical evidence of programme effectiveness.

If you have any question about the evaluation, please feel free to contact the evaluator Amosse Ubisse (0606408334; ubsamo001@myuct.ac.za) or his supervisor Dr. Adiilah Boodhoo (0847174750; adiilah.boodhoo@uct.ac.za)

"*I acknowledge that my organization (LPC) will be participating in this evaluation of its own free will. I understand that LPC may refuse to participate or stop participating at any time without penalty. LPC may request a copy of this consent form."*

Check the box if the LPC representatives understand the content of the consent form and agree to participate in the evaluation ☐

Signature of the LPC representatives

Name of the board members	**Date**	**Signature**

Appendix B: CONSENT FORM FOR LPC LEARNERS

Information sheet and parent/ guardian consent form – Permission to assess LPC learners

A Formative Evaluation of the Montessori education

Instructions: Please read the consent form carefully and do not hesitate to ask us questions.

Dear Parent/Guardian

My name is Amosse Ubisse and I am conducting an evaluation of the LPC preschool programme for my Master's degree at the University of Cape Town. With permission and support from PPC, trained assessors will administer (in the presence of your child's teacher) a preschool child assessment tool (in your child's home language) to measure his/her:

1. coordination of movements;
2. ability to understand instructions and solve simple problems;
3. language development;
4. ability to count.

This will take about 45 minutes. Your child will only be assessed only if he/she is willing to. He/she may stop the assessment at any time, without any penalty or consequences. There are no risks to child by participating in this assessment.

Results of the assessment will be kept confidential and your child's identity will not be disclosed in any publications. Assessment data (not linked to your child's identity) may be used for other research purposes. Please note that the Commerce Faculty's Ethics in Research Committee has approved this evaluation.

If you have any question about the evaluation, please feel free to contact the evaluator Amosse Ubisse (0606408334; ubsamo001@myuct.ac.za) or his supervisor Dr. Adiilah Boodhoo (0847174750; adiilah.boodhoo@uct.ac.za)

On the next page, we ask you whether or not you agree that your child participates in the assessment.

Thank you very much for completing the form.

PLEASE DO NOT FORGET TO GIVE IT TO YOUR CHILD TO BRING TO SCHOOL

VERY IMPORTANT: PLEASE SEND THIS FORM BACK TO SCHOOL WITH YOUR CHILD ON THE NEXT SCHOOL DAY. IF YOU DO NOT SEND IT BACK WE SHALL ASSUME THAT YOU HAVE NO OBJECTIONS TO YOUR CHILD'S PARTICIPATION.

PLEASE PRINT YOUR CHILD'S NAME HERE: ----------		
PLEASE READ: I understand that the assessment will not harm my child in any way and that it will measure his/her coordination of movements and language development; ability to understand instruction, solve simple problems and count. I understand that the results of my child's assessment will remain confidential. I understand that the assessment results may be used for other research purposes. I acknowledge that I am not being forced to give permission for my child to be assessed. I also understand that my child will not be forced to participate, and nothing will happen to him or her if he/she does not want to participate. I also understand that neither I nor my child will be given anything for participating in the assessment.		
PLEASE PRINT YOUR NAME HERE:		
IF YOU **AGREE** THAT YOUR CHILD CAN PARTICIPATE, MAKE AN **X** HERE:		
IF YOU **DO NOT AGREE** THAT YOUR CHILD CAN PARTICIPATE, MAKE AN **X** HERE:		
PLEASE SIGN HERE:		
PLEASE FILL IN TODAY'S DATE HERE: DAY…… MONTH …….. 201		
Did your child attend Learn and Play Centre preschool for the whole of last year? (Make an X in the block that applies to your child)	YES	NO

APPENDIX C: CONSENT FORM FOR PARENTS

Information sheet and consent form - of the LPC learners

A Formative Evaluation of the Montessori education

Instructions: Please read the consent form carefully and do not hesitate to ask us questions.

Dear Parent/Guardian

My name is Amosse Ubisse and I am conducting an evaluation of the LPC preschool programme for my Master's degree at the University of Cape Town. I am interested in understanding the support that the Learn and Play Centre (LPC) offers to you as a parent/guardian. I would like to ask you some questions about your education level, payment of the school fees, and any support you received to apply for the child support grant and/or sponsorship.

