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Editorial

Stay in solidarity and share equally: An open access journal in childhood studies

Mehmet Toran[*], Mesut Sackes[**], Mine Gol-Guven[***]

Journal of Childhood, Education & Society (JCES) was founded as a product of collective thought under the leadership of Dr. Mehmet Toran in July 2019 by a group of early childhood researchers who conduct both collaborative and independent academic research. Under the light of scientific research, current publishing policies cannot eliminate inequalities in public access for transfer and access of knowledge that is generated for the public weal (Beall, 2013). Particularly, having a limited access to the knowledge in early childhood studies is acknowledged as the first step for constitution of JCES. In this context, we would like to underline that independent researchers who are voluntarily taking part in the emergence of JCES are involved in a very courageous endeavour. This collective constitution takes an important responsibility for the public as well, and we point out that to fulfil this responsibility, it embraces moral and ethical rules as a reference point. Objectives, scope and ethical principles of JCES are determined with the contribution of the editorial board. In addition, we make promise to the larger research community of early childhood area that we will make sure to contribute to the area by giving a priority to high quality of research with robust evidence.

JCES adopts open science perspective in early childhood studies. Therefore, JCES has a high opinion of sharing the knowledge among people who are in children's ecology democratically. Attaching importance to open science policy, JCES defends scientific knowledge as public property that should be shared with all without depressing its value (Tonta, 2015). In the light of this target, -as JCES editorial board- we believe that scientific information that has been produced as public property should be shared with everyone through open access. The scientific communication enhanced between researchers-practitioners-readers is aimed to put into practice through the "open access" method. In this context, as open access policy within JCES, we embraced non-profit, voluntary editorial operations without charging a fee either from the reader or authors. Our experiences during publishing our first issue promise that it can be put into practice with a collective movement voluntarily on a digital platform. Solidarity is possible to carry out editorial process not only in Turkey but also with a contribution from every corner of the world.

We have given extra importance to research ethics as our publishing policy. While specifying ethical principles, we aimed to take researcher's attention to this issue. In this sense, after discussions with EECERA and then with the permission from Trustees of EECERA, we decided to embrace EECERA Ethical Code for Early Childhood Researchers that is formulated by Chris Pascal, Tony Bertram, Julia Formosinho, Colette Gray and Margy Whalley (2012). The ethical code bears qualification as a guide for researchers working in the early childhood area. We would like to indicate that applicant articles to the JCES are also evaluated in terms of those ethical codes during the editorial preliminary consideration process.

After calling for papers for the inaugural issue, we had a considerable amount of article applications.

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Those applications studiously evaluated by the referees after preliminary considerations. In this process, constructive feedback from the referees and the revisions authors made in consideration to given feedback contributed to quality of articles concurrently to the quality of the journal. Peer review process that is held studiously, on time and constructively demonstrated that solidarity is built correctly and truthfully. Therefore, we would like to especially thank the referees for the inaugural issue.

As you will see in the journal, there are six articles for the inaugural issue from five different countries: Belgium, Colombia, Israel, Tanzania and the USA. This variety is a result of effective publicity of the journal by editorial board and efficient use of digital platforms with open access policy. Besides that, especially the call for papers announcements by EECERA in their member mail groups and social media accounts demonstrated once more how important solidarity is. As a result of this solidarity and cooperation, we would like to underline that the geographical variety of applicant articles strengthen our faith and self-confidence as well.

After publishing first issue, we will continue pertinaciously working to strengthen international collaborations and to ensure continuity of the journal. Being aware of responsibility we are carrying and the risks we may face in the process, we would like to state that we have already taken necessary precautions. To ensure long running path and continuity of publishing for the journal, Gizem Alvan, Kerem Avcı and Taibe Kulaksız - doctorate students- have already started gaining experience in journal publishing and editorial administration process. These experiences would play an important role to provide sustainable publication of the journal. We would like to congratulate them to take part in a constitution courageously.

We would like to thank all partners who contributed to spreading information to publish interest with open access with their articles and their supports in the editorial process for the inaugural issue. We would like to state that the call for papers continues for the second issue of JCES which will be published in August 2020 and we are open to early childhood researchers' original contributions.

Declarations

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Research Article

Perspectives of teachers, children, and parents on the transition to first grade

Miriam Breuer*, Clodie Tal**

Abstract: This research is a case study of a school that sought to ascertain what is required for the optimal adjustment of children to first grade from the perspective of each partner in the education triad – children, parents, and the teaching staff (teachers and assistant teachers). The research tools adapted to the participants are open-ended questionnaires to elicit the perspectives of the parents and teaching staff, and interviews of the children following their creation of a metaphorical collage to elicit their perspectives. Participants were three first-grade teachers, the assistant first-grade teacher, ten children from one of the first-grade classes, and twelve parents of these children. All the children attend a regional primary school and come from [cooperative Israeli settlements in central Israel. The findings indicate that the emotional climate of the school was regarded as positive by all the respondents. Although all respondents expressed a desire for more inter-personal communication with each other, the expectations of parents and teachers differed with respect to the desired frequency and setting limits on the communication between them. The paper also describes changes instituted to improve communication between the school and the parents in light of the research findings.

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Transition to first grade;
Parental involvement;
Children's perspectives;
Parent-teacher collaboration;
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Introduction

This research sought to gain insight about what is required to facilitate the adjustment of children to first grade from the perspective of each participant in the education triad – children, parents, and the teaching staff – and to understand the prevailing relations. In particular, we wanted to learn how each participant in this triad perceives his or her own role and the role of the other in the child's adjustment to first grade. For this research, in keeping with the ecological systems theory of Bronfenbrenner, a role is defined as "a set of activities and relations expected of a person occupying a particular position in society, and of others in relation to that person" (1979, p. 85).

To that end, research tools suitable for each participant were used: open-ended questionnaires to the parents and teaching staff to elicit their perspectives, and interviews of the children following a metaphorical collage they prepared to elicit their perspective.

The transition of children from preschool to first grade is experienced by parents with a mixture of joy and fear, aware that the start of formal education is the foundation for learning and personal growth. Parents bring with them memories of their own lives, the experience of raising children, and imprints of relationships with preschool teachers and caregivers prior to their child's entry to first grade – a mix of trepidation and expectation. Teachers bring to the first grade, besides their professional expertise, their experiences of relationships with parents in the past, expecting to be able to construct a new and positive set of relations with the new class. Young children with a character set of their own bring varied experiences from their preschools. They are happy and fearful, still processing their separation from the preschool teacher and perhaps also from friends who remained behind, and they too hope for and expect a positive experience.