The form will only take about 5 minutes to complete. Please, understand that you are allowed to refuse to complete it, or stop at any point without any penalty. Your answers will be kept confidential. At the end of the research I will write a report, but your name will not appear in that report or in any other publications. Your responses, together with those of other caregivers/parents may be used for other research purposes. Please note that the Commerce Faculty's Ethics in Research Committee has approved this evaluation.

If you have any question about the evaluation, please feel free to contact the evaluator Amosse Ubisse (0606408334; ubsamo001@myuct.ac.za) or his supervisor Dr. Adiilah Boodhoo (0847174750; adiilah.boodhoo@uct.ac.za)

Thank you very much for completing the form.

PLEASE DO NOT FORGET TO GIVE IT TO YOUR CHILD TO BRING TO SCHOOL!

VERY IMPORTANT: PLEASE SEND THIS FORM BACK TO SCHOOL WITH YOUR CHILD ON THE NEXT SCHOOL DAY.

PLEASE PRINT YOUR CHILD'S NAME HERE: ----------	
PLEASE READ: I understand that there are no known risks or dangers for me for providing information about my level of education, challenges I face to pay the school fees and LPC support to my child to submit application to the child support grant and/or sponsorship. The researchers will not attempt to identify me with the responses to my questionnaire, or to name me as a participant in the study, nor will they facilitate anyone else's doing so. I understand that the results of the study may be used for research purposes. I acknowledge that I am participating in this study of my own free will. I understand that I may refuse to participate or stop participating at any time without penalty. If I wish, I will be given a copy of this consent form. I also understand that there will not be direct benefits for participating in this project, but the information provided may be used to improve the preschool programme in LPC and may benefit the learners that will take the programme in the future.	
PLEASE PRINT YOUR NAME HERE:	
IF YOU **AGREE** TO PARTICIPATE, MAKE AN **X** HERE:	
IF YOU **DO NOT AGREE** TO PARTICIPATE, MAKE AN **X** HERE:	
PLEASE SIGN HERE:	
PLEASE FILL IN TODAY'S DATE HERE: DAY…… MONTH …….. 201	

PLEASE ANSWER TO THE QUESTIONS IN FOLLOWING PAGE, IF YOU AGREE TO PARTICIPATE IN THIS PROJECT.

Appendix C _ Questionnaire

Questionnaire to caregivers/parents of the LPC learners

A Formative Evaluation of the Montessori education

Number Code: _____

QUESTIONS TO BE ANSWERED BY THE GUARDIAN/PARENT(S) OF THE CHILD

Instructions: Please read the questions carefully and do not hesitate to ask us if needed.

1. What is your highest level of education?
   Mother: _____Father:_____

2. Have you ever faced challenges to pay the school fees for your child?
   Yes:_____ No:_____
3. If yes, how did you find the money to pay the school fees?
   _____
   _____
4. Did LPC help you to apply for the child support grant or sponsorship for your child?
   Yes:_____ No:_____
5. If yes, how did LPC help you to apply for the child support grant or sponsorship for your child?
   _____
   _____

APPENDIX D: CONSENT FORM FRO EDUCATORS

Information sheet and consent form -the educators

A Formative Evaluation of the Montessori education

Instructions: Please read carefully. Ask clarification if needed.

Dear Montessori Educator,

My name is Amosse Ubisse and I am conducting an evaluation of the LPC preschool programme for my Master's degree at the University of Cape Town. I would like to understand the implementation of the LPC preschool programme and assess the effectiveness of the programme in producing the desired academic and social skills outcomes.

You will be asked few questions about how the learners interact with Montessori material in your classroom and your teaching background.

The questionnaire will take about 15 minutes to complete. Please note that you are not obligated to participate in this evaluation (i.e., participation is voluntary). You may decline to participate or withdraw your participation at any point without any penalty or consequences. Your responses will be kept confidential and anonymised in the final report. No identifying information will be disclosed. Responses from all educators will be presented in aggregate format.

Please note that the Commerce Faculty's Ethics in Research Committee has approved this evaluation

If you have any question about the evaluation, please feel free to contact the evaluator Amosse Ubisse (0606408334; ubsamo001@myuct.ac.za) or his supervisor Dr. Adiilah Boodhoo (0847174750; adiilah.boodhoo@uct.ac.za)

Thank you very much for completing the form.

PLEASE DO NOT FORGET TO GIVE BACK TO A PERSON WHO IS ADMINISTERNG THIS QUESTIONNAIRE

PLEASE PRINT YOUR NAME HERE: ----------			
PLEASE READ: I understand that there are not known risks or dangers for me for providing information about how the learners interact with Montessori material and about my teaching background. The researchers will not attempt to identify me with the responses to my questionnaire, or to name me as a participant in the study, nor will they facilitate anyone else's doing so. I understand that the results of the study may be used for research purposes. I acknowledge that I am participating in this study of my own free will. I understand that I may refuse to participate or stop participating at any time without penalty. If I wish, I will be given a copy of this consent form. I also understand that there will not be direct benefits for participating in this project, but the information provided may be used to mobilize funds to improve the preschool programme stage, including my working system.			
PLEASE PRINT YOUR NAME HERE:			
IF YOU **AGREE** TO PARTICIPATE, MAKE AN **X** HERE:			
IF YOU **DO NOT AGREE** TO PARTICIPATE, MAKE AN **X** HERE:			
PLEASE SIGN HERE:			
PLEASE FILL IN TODAY'S DATE HERE: DAY…… MONTH …….. 201			
Were you working with preschool programme stage in whole of last year? (Make an X in the block that applies to your child)		YES	NO

PLEASE ANSWER TO THE QUESTIONS IN THE FOLLOWING PAGE, IF YOU AGREE TO PARTICIPATE IN THIS PROJECT.

Appendix D - Questionnaire

Questionnaire to educators of the LPC

A Formative Evaluation of the Montessori education

Number Code: _____

QUESTIONS FOR EDUCATORS

Instructions: Please read carefully. Ask clarification if needed.

1.Montessori educators generally divide the school day into different activity periods. How have you scheduled classroom time during the morning in your program? For example, when do learners arrive?

	When do learners start?	When do learners end?	How long each activity last?
Work period/engagement:			
Circle(s):			

Freedom and process quality

How would you rate your agreement for the following practices in your classroom on a scale from one to five with one representing total disagreement and five representing total agreement?

2.Having learners to choose whether to participate in an individual presentation or lesson.
total disagreement 1 2 3 4 5 total agreement

3.Having learners to work with or explore a material that hasn't been presented to them yet provided this is done in a non-disruptive, safe manner.
total disagreement 1 2 3 4 5 total agreement

4.Allow learners to combine certain materials, such as the sensorial materials.
total disagreement 1 2 3 4 5 total agreement

5.Giving initial material presentations to individual learners: (rather than to the whole group)
total disagreement 1 2 3 4 5 total agreement

6.Learners can choose whether to work with others.
total disagreement 1 2 3 4 5 total agreement

7.Learners choose when to have snack.
total disagreement 1 2 3 4 5 total agreement

8.Learners can choose to participate in lessons and circle time.
total disagreement 1 2 3 4 5 total agreement

9.Allowing learners to choose their work even if they haven't had a lesson first and how they'll work with a material provided this is done productively.
total disagreement 1 2 3 4 5 total agreement

10.Providing learners with a full range of Montessori materials, activities, and extensions rather than play or other supplemental activities during the work period.
total disagreement 1 2 3 4 5 total agreement.

Structural quality

DEMOGRAPHIC INFORMATION
Now I have a few questions about you and your classroom:
11. Gender: _____ male _____ female _____Prefer not to answer
12.How many learners are currently enrolled in your classroom? _____
13.How many paid staff members are usually in your classroom at one time, including yourself? _____
14.How many paid staff left your class in last 3 year? _____
15.How many paid staff joined your class in last 3 year? _____
16.How long have you worked in your current job at this school? _____ years _____ months
17.What is your highest level of education:
a. Associates (AA) or 2 years college degree
b. Bachelor or 4 year college degree
c. Advanced degree (Masters, Doctorate)
18.Do you hold a Montessori early childhood certificate? Yes ____ No Will soon_____
19.(if yes) What type of Montessori certification do you hold?
a. SETA____ b. SACE___ c. Grassroot___ d. Other: _____
20.What year was your Montessori certificate granted? _____
21.Did you teach prior to your Montessori work? Yes _____ No ____
22.If so, for how long? _____ years.