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In light of the importance of understanding the perspectives and relationships of the participants in their "natural" context, the ecological-systems theory of Bronfenbrenner (Bronfenbrenner and Morris, 2006) was selected as a theoretical approach to guide the planning of the research, analysis of the data, and communication between the teaching staff, parents, and children. This microsystem is evident in the daily interactions of the child with his or her parents and teachers within the physical space of the home and school – the developmental context closest to the child –proximal processes that affect the child's development. These relations are also affected by the traits of the child, the parents, and the teaching staff (the perceptions and expectations studied in this research are included in the traits of the "Person"), which ultimately affect the development and adjustment of the child. Relations between the children and their teachers are also affected by the "Context" dimension, which includes the interrelations, cooperation, and coordination between the parents and teachers (relations situated in the mesosystem), each of which has a direct connection to the child in terms of Bronfenbrenner's original model (1979). The context also embraces specific geographic and cultural characteristics of the parents and teachers in each framework. In this study, for example, many of the families live in cooperative Israeli settlements at some distance from the school, and therefore the children require transport to school. Social and power dynamics in society between parents and teachers are among the macrosystem factors that indirectly affect the child's development (Addi-Raccah and Ainhoren, 2009; Addi-Raccah, Amar, and Ashwal, 2018). Moreover, the "Time" dimension in the early twenty-first century affects relations both on the level of daily planning in school and home and, correspondingly, on the level of contemporary life when technology dramatically affects communication options between people, even parents and teachers (Schechtman and Busharian, 2015).

School is an organization in which its officials stand in power relations with each other and with the parents. In addition, as found by Addi-Raccah and Ainhoren (2009), the balance of power between the establishment and the teachers and parents – more precisely, the relative power of each group – affects how teachers perceive their involvement with the parents. An equitable balance of power between the parents and teachers correlates with teachers' positive attitudes toward the involvement of parents in school life. The power balance between parents and teachers has shifted dramatically since Israel became a state. In the early years, teachers were perceived as the ultimate school authority, and parents were kept out of school decision-making; today, parents wield a decisive influence on their children's education (Erez, Bienstock, and Lukes, 2005) and what happens in the schools (Bronfenbrenner and Morris, 2006; Friedman, 2010; Greenbaum and Fried, 2011; Tal and Bar, 2011). Beyond the ecological approach, this research takes the view that children are full members of society and entitled to their own basic human rights, besides being part of their families (Britto, 2012; Dahlberg, Moss and Pence, 2013, p. 52; Dockett and Perry, 2014). Hence, we also examined the perceptions of the children entering first grade as well as the perceptions and expectations of their parents and the teaching staff about their transition into primary school.

An Ecological Systems Approach to Parental Involvement in the Transition to First Grade

A transition such as that from preschool to primary school is an inevitable situation that can be experienced in various ways. Transitions are challenging because they are often linked to changes in an individual's appearance, activity, status, general functioning, and, in particular, social functioning. What's more, the changes may be associated with the use of physical and social space and may impinge upon cultural beliefs and educational practices that have repercussions for an individual's sense of identity – in this case, a child entering first grade (Vogler, Crivello, and Woodhead, 2008). The research presented here focuses on the perceptions of the parents, children, and teaching staff at the beginning of first grade, immediately following the transition of the children from preschool into primary school, conducted from an ecological systems approach, as noted, and in keeping with UNICEF's conceptual framework of school readiness (Britto, 2012) and the position paper of the Australian Ministry of Education concerning transition to school (Dockett and Perry, 2014).

The transition of children to school impacts their learning and development (Hughes, Luo, Kwock, and Loyd, 2008; Sayers et al., 2012). A successful transition to first grade fosters the child's positive attitude to school, a sense of belonging, and active participation in what happens there (Dockett and Perry, 2009; 2014).

The child's family and educational frameworks, in addition to his or her characteristics, can affect how the child copes with transition (Britto, 2012; Dockett and Perry, 2014). Forcing children to cope without support or protection, for example, could diminish their competence in handling transitions in general.

The educational institution provides opportunities for learning, and the family provides the scaffolding of support to the child in transition to complete the process of adjustment to a new framework. In this process, children also shape attitudes and expectations about their own ability to grapple with learning tasks (Dockett and Perry, 2014; Erez et al., 2005; Plotnik and Eshel, 2007). Furthermore, parent-school relations and partnerships are likely to influence the children's adjustment to the school environment, their wellbeing, and learning (Acar, Veziroğlu-Çelik, Çelebi, İngeç, and Kuzgunet, 2019).

Upon entering first grade and separating from the preschool, the child is expected to have a higher level of independence. This is a transition to a more achievement-oriented system, and therefore preschool teachers and parents worry about the fate of some first graders. The process can be facilitated by providing more information about school and opening the channels of communication between the preschool and the primary school; when a child is prepared for the transition, it becomes an opportunity for growth (Dockett and Perry, 2014; Plotnik and Eshel, 2007).

In short, how the transition to first grade is handled greatly affects the sense of belonging, learning, and development of children, as well as their involvement in school activities (Dockett and Perry, 2014). A successful transition depends not just on the child's characteristics, but also on the quality of the relationships between the parents and teachers, the parents and children, and the teachers and children (Bronfenbrenner and Morris, 2006; Dockett and Perry, 2007, 2014; Pianta, 1999; Vogler et al., 2008). Based on the ecological systems approach to teacher-parent relations (Bronfenbrenner, 1986), Walker and Hoover-Dempsey (2015) emphasize the need for each party to understand the perspectives of the other – that the parents understand the perspective of the teachers and children, and the teachers understand the perspectives of the parents and children.

Thus, the research presented here sought to ascertain what actually transpired and what is required for the successful adjustment of children to first grade from the perspective of each party to the education triad – children, parents, and the staff (teachers and assistant teachers). In particular, it sought to understand how each perceives his or her own role and the role of the other in the process of the child's adjustment to first grade.

Research Questions

- How do the parents, children, and teachers in the school grasp their own role and the role of the other in the effort to create a good and supportive relationship during the child's first year of primary school?
- What are the parents' expectations of their children's teachers as the children begin first grade?
- What expectations do the teachers have of the first graders' parents?
- What are the children's expectations of their parents' involvement in the school?
- What are the children's expectations of their teachers in general and specifically the teachers' relationship with their parents?
- In the opinion of the parents and teachers, how can the children themselves contribute to their adjustment to school and success at their studies?

Method

Type of Research

Case study methodology was used to derive answers to the research questions. In this method, an in-depth study is conducted of a social or organizational phenomenon in a real-life context, particularly in cases where the boundaries between the phenomenon and its context are not clearly demarcated (Yin, 2009,

p. 18). Case study methodology was used here to ascertain the perceptions of the teachers, parents, and children about the transition and adjustment to first grade. This type of research is rich in data and requires multiple sources of evidence to enable triangulation of the data. Furthermore, the methodology rests on theoretical assumptions, such as the ecological systems approach, which underpins this research. A qualitative analysis of the data allows for a broad and detailed examination of the phenomena, and brings into view a range of diverse findings and perspectives. One of the advantages of qualitative analysis is that it enables the linkage of findings and theory in a rich and compelling manner (Shlaski and Arieli, 2001). Research of this type also allows for a description of the respondents' reality as it is perceived by them.

Respondents and Field of Research

Research was conducted in the first grade of a public, regional primary school (1st to 6th grades) serving several cooperative Israeli settlements. Some of these children live at a distance from the school, and therefore require transport to and from the school, which raises concerns for many parents. This is a relatively big elementary school, serving 825 children at the time of the research (three classes at each age level). As part of the school's vision, student entrepreneurship is encouraged – students are advised by experts to develop and sometimes sell various products. Thus, the school encourages students to dare, think, invent, make mistakes, and be critical of ideas at the expense of the quantity of contents processed. To that end, the school partners with experts in education, ecology, business technology, and the arts. Children's parents are also involved either at the stage of idea development or as experts.

Ten children – six girls and four boys – twelve mothers, three first-grade teachers, and one first-grade assistant teacher participated in the study. The participating children and their parents are all part of the class led by the first author as a first-grade teacher.

The children: To grasp the children's perspectives, ten of the most expressive and articulate girls and boys in the class were selected to participate in the study, out of 32 children in total in the class. The students selected were those willing to share their thoughts and feelings with an adult and willing to have a group conversation. They are also students who spend more time touching creative materials and engaging in artistic work. Six of these children get to school by the bus belonging to the regional council's transport system, while the other four live in the cooperative settlement where the school is located and go to school on foot or by bike, alone or accompanied by a parent. Distinguishing between children who come by bus and those who live near the school is significant in light of the concern shown by some parents and children related to the daily use of bus transportation to and from school. This is an issue with which some children and parents have to grapple upon entering first grade.

The parents: Questionnaires were distributed to all the parents of the class studied. Twelve of the 32 mothers in the class responded, all of whom were married, have professions, and hold down a job. Nine mothers live in this regional council and their children use the organized transport to get to school; three mothers live in the cooperative settlement in which the school is located and their children do not use the bus to get to school.

The teachers: All three first-grade teachers in the school during the year of the research were interviewed. Two had over twenty years of experience and one had three years of experience. The assistant teacher of first grade had served in this position for six years. One of the teachers who participated in the study is the first author of this study.

The names of all participants in the research, the name of the school, and its location remain anonymous; names used in this paper are fictitious. The parents of the children gave consent to participate in the research. The children were also asked for their consent, which they gave both orally and by signing their name; they were also told that they may opt out of the study at any time.

As noted, the first author of this paper was herself a first-grade teacher in this school and conducted interviews as part of this research. Being a teacher may have been helpful in the good relations she has with the respondents; on the other hand, being a teacher could adversely affect the openness of the respondents in expressing their views. In retrospect, the findings indicate that the participants expressed both positive

and negative views about what transpires in the school.

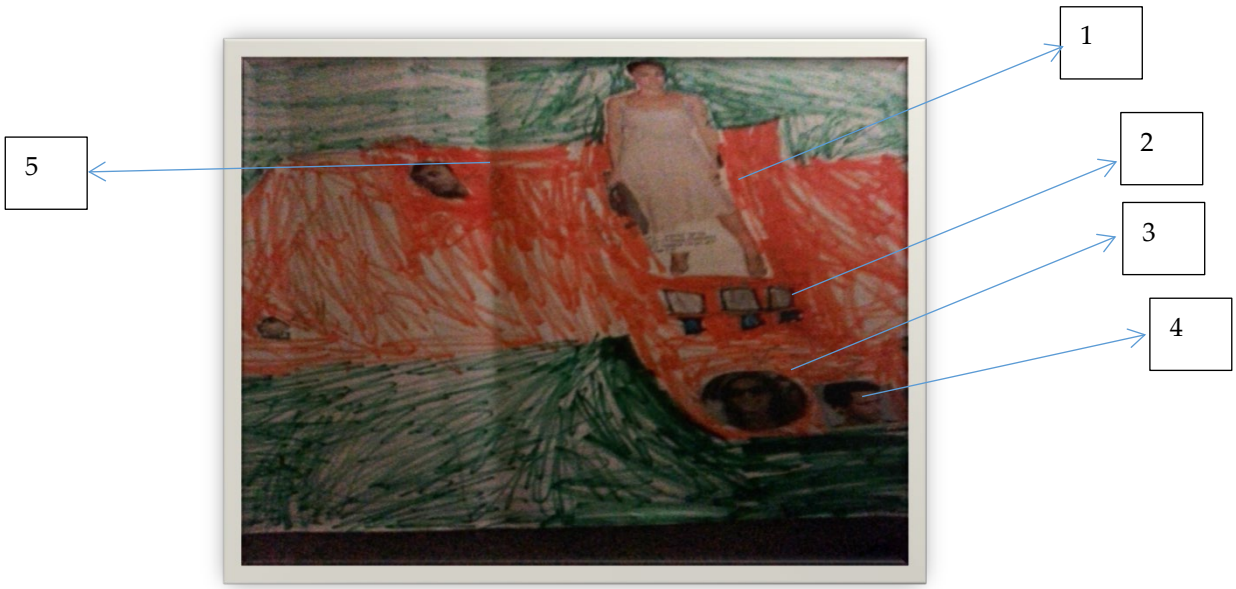
Research Tools

To understand the perspectives of the various respondents, we interviewed the children following their creation of a metaphorical collage and administered partially open-ended questionnaires to the parents and teachers. Data were collected in January and February 2014. The data obtained in the study, as shown below at the end of the Findings section, catalysed changes in how the school management and teaching staff collaborated with children's parents. These changes are still in effect in 2019. Furthermore, the approach adopted in this study of taking an interest in the expectations that children, parents, and teachers have for each other required that the school learn about these expectations and find ways to take action to meet the stakeholders' needs.

Details about the research tools.

1. *Interviews with the first-graders following their metaphorical collage*. This tool makes use of visual language as the child creates images that can shed light on his or her perspective about the subject of the collage. In this activity, the children are engaged in reflection both during and following the creative act (Russo-Zimet, 2016). The children are already familiar with and enjoy creative activity. The researcher places on the table newspapers, magazines, and other accessories such as scissors, a stapler, colours, and paste, and gives the children the following instructions: "On the table are various materials. Use these materials to express the subject, 'I am in first grade, my parents and my teacher' in any way you choose." While the child is working, the researcher does not converse with him or her or intervene in any way to avoid influencing the child's creation. If the child addresses the researcher, she approaches the child and responds directly to the question. The child must be allowed maximum freedom of expression and reminded of the instructions and the permission to use additional materials. After completion, the child is asked to explain the collage that is the product of his or her creative activity. Discussion between the researcher and child leads to exposure of the thought underlying the collage and strengthens the personal connection between the researcher and the child. All discussions with the children were recorded and transcribed. A photograph was also taken of each collage.

Below we present an example of a metaphorical collage (Figure 1) and an interview following it. Upon completion of the collage, Alon titled it, "A Visit to First Grade."



1 = my teacher; 2 = the classroom; 3 = my mother; 4 = my father; 5 = my brother
Figure 1: Alon's Collage: "A Visit to First Grade"

The interview with Alon:

> First of all, I like being here [in school], especially recess. A second thing, my mom…Wow! It's hard…I don't have, don't know what to say. Three, my dad. Sometimes he makes me angry and sometimes he teaches me important things. Four, my brother, he's cute. Five, you, the teacher. That it's fun that you're teaching me. Six, my big brother. He always bothers me and he also gets me angry with his blade and that's it."