MONTESSORI MATERIAL

In the list below, please, check the material that you used in your class.

Practical Life, Arts and Crafts	**used**
Grace and Courtesy (greetings, please, thank you, sorry, interrupting, etc.)	
Walking on a Line	
Rolling and unrolling a rug	
Moving Furniture	
Sequence of Pouring activities (incl. solids and liquids)	
Sequence of Scooping/Spooning activities	
Sequence of Squeezing activities (e.g. sponge/baster/clothespins/tongs/tweezers)	
Sequence of Threading activities	
Sequence of Twisting activities (bottles & caps, nuts & bolts, etc.)	
Sequence of Folding activities	
Sweeping activities (broom, dustpan & brush, table brush & pan)	
Mopping the floor (mop and bucket)	
Scrubbing a table / chair	
Washing a window (or mirror)	
Sequence of Polishing activities (mirror/wood/metal)	
Watering a plant	
Flower arranging	
Feeding an animal	
Dressing Frame- Buttons	
Dressing Frame- Zipper	
Dressing Frame- Buckles	
Dressing Frame- Lacing	
Dressing Frame- Bow-tying	
Nose-blowing	
Hand-washing	
Clothes/Towel- Washing	
Ironing	
Sequence of Food Preparation and Serving activities	
Dish-washing	
Outdoor Gardening activities (e.g. raking, weeding, planting, watering, harvesting)	
Play Dough (or Clay)	
Crayons	
Sequence of Pasting/Glue activities	
Sequence of Scissor Cutting activities	
Sequence of Brush Painting activities	
Sequence of Sewing / Weaving activities	

Sensorial	**used**
Cylinder Blocks (Knobbed Cylinders) – 4 blocks	
Pink Tower (Tower of Cubes)	
Brown Stair (Broad Stair)	
Red Rods (Long Rods)	
Knobless Cylinders – 4 boxes	
Color Tablets – Box I	
Color Tablets – Box II	
Color Tablets – Box III	

Geometric Cabinet w/ Demonstration Tray and 3 sets of cards	
Constructive Triangles – 5 Boxes: Triangle, Large Hexagon, Small Hexagon, Rectangle, Blue Geometric Solids and Bases	
Binomial Cube	
Trinomial Cube	
Sound Boxes (Sounds Cylinder)	
Bell Material w/ mallet and damper	
Rough and Smooth Boards – 2 or 3 boards	
Rough Gradation Tablets (Touch Tablets)	
Fabric matching (Touch Fabrics)	
Mystery Bag (Stereognostic)	
Baric Tablets	
Thermic Bottles	
Smelling Bottles	
Tasting exercise	
Sequence of Sorting activities (by size, color, shape, etc.)	
Silence Game	

Math	**used**
Red and Blue Rods (Number Rods and Numerals)	
Sandpaper Numerals	
Spindle Boxes	
Numerals and Counters (Cards and Counters / Odds and Evens)	
Memory Game	
Golden Beads - Intro to Decimal Quantity (One Tray)	
Golden Beads - Large and Small Numeral cards	
Golden Beads - Intro to Decimal System (Nine Tray/Function of the Decimal System)	
Golden Beads - Four Operations (Addition, Multiplication, Subtraction, Division)	
Stamp Game	
Teen Boards (Séguin Boards) and Beads	
Tens Boards (Séguin Boards) and Beads	
Hundred Board	
Short Bead Stair	
Short Bead Chains (Square chains) w/ squares and arrows	
Long Bead Chains (Cube chains) w/ cubes and arrows	
Addition Snake Game	
Addition w/ Bead Bars	
Multiplication w/ Bead Bars	
Addition Strip Board and Tables	
Subtraction Strip Board and Tables	
Multiplication Board and Tables	
Unit Division Board and Tables	
Addition Working Charts (Finger Charts, etc.)	
Subtraction Working Charts (Finger Charts, etc.)	
Multiplication Working Charts (Finger Charts, etc.)	
Division Working Charts (Finger Charts, etc.)	
Multiplication w/ Bead Bars	

Language	**used**
Oral language development activities (Sharing news, fingerplays, songs, stories, etc.)	