The researcher (the boy's teacher): *Can you tell me about first grade and the roles of the people involved?*

> Yes, Mom makes sure to remind me every day if I forget my schoolbag, she reminds me to take it. Dad makes tea for me in the morning so I won't be hungry in the bus. My little brother reminds me that I have school. The teacher teaches me. I put you in the classroom and them [the parents] in the workshop a little in the classroom, they're not exactly there. I feel them in my heart.

2. *A partially open-ended questionnaire administered to the parents of the first-graders*. The parents were asked to write about their perceptions and desires concerning their children's transition to first grade and the relationship they would want with the teachers. Examples of questions: "In your opinion, what would be a very good relationship between you and the school?" and "What is a successful transition from preschool to first grade, in your opinion?"

3. *A partially open-ended questionnaire administered to the first-grade teachers*. This was designed to elicit the teachers' perception of the roles of the parents, the children, and themselves in the transition of the children to first grade. Examples of questions: "What can you do as a teacher to ensure a smooth transition and successful adjustment of the children to first grade?"; "How do you think the children regard the transition from preschool to first grade?"; "What do you think the child expects of his teacher?"; and "What do you think the child expects of his parents?"

4. *A questionnaire to the assistant teacher of first grade* had the same level of detail as the questionnaires to the other teachers.

A pilot test to establish the content validity of the open-ended questionnaires for parents and teachers was conducted. This was administered to approximately 23 M. Ed. students in an Early Childhood Education research class at Levinsky College of Education. The students were preschool or first- and second-grade teachers completing their M. Ed. degree in Early Childhood Education. About half the students filled out the questionnaire as teachers and the other half were asked to fill it out as parents (they themselves were also parents). In the second stage, the students were asked for feedback and suggestions about the content and structure of the questionnaire itself. Based on the pilot test and feedback, the questionnaires were modified and finalized. In the research itself, data from the responses of the teachers, assistant teacher, parents, and children were triangulated to enhance reliability.

Data Analysis

A content analysis was conducted of the responses to the questionnaires and interviews with all the respondents, including the interviews with the children following the metaphorical collage. An inductive approach to category development was adopted as categories were directly extracted from the data (Mayring, 2000). The content analysis led to the identification of three categories underlying the texts, which emerged as subjects that study participants regarded as critical in the adaptation of children to first grade:

1. Emotional climate in the home and classroom environment with reference to (a) the climate that exists; and (b) the desired climate.

2. Parental presence at school, which included two subcategories: (a) the physical presence of parents in the classroom; and (b) parental presence as part of ongoing non-face-to-face communication with the school and educator (via telephone or digital media).

3. Interpersonal relationships as a basis for building trust, strengthening security, and creating a learning environment.

Transcriptions of the interview and questionnaire responses were then broken down into statements

that were categorized according to the above three categories and subcategories related to the mutual perceptions about the roles of parents, teachers, and children during adjustment to first grade. Categorization was initially performed by the first author and then independently by the second author. Inter-judge agreement between the two authors on attribution of statements to categories was high (around 90%) and disagreements were subsequently resolved.

Results

Analysis of the interviews with the parents and teachers and of the post-collage interviews with the children revealed three main subjects on which the participants focused as promoting successful adjustment of the children to first grade:

1. The emotional climate in the home and classroom
   (a) the current emotional climate
   (b) the desired emotional climate
2. The presence of parents
   (a) physical presence in the classroom
   (b) indirect (not face-to-face) communication with the school or teacher (by telephone or digital media)
3. Interpersonal relations as the basis for building trust, enhancing security, and creating a learning environment

Emotional Climate in the Home and Classroom

The current emotional climate. The emotional climate relates to the feelings shared by the members of a community or organization and is closely related to the quality of relationships among the people involved (de Rivera, 1992). Emotional (positive and negative) climate was therefore included in the Classroom Assessment Scoring System (CLASS) by Pianta, LaParo and Hamre (2008) The children, parents, and teachers all addressed in their responses and evaluated positively the current emotional climate in the home and classroom. The children's interviews following preparation of the collages also reflected positively on the classroom and good relations with the teaching staff. Some respondents included aspects of learning (such as stating that it is fun to learn) as components of the classroom climate. That is, some children indicated that they were eager to learn and that experiential learning contributed to the positive climate of their classroom, while others perceived social encounters during recess as most contributing to the positive emotional climate of the school. A few linked the positive climate at home with the positive climate in the classroom, reflecting on how they view the environments in which they live.

Responses from the children. The following excerpts were extracted from interviews with the children explaining their collages. The children's descriptions of the positive climate in the classroom were spontaneous and not elicited by the interviewer's direct questions. Alon stated, "First of all, I like being here, especially [I like] recess." Noy commented, "I like being in first grade, the lessons are fun, and I enjoy it here." Noga talked about the pleasant atmosphere during classroom learning, illustrated by noting, "things that children in first grade like – costumes, wigs."

Responses from the parents. The parents' responses showed that they are aware of their responsibility in ensuring a good climate in first grade, and want to be involved in creating it. The mother Na'ama emphasized the importance of the parents' contribution to creating a positive emotional climate in class: "Parents should ask: How was it during the recess? How was it in the classroom? How does the teacher treat the children?"

Responses from the teachers. The teachers' responses show that they are aware of the emotional needs of the children and see themselves as responsible for creating a positive climate in their classrooms. One of the teachers stated, "I lay the groundwork, prepare a beginning that will be pleasant and helpful,

play with them [the children] a lot while instilling good work habits.".

Nevertheless, one can see that the teachers are critical toward some aspects of the home environment, though they are not self-critical. Nira, a teacher with many years of experience teaching first-graders, observes, "Sometimes contradictions appear between the home and the classroom…".

In contrast, the parents praise the school for creating a positive climate. The mother of one child exclaimed, "The daily update on the website is wonderful! I don't know what I would do without it.". This indicates the importance that parents attach to having information about what takes place in school. The availability of this information contributes to a positive atmosphere.

The desired emotional climate. Analysis of the data showed that the participants addressed the desirable emotional climate at home and at school as facilitating wellbeing and learning:

Parents addressing emotional climate at home. Parents talked about the desirable climate at home to support the children's learning: One mother, Noam, whose oldest child, a daughter, is in first grade, stated that it is the parents' role "to give space to talk about fears and expectations from school… One should also support the children in preparing homework."

Parents addressing emotional climate at school. In relating to the school climate, parents focused on content related to both emotional and pedagogical aspects of how first grade should be conducted. They stated that the teachers should address many needs. The mother Noam stated that "good relations with the parents, meetings with the child, being sensitive to the child [are needed for adaptation to school]" (emotional aspect). According to Donna, the mother of a middle child now in first grade, learning should be "flexible experiential learning…mediating, explaining, cooperating, flexibility in seeing the effect of the transition on each child" (pedagogical aspect).

The parents related to the children's feelings and needs at home and at school, the learning process, and the children's progress. They also related to what is desirable in relations with the teachers, not just the current relations.

Responses from the teachers. The first-grade teachers expressed their opinions about the desirable climate in first grade: The teacher Tali noted that what she and the parents experience at the beginning of first grade is important: "The parents should feel comfortable approaching me." Iris, the teaching assistant, reflecting on the atmosphere in the class, said, "There must be cooperation, meetings through the course of the year."

Summary of findings related to the desired climate in class. Most references to the school climate by the children, parents, and teaching staff were positive. The respondents described the positive climate as the product of close relations that allow for frank communication between the parents and teachers. The children expressed positive feelings toward their parents and teachers, and their expectations differ little. The parents appear to be taking responsibility for being involved and are willing to contribute to the formation of a positive emotional climate in the class. In addition to parents and teachers agreeing about their perception of the classroom climate and what engenders it, parents wanted to express their views about how the class is managed, while the teachers are sometimes critical of what happens at home. Yet not one of the participants, it should be noted, proposed a specific mechanism to discuss the issues in disagreement.

The Presence of Parents

The children, parents, and teachers underscored the importance of parental presence in school as a main factor affecting children's adaptation to this new environment. Analysis of data showed that participants mentioned two types of parental presence in first grade: physical presence in school and indirect – not face-to-face – presence through telephone or digital communication between the parents and teaching staff.

Physical presence in the classroom.

Perception of the children. Analysis of the data suggests that the children feel a need for the physical presence of their parents in the school. Gal, the oldest child in her family, describes a desire for involving her parents in her learning process: "I want them to come more because it's fun to hear what the teacher says about me [to my parents]. They should see the things I made." During the process of adjustment, the children developed coping mechanisms to deal with the desire for their parents to be physically present and the fact that this does not routinely take place. Alon says that he feels his parents in his heart: "I put you in the classroom and them [the parents] in the workshop a little in the classroom, they're not exactly there. I feel them in my heart." Galia is beginning to demonstrate her ability to separate from her parents for a longer period of time. She is independent in her new role as a first grader. Galia and Alon make note of the separation: "I go to school, they [the parents] go to work, and I'm in school."

In short, the children express a need for the physical presence of their parents, without specific mention of when they should be present (prior to the schoolyear, during the initial school period, or throughout the year). Also, the children displayed two types of conscious mechanisms for coping with the physical absence of their parents: (a) thoughts that enable the children to symbolically feel that their parents are near them; and (b) development of a relationship with the teaching staff and other children as a way to enhance their emotional security.

Perception of the parents. With regard to a physical presence in the school during the transition period, the parents feel it is important to accompany the children prior to the start of studies and during the first days of school. Gili, mother of a second son in first grade, says, "It's good to accompany them physically at first." Ayala relates to the bus trips: "He [my son] was frightened of the trip [by bus]. He was afraid he wouldn't get on the right bus, he wouldn't know the way home, he wouldn't know where to get off."

Analysis of the parents' questionnaires indicates that the parents view their physical presence as important for a smooth transition – prior to the school year and during the initial period in school. The parents expressed a need for physical closeness, especially since the children go to school by bus. Bus trips are perceived by some parents as a particular difficulty, and grappling with this issue is shared by most of the children and parents. This is not relevant for the children and parents who live in the community where the school is located.

Perception of the teachers. The teachers also mentioned the need for the physical presence of parents in the classroom primarily prior to the beginning of the school year. The teacher Ronit stated, "The parents should visit the school during the preparatory phase of transition to first grade.". Nira, also a teacher, attests that the presence of parents is important during the transition from preschool, which includes a visit by them to the school. Iris, the assistant teacher of this grade, comments about the presence of parents, initially through communications media. Her meeting with parents is limited to specific events "and I am very happy to meet them [the parents] on school trips and special events. It's as if we all know each other already."

The teachers cited the importance of the physical presence of the parents as their children get to know the new physical setting or environment and new people. They were referring primarily to the period prior to the start of the school year, but the children expected physical presence of the parents throughout the year.

The findings on this subject can be summarized by saying that the children express a desire for the physical presence of their parents more than the parents themselves or teachers do. The children would like to see their parents in their classroom throughout the school year, whereas the parents and teachers perceive parental presence in school as important before and at the beginning of the school year.

Indirect presence – telephone and digital communication with the school or teacher. Analysis of data shows that parents' presence is evident in frequent communication between the parents and teachers via telephone or email, not only by face-to-face encounters. Yet data show that parents and teachers hold

different attitudes toward the desirable frequency of telephone conversations.

Attitudes of the parents. Analysis of questionnaires shows that even when everything is going smoothly in school, the parents feel a need for frequent contact with the teachers, both for the exchange of information and as the basis of forming and maintaining a good relationship. Hila, one of the mothers, complained that communication with the first-grade headteacher is much less frequent than the daily communication with the kindergarten teacher: "Missing is the daily encounter." Noam sees the importance of "having long conversations, passing on information, having meetings in transition to first grade, parent guidance, and getting to know the headteacher.". Adi, the mother of a first-grader, asks for "teacher accessibility.". She expects her to be "responsive to requests and questions.". Ayala adds, "And reporting to parents is crucial.". Sima, the mother of a daughter in first grade, says:

> For me, the relationship with the school staff should not only manifest itself in the event of difficulties. [At present] there is no regular meeting on a monthly basis or any regular communication if everything is going smoothly. A good relationship is based on continuous interactions, even if there are no problems; a good relationship would even mean individual emails with two or three pieces of information.

Attitudes of the teachers. Analysis of the data indicates that teachers do not always consider telephone conversations appropriate. Ronit, a first-grade teacher, notes that in order to strengthen the relationship with parents, "it is important to use a variety of communications media. Telephone conversations are sometimes inappropriate when the subject is not important, and they [the parents] sometimes cause conflicts between the home and classroom.". The teachers are much less enthusiastic than the parents about frequent communication between them. While acknowledging the need for contact, the teachers want to set the limits in advance about how and when this takes place. Nira the teacher also says that communication is important, but within limits. She feels that the rules about this are not clear, and that parents do not always respect existing rules. She writes in the questionnaire that the parents must "respect the communications rules that I set.".

In summary, though both parents and teachers recognize the importance of ongoing, open communication between them, parents show the need for frequent and regular conversations with teachers, while the teachers see the need to set boundaries on the amount and the media used for the communication. The parents, teachers, and children all cite the importance of the physical presence of the parents during the first year of school to facilitate adjustment, enhance the child's sense of security, and cope with travel by bus, which is part of the transition from preschool to primary school. While a physical presence is regarded as critical by all the adults during adjustment to first grade, the need for regular communication via the media (particularly telephone conversations) is desired primarily by the parents and not the teachers.