Child library area w/ fiction and non-fiction picture books	
Picture/Object matching	
Picture/Picture matching	
Classified Three Part cards (Pictures, labels, control cards)	
Classified Picture cards for vocabulary and sorting by category	
Phonemic awareness activities w/ objects or pictures (e.g. I-Spy)	
Metal Insets w/ pencils, pencil holders, trays, paper	
Sandpaper Letters	
Sand Tray	
Large Movable Alphabet - composition of words and phrases	
Small chalkboards or whiteboards for writing	
Writing Sequence	
Comprehensive writing program	
Object Box I: Intro to reading phonetic words	
Picture/word matching - phonetic	
Object Box II: Intro to reading words w/ phonograms	
Double Sandpaper Letters	
Picture/word matching - w/phonograms	
Silent ‘e	
Puzzle Words (for English)	
Environmental Labels	
Action Commands	
Series of Phonics-based Readers	

Cultural (Geography, History, Natural, and Physical Sciences)	**used**
Land and Water Forms	
Land and Water Forms Three Part Cards and Definitions	
Globe of Land and Water (Sandpaper Globe)	
Globe of the Continents (Continents Globe)	
Puzzle Map - World Parts (Hemispheres)	
Puzzle Map - North America	
Puzzle Map - South America	
Puzzle Map - Europe	
Puzzle Map - Asia	
Puzzle Map - Africa	
Puzzle Map - Australia	
Puzzle Map - A country e.g. USA, Mexico, Canada, Japan, China	
Tool and felt pad for pin-pricking maps	
Packets of Pictures for Continents / Countries	
Flags	
Calendar	
Clock	
Classification: Living/Non-Living picture cards	
Classified Picture Cards - Animals	
Classified Picture Cards - Plants	
Classification: Animal/Plant picture cards	
Parts of a Horse (mammal)	
Parts of a Bird	
Parts of a Turtle (reptile)	
Parts of a Frog (amphibian)	
Parts of a Fish	
Botany Cabinet (leaf shapes) and cards	

Parts of a Plant (tree)	
Parts of a Flower	
Parts of a Leaf	
Sink/Float activity	
Magnetic/Non-magnetic activity	
Solid to Liquid to Gas activity	
Peace Education materials	

SUPPLEMENTARY MATERIAL

Practical Life, Arts and Crafts	**used**
Large motor i.e. woodworking	

Sensorial	**used**
Sorting activities by size and color	
Photographs/Illustrations of building using the following materials	
Cylinder Blocks (Knobbed Cylinders) – 4 blocks	
Pink Tower (Tower of Cubes)	
Brown Stair (Broad Stair)	
Red Rods (Long Rods)	
Knobless Cylinders – 4 boxes	
Color Tablets – Box II	
Color Mixing	
Picture Cards or Matching Geometric solids in real life	
Geo Boards	
Pattern Blocks	

Math	**used**
Numeral Cards	
Dot Game	
Equation Cards (static and dynamic)	
Fractions	
Fraction Circles (Insets)	
Fraction Skittles	
Money Coin recognition	
Money Activities	

Language	**used**
Object Boxes (match initial sounds)	
Objects to be spelled using the Movable Alphabet	
Pictures to be spelled using the Moveable Alphabet	
Composing Words	
Vocabulary Activities	
Non-phonetic reading books	
Easy Readers	
Poetry	
Mini environments e.g. farm/phonetic	
Mini environments e.g. farm/non-phonetic	
Language	**used**

Farm or equivalent for intro to grammar	
Grammar Symbols	
Nouns	
Verbs	
Article	
Adjectives	