Ongoing contact via the media replaces the physical presence of the parent, and the preferences for frequency and type of media vary from parent to parent. Such communication serves a range of purposes: exchange of information about the child, guidance to the parent, and fostering authentic relations based on trust between the parents and teachers. Relatively more children than teachers or parents emphasized the importance of the parents' physical presence in the school. And yet the children find ways to cope with not having their parents physically present, whether through internal, symbolic means (thoughts about the parents being "in my heart") or by forming good relationships with alternative figures (teachers or other children).

The parents and teachers concur that communication is important for building relationships and fostering cooperation. The parents refer to communication with the teacher as a response to many needs, and they expect more regular contact than what currently exists, expressing the desire for frequent updates and use of all the communications media. While the teachers also view contact with the parents as an important component of their relationship and cooperation, the teachers cite the need for boundaries and rules, conventions that must be respected, and even how the parents should make contact. This issue reveals disparities in the expectations of the parents and teachers, and lack of clarity about boundaries and how to make contact.

Interpersonal Relations as the Basis for Building Trust, Enhancing Security, and Creating a Learning Environment

The need for an interpersonal relationship as the basis for building trust, strengthening a sense of security, and fostering a learning environment appears in the responses that refer to qualities such as trust and openness. The children, parents, and teachers all relate to the nature of their relationships with each other.

The emphasis of the children seems to be on having a close relationship with the teacher, which provides a sense of security. In Alon's words, "It's fun that you're teaching me.". Yarin's drawing of the teacher shows her with open arms and a wide smile at the entrance to the classroom. Gal notes, "it's fun to hear what the teacher says about me [to my parents].".

The parents view their relationship with the teachers as a tool for information exchange and trust building; they cite the need for openness by the teachers, and assert that trust between the parent and teacher allows the parent to approach the teacher for information and guidance.

Donna, the mother of a middle child in first grade, says, "A first grader needs warmth and individual attention, therefore it's important that the staff have a one-on-one meeting with each child. They can see who the child is and allow him to forge ahead in what he's good at.".

The teachers emphasize that trust between them and the parents is critical to a good relationship. As Nira the teacher notes, "The relationship can be meaningful if they [the parents] feel comfortable coming to me about issues concerning their children, and if I feel comfortable turning to them about the progress of their child, whether good or bad.". Tali, another teacher, also addressed the need for openness with the parents, "A good relationship is one in which the parents see me as an empathic listener.".

The teachers' perception of the relationship with the parents is also based on experiences that were not always positive. Tali asserted that the parents "must accept my opinion as authoritative, agree to share honestly, respect the norms of conduct I set, and behave with mutual respect.".

The children perceive the relationship with the teacher to be an emotional attachment, one that allows for a learning relationship and fosters a sense of personal security and physical closeness. Statements by the parents and teachers indicate that they all ascribe importance to a trusting and open relationship. Nevertheless, expectations between the parents and teachers differ about how the contact should take place, and this could undermine the quality of the relationship. Parents expect to receive ongoing updates, information, support, and guidance. The teachers note the different expectations between them and the parents with respect to telephone calls – the manner, timing, and frequency of contact with parents are not always consistent with accepted norms or the level of importance of the subject.

Teachers appear to view information provision to parents as part of their job, but they do not see themselves as parental guides or supporters, even though parents mentioned this as a need. Though both teachers and parents note the importance of regular contact and a good relationship in order to create the optimal climate in the classroom, teachers propose setting limits and rules about it, and are more critical of the parents at this early stage than the parents are of them. It also appears that teachers are willing to be perceived as the authoritative partner in the relationship with the parents – the person who sets the rules about communication between them.

Summary of Findings

The parents, children, and teachers agree on several points: The climate in the classroom and home is of critical importance as these are the main environments where the partners develop and the processes of adjustment and relationship-building take place between the children and teachers, and between the teachers and parents. The interpersonal relationships and communication with parents via physical presence or indirectly are subjects that the children, parents, and teachers all cite. Disagreements appear concerning the frequency and manner of communication between the parents and teachers, and this issue is not discussed or addressed in either formal or informal frameworks. Parents and children are looking

for a more profound partnership, while the teachers speak about the boundaries between involvement and interference. In addition, teachers perceive themselves as the senior partner in the relationships with parents. Informal meetings with the teaching assistant are important for building the connection between the school and the parents, and creating a positive emotional climate in the school.

The findings indicate that all partners to the education triad in the first year of primary school confirm that a positive emotional climate fosters learning. The findings also indicate that this school maintains good relations with the parents and children.

What happened after completion of the study? After this research was complete and following personnel changes in the school administration, the first author initiated broad-based changes in concert with other staff members (teachers, school counsellor, and principal), parents, and students to address the needs that came to light in this research. This team, comprised of the school counsellor, the teacher-researcher now assistant principal, and the first- and second-grade coordinator, added the preschool teachers to the team of stakeholders whose perspectives and perceptions should be considered in order to create optimal adjustment conditions for the preschool children starting first grade.

Regarding the involvement of the parents, their physical presence in the school, and communication between the parents and teaching staff, many activities were introduced in addition to what had been done prior to the research. These actions involved the entire teaching staff and parents, and included:

- Meetings of the school counsellor, the principal, and the assistant principal for first and second grades with the parents in their communities during the summer vacation or before their children graduate kindergarten in order to clarify and coordinate expectations.
- Parents who wish to talk with the school staff personally are invited to meet with them prior to the start of the school year.
- The teaching staff updates the parents about what takes place in the classroom both in a class internet forum and personally by email or phone concerning the functioning of individual students.
- An evening roundtable is held once a year with the participation of teachers and parents to discuss subjects of concern to all (homework, educational innovations, etc.).
- Parents are invited to teach a class as experts in their fields, and to volunteer in the library on Fridays. The intent is to increase the physical presence of parents in the school in response to the needs articulated by the children.
- To increase the involvement of parents, activities were defined in diverse areas, such as taking responsibility for being in contact with the parents in the communities, inviting parents interested in educational innovations to learn about them and help introduce them to the classroom, etc.
- These initiatives come from both the teachers and the parents. In 2016-17, parents replaced the teachers on Teacher's Day, giving them a "different" type of morning, and this was made a permanent event by decision of the school staff and parent representatives at the beginning of the subsequent school year.
- Regarding bus transport, a task force was created to include representatives of the parents from the communities, a transport coordinator, and older students who serve as bus monitors. Bus rules were written that give special attention to the youngest students boarding first. Changes were made in the bus parking area to improve the conditions for students waiting for buses. These changes were adopted in response to the needs of the parents revealed by the research and also following requests by sixth graders in the school.

Conclusion and Discussion

The present research focused on how parents, children, and teachers perceive their own role and the role of the other in an effort to create a successful and supportive relationship in the children's first year of school. The researchers sought to understand the perceptions and perspectives of the parents and teachers

based on the assumption that the successful adjustment of first graders is also contingent upon good relations among the partners – children, parents, and the teaching staff. This research therefore also takes into consideration the voices of the children so that a work plan can be designed that meets their needs. It should be noted that the preschool teachers who took part in preparing the children for first grade are also partners to the process, but their perspective about the adjustment of the children to first grade was not examined due to time constraints.