Cultural (Geography, History, Natural and Physical Sciences)	**used**
Directions – North, South, East, West	
Cultural Artifacts	
Cultural Explorations of the World (e.g. Continents, Countries, Clothing, *Food, Landmarks, Traditions)	
Observation of Seasons Activities	
Study of Clocks, Learning Time	
Time Activities	
Timeline of a Child's Life	
Timeline of a Day	
Artists and History of Art	
Art Materials (various mediums and techniques)	
Musical Instruments	
History Activities	
Nomenclature Cards (cultural)	
Life Cycle of an Animal (e.g. frog, fish)	
Life Cycle of a Plant (e.g. pumpkin, seed)	

APPENDIX E: ASSESS OF OLS ASSUMPTION

Appendix E1: Assessing linearity

Figure E1 shows that while the variable age, gender, home language, household income, source of school fees (sponsorship=1) exhibit positive and linear relationships with the total ELOM score, the variable years spent in the preschool programme and female with English as the home language have a negative and linear relationship. Although the source of school fees (sponsorship=1) presents an outlier, it does not have an influence on the regression parameters, as confirmed below in the casewise diagnostics.

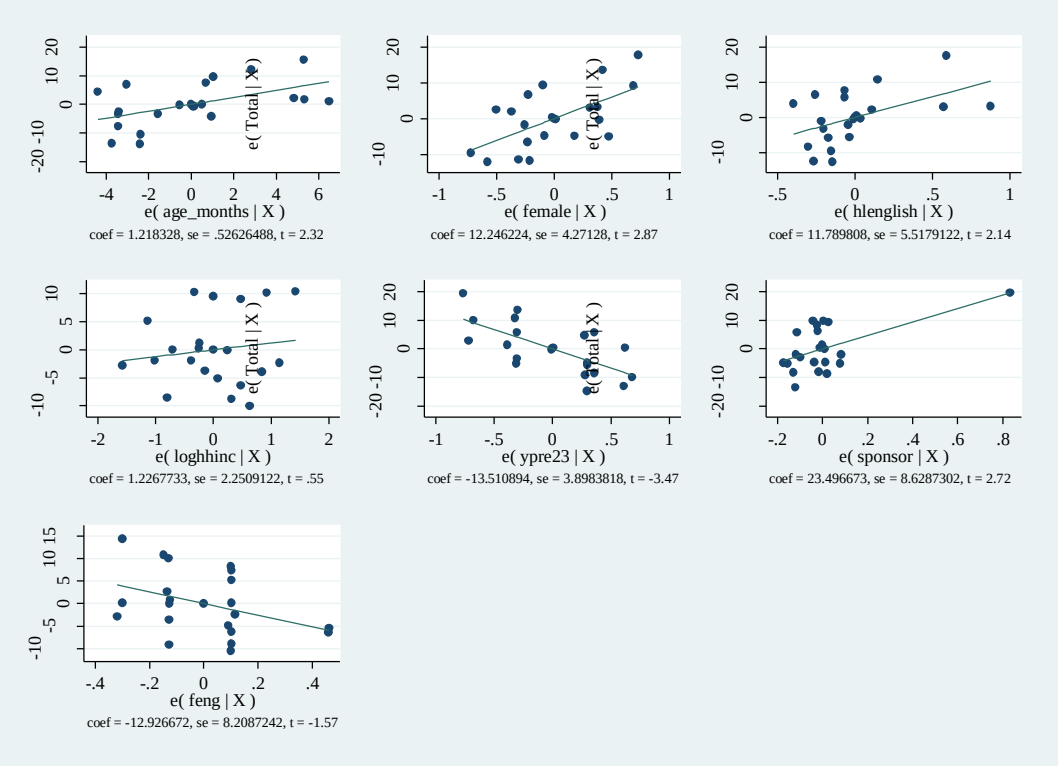

Figure E1. Assessing the relationship with total ELOM.

Appendix E2: Assessing multicollinearity

Table E2 indicates that there is no multicollinearity amongst the independent variables included in the model. The VIF values are all below 10, the tolerances are all above 0.2, and the *F* observed of the auxiliary regressions of regressors are not statistically significant at 5%.

Table E2

Diagnose of multicollinearity

Variable	VIF	1/VIF
Female whose home language is English	1.98	0.51
Home language (English=1)	1.90	0.53
Gender (female=1)	1.61	0.62
Household income (square root)	1.51	0.66
Age (in months)	1.42	0.70
Years of preschool programme (>1)	1.31	0.77
Source of preschool fees (sponsor=1)	1.15	0.87

Appendix E3: Assessing cases with undue influential

From the table E3, the standardised residuals are all at ± 2, which suggest a fairly accurate model. The Cook's distances are all below one therefore none of the cases have undue influence on the model. The leverage values are all less than 0.73 (2*(k+1)/n) and the Mahalanobis distances are all below 11, therefore, there is no suspicion of undue influential cases within the data.

Table 3

Casewise diagnostics

Case Number	Standardised Residual	Cook's Distance	Mahalanobis Distance	Centred Leverage Value
2	1.35274	.25704	7.48610	.35648
4	-.06057	.00094	9.64932	.45949
5	-.96828	.03472	3.09775	.14751
6	-1.16267	.08122	4.54475	.21642
7	-.47529	.01521	4.91707	.23415
8	-1.37173	.12549	4.88499	.23262
9	1.06818	.03845	2.84391	.13542
11	-.46267	.03336	7.86079	.37432
12	1.09654	.15366	7.14614	.34029
13	.82779	.05254	5.35209	.25486
15	-.19016	.00119	2.78044	.13240
17	1.21650	.08412	4.36772	.20799
19	-.66806	.01340	2.54780	.12132
21	.19343	.00138	3.09200	.14724
n	14	14	14	14

Appendix E4: Assessing cases with undue influence on regression parameters

When analysing the DFBeta statistics, it is found that all cases are within the ± 1, which indicates that no case has an undue influence over the regression parameters.

Table E4

case summaries

Case Number	Standardised DFBETA	Standardised DFBETA	Standardised DFBETA	Standardised DFBETA	Standardised DFBETA	Standardised DFBETA	Standardised DFBETA	Standardised DFBETA
	Intercept	Age	Gender (female=1)	Home language (English=1)	Female whose home language is English	Household income (Log transformation)	Programme dosage (>1 year)	Financial source for school fees (sponsorship=1)
2	.44768	-.50130	-.13255	1.01980	-.77030	-.22611	.43896	-.11484
4	.00638	-.00415	-.00092	.00082	-.05636	-.00829	.00044	-.00145
5	-.27877	.19012	.20430	.12784	-.12989	.27595	.18082	.02562
6	-.27450	.40373	.18253	.30744	-.16951	-.14949	.24834	-.03209
7	.22206	-.20708	.08011	.07734	-.06102	-.21160	.12255	-.05657
8	-.08382	.32438	-.51872	.20681	.27310	-.36425	-.29518	.26796
9	-.14334	.09062	.30328	-.06127	-.18052	.17809	.17697	-.16543
n	7	7	7	7	7	7	7	7

Appendix E5: Assessing Bias in the Model: homoscedasticity normality of errors, serial correlation.

An analysis of heteroscedasticity, the Breusch-Pagan/Cook-Weisberg test suggests the existence of constant variance (p=0.62); the Skewness/Kurtosis test for normality does not reject the hypothesis of normality of residuals (p=0.38), which is confirmed in Figure E1 below; The Durbin-Watson statistic is 2.08 and because it is not less than one or greater than three there is no correlation between the residuals.

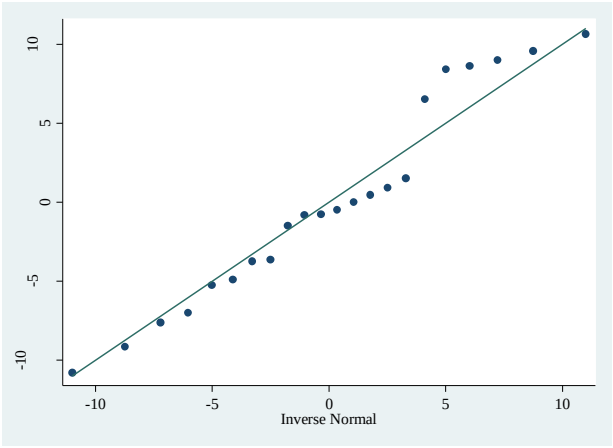

Figure E5: Test for normality of errors