An analysis of the interviews and questionnaire responses found three interrelated issues that are of concern to the first-grade children, parents, and teachers: the classroom climate, parental presence, and interpersonal relations.

Because parents and teachers have a common interest in promoting the children's development, it is not surprising that the research participants have similar perceptions. The findings indicate that all the participants – parents, teachers, and children – agree that there is a positive climate in the home and classroom, that parental presence in the school makes a positive contribution, and that generally good interpersonal relations prevail between parents and teachers. In the view of the research participants, all these contribute to the successful adjustment of first graders, and are consistent with Bronfenbrenner's theory that when systems affecting the child are coordinated, they allow for optimal development of the child and strengthen each other (Bronfenbrenner, 1986; Bronfenbrenner and Morris 2006). These findings reflect the current approach about the importance of collaboration between parents and teachers for the benefit of the child (Acar et al., 2019; Dockett and Perry, 2014; Greenbaum and Fried, 2011).

While perceptions were similar, differences were found in the expectations of parents and teachers regarding the amount and channel of communication between them. This finding is consistent with Gavish and Friedman (2007), who argue that the differences in perceptions between the parents and teachers may be rooted in the lack of clarity about the needs of each group, and/or insufficient sensitivity to the parents' and teachers' needs as individuals and groups.

One important difference is how each group perceives the subject of parental presence in the school. Both parents and teachers agree and accept that the physical presence of parents is vital at the beginning of the first grader's school year, but when physical presence is replaced by mediated communication, particularly via the telephone, a gap emerges between the desires and needs of the parents, teachers, and children. The parents expect more frequent and ongoing communication than what currently exists, while the teachers assert that the parents lack limits about the frequency of their contact. What's more, teachers view some of the phone calls with parents as lacking importance. The children speak clearly in favour of the physical presence of their parents in the school throughout the school year, not just during the adjustment period. This is consistent with Dayan's findings (2011) about the longing of preschool children for their parents to spend more time with them in the physical school and get to know it more intimately. The children, however, find ways to cope with their parents' physical absence by symbolic means and by creating meaningful relationships with their teachers. The children also expressed a desire to involve their parents in their learning and the products of their learning.

It is important to understand that, prior to this research, the school under study had no mechanism for parents and teachers to work through the issues in disagreement. Had it not been for this research, the first author as a head teacher would not have known what the parents think about contact with the teachers, and to what extent they long for ongoing, personal contact with the teaching staff beyond what they currently have. Furthermore, the teachers would not be aware of the importance the children ascribe to the physical presence of their parents throughout the school year or their need to share with their parents the products of their learning activities.

Another concern of the parents that appears in the findings relates to the bus rides between their homes and the regional school. Technically, the school handles the transport arrangements: The children are escorted to the bus stops, and supervised for orderly boarding. Although the school does not view this as an issue, parents have expressed considerable concern about it, which the school staff was not aware of. This is where many parents find it hard to grapple with their physical absence from the school and worry

about the security of their children. Note that the children do not raise the subject of the bus in their interviews, nor does it concern them after the initial adjustment period. It is important, however, to raise this issue in discussions between the parents and teachers as a concern of the parents.

Parents and teachers express dissatisfaction when the issues of concern to them are not properly addressed by the school staff. This observation, which also appears in the research literature, was apparent to some extent in the findings of this research. Greenbaum and Fried (2011) argue that the school system is still fearful of the involvement of parents in the school system, which may explain the failure of the system – unaware of the parents' perspective – to address the needs of this group. The bus rides to school, for example, illustrate that each party has its own perspective: The school believes that the matter is being handled, therefore it is not raised in teachers' conversations with the parents. From the parents' perspective, however, this sensitive subject, which preoccupies and concerns them, does not get a hearing in the parent-teacher exchanges.

From the teachers' perspective, their needs vis-à-vis parents are also not being addressed. The teachers want to set limits on contact with the parents, limits that they believe are not sufficiently clear or understood by the parents. The lack of dialogue on this issue between teachers and parents leads to criticism of the parents by the teachers, criticism that could undermine relations between them and cast a pall on the atmosphere in the classroom. The parents, on their part, speak of the need to increase the frequency of meetings or dialogue with the teachers, paying little regard to the teachers' needs to set limits on the frequency or the subjects discussed. Failure to address the need for limits ignores the needs of the teachers, who are subject to ongoing, frequent contact with a large number of parents.

For a partnership among the parents, children, and teachers to be authentic, the needs of each group must be addressed, hence it is important to ascertain the unrealized needs of each group through dialogue among the partners.

These broad subjects as well as the different needs of the parents are not adequately addressed, hence the importance of engaging in research that offers ways to deepen the relationship between school staff, parents, and children, and more adequately respond to the needs of the stakeholders (Pianta, Kraft-Sayre, Rimm-Kaufman, Gercke, and Higgins, 2001).

This kind of research should be conducted beyond first grade in the school studied and indeed in all schools as part of the ongoing educational praxis. This would mean conversations in every educational framework to clarify expectations – identifying and defining needs and monitoring the changing needs of children as they adjust to first grade and later. Identifying needs and clarifying the expectations of the parents, children, and teachers could facilitate creation of a work plan relevant for the entire school in each educational framework. For example, in the school in which this research was conducted, the need arose to think of ways to increase the physical presence of parents in the school, to provide more information to parents about the bus transport of their children, and especially to reach agreements acceptable to both teachers and parents about the frequency and channels of communication between them. The focus of the work plans may be different in other schools, in accordance with the needs that arise from clarifying the expectations of the stakeholders. What emerges from this research is the importance of creating agreed-upon mechanisms for parents and teachers to resolve disagreements that may arise and a framework for clarifying the expectations of each side. It is important to note that it is the school's responsibility to institute regular communication mechanisms with parents and families. Addi-Raccah et al. (2018) found that in cases in which teachers overcome their fear of "strong" parents, the teachers can be perceived as "carriers of social change through a relational system.". It was suggested that teachers, led by influential principals, who form reciprocal relations with students' parents can have an improved impact on their communities.

In the case presented in this study the principal and vice principal (the first author) led the teaching staff and the parents to forming a real partnership that did not exist before the research. This partnership built a mechanism for checking the expectations of stakeholders and one that enabled adoption of actions to meet the children's, parents', and teachers' expectations.

Declarations

Limitations of the Study: In light of the small number of respondents, the scope of this research was limited, and should be expanded to the entire school. Furthermore, only mothers responded to the questionnaires even though they were distributed to both mothers and fathers. In the future, greater efforts should be made to involve fathers in the study and hear their perspective. The findings could help create a partnership of teachers, parents, and children with a more contemporary perception of school as a safe space that conveys a sense of belonging and in which the child develops abilities to meet complex needs. The involvement of parents and teachers together can create a real partnership that will enhance learning and the motivation to learn for the benefit of the children (Israel Ministry of Education, 2001; Sagi-Schwartz and Gini, 2008).

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Research Article

Muraling the invisible strings: Collective memory work from an educator inquiry group

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Abstract: In this qualitative study of a year-long educator inquiry workshop, nine early childhood educators engaged in the process of collective memory work to critically reflect on how their past experiences as young learners relates to their current teaching practices. Through an iterative analysis of the participants' discussions and writings, this paper highlights how a group of educators shifted their way of thinking about teaching from a series of damage-based memories of restrictive learning environments towards a focus on desire-based stories of transformational and expansive learning experiences. For this group of teachers, this shift became an essential component to identifying how they could begin to work to create liberatory learning experiences and spaces for all students.

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Introduction to the Study

> The mapping of my educational history – my memories - again goes back to the origins of why I teach. This helped me see the journey of my teaching as a process, and how events, people and experiences in general connect to one another and to who I am today. It was muraling of the invisible strings that makes the big picture. –Samara, Teacher

For centuries, the concept of memory has been a topic of exploration for philosophers, cognitive scientists, novelists, psychologists, anthropologists, and playwrights. Memories, and the stories connected to them, are used to explain the complexities of the mind and its power to recall past events. In addition, memories have been used to make sense of cultural and social moments and contexts. Over time, a multitude of philosophers and psychologists have worked to understand human memory by using metaphors, including: memories as libraries, melodies on a piano, or even a leaky bucket (Roediger, 1980). Plato described memory as the impression of a seal ring into a block of moldable wax (McDowell, 1973). Freud compared memory to a house, with specific memories as the objects and rooms in that house (Roediger, 1980). Virginia Woolf (2007) called memory a "seamstress" who "runs her needle in and out, up and down, hither and thither. We know not what comes next, or what follows after" (p.436).

Recently, educational researchers and theorists have explored the role that memories of early schooling experiences play in teachers' current pedagogies (Rothenberg, 1994; Van Hook, 2002; Chang-Kredl and Kingsley, 2014; Miller and Schifflet, 2016). In her research on the autobiographical stories that parents and teachers bring to the classroom, Lightfoot (2004) likened teachers' memories to ghosts that follow us as we move through life. Rothenberg (1994) described how memories are intertwined in teachers' everyday lives and practices:

> In the case of memories about schooling, things are very thick indeed, and richly informative as well. Being in "the thick of things" encapsulates the inescapability of the presence of memory in everyday life, as something we are always stirring up and moving through. This must surely be the case for teachers in their classrooms, with a background of thousands of hours of memories, and a multitude of classrooms, teachers, and peers from which to draw. Such memories are a vast and varied landscape of personal knowledge, beliefs, and understandings, replete with all the potential riches and problems of a complicated area. (Rothenberg, 1994, p. 369)

The concept of memory, specifically the memories of teachers' early experiences of schooling,

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emerged as an important theme in this year-long qualitative study of an educator inquiry group. The group was made up of nine early childhood educators who met on a monthly basis to discuss, reflect and investigate different aspects of teaching young children. During the year, the group spent time reading educational theory and discussing their successes and challenges as teachers. The teachers represented a range of different pedagogies and while they each framed their teaching practices differently, they came together with a common goal of learning from one another and creating a community among educators. The focus on teacher memory emerged from their workshop discussions about why this specific group of teachers choose to teach, with all nine of them describing memories of their schooling experiences as young children as directly related to their current profession.

An analysis of the teachers' discussions and writings revealed that when asked to describe their early memories of learning and school, this group of teachers initially focused on their negative experiences, however after three months of engaging in a practice known as *collective memory work*, the teachers were able to recall more positive experiences of learning as young children and were able to connect those memories to their current practices. The findings of this study outline how this process of recalling and critically reflecting on memories can help teachers move beyond, even heal, from the emotional pain they may have felt as young children. And in turn, help them re-affirm the encouraging and liberating moments of learning that they aim to create for the young children in their own classrooms. This critical reflective process is posited as a useful tool for promoting thoughtful inquiry among in-service early childhood educators.

Theoretical Framework

This year-long project was grounded in the concept of a critical reflective practice and its use as a theory and process to uncover, examine, and critique one's current teaching identity and practices (Loughran, 2002; Buchanan and Clark, 2018). Critical reflective practice involves a framework that is based on the idea that through a collaborative inquiry process, one can begin to engage in a practice of critical reflection, working to analyze the social and cultural contexts in which one may be learning and teaching (Buchanan and Clark, 2018). Critical reflective practice emerges from a popularized framework known as reflective practice, first outlined in the work by Donald Schön (1983, 1987). Schön's work has become the cornerstone of many teacher education preparation programs across the United States (Loughran, 2002; Richert, 1990; Valli, 1993; Zeichner, 1987). However, despite its popularity, multiple critiques have emerged around the concept of reflective practice (Zeichner and Liu, 2010), noting that the term has become broadly used in only abstract terms, disconnected from the real-world classroom contexts in which educators are learning. Some pre-service teachers have noted that the concept of a reflective practice is something that is simply noted at the "top of every course syllabus" (Buchanan and Clark, 2018). A critical reflective practice framework addresses this gap by including a critical examination that involves specific guiding questions and activities for this reflection. This guide, as noted in the activities used by the educators in this study, gives educators the opportunity to question and examine the power and institutional contexts and dynamics which may influence their teaching and learning experiences (Buchanan and Clark, 2018). A critical reflective practice is additionally grounded in the broader view that all learning and communication is social (Lave and Wenger, 1991; Lave 1996). As these social learning theorists have posited, when learners are provided the opportunity to engage in social interactions, they can work to make meaning together, establishing shared understandings and knowledge about the institutions, contexts, and classrooms in which they learn and teach. The educators in this study were able to use their memories of their early schooling as a tool in their reflective practice, referencing their memories (as noted in the findings section) to make shared meanings and build common understandings among the members of the group.

Review of Literature on Teacher Memories

Over the past thirty years, multiple researchers have asked teachers to reflect on their early memories of schooling and learning (Rothenberg, 1994; Van Hook, 2002; Chang-Kredl and Kingsley, 2014; Miller and Schifflet, 2016). Researchers have examined how memory plays an important role in the current pedagogical practices and beliefs of educators working with young children. While this body of literature

is extensive, there is a lack of research on memory work with teachers that is intensive, involves in-service educators, works with a small group of participants, and is longitudinal in design.

One large-scale study, Rothenberg's (1994) "Memories of Schooling," asked over 400 undergraduate and graduate students to write descriptive essays on their worst and best schooling experiences. Rothenberg discovered that in writing, these students focused on academic challenges and successes, failures and humiliation, competition and fairness, and assessment and transitions. Rothenberg (1994) concluded that, while it is interesting to look at this large body of experiential data from individuals, both educational researchers and teachers could also benefit if memories were to "be examined on a finer-grain level" in a group setting:

> These approaches could be more intensive, personal, and collaborative in helping to develop teacher knowledge and insight. They could be analyzed with a small group of people remembering and then adding to memories (Rothenberg, 1994, p. 377).

Building on Rothenberg's research, Van Hook (2002) asked 59 pre-service early childhood teachers at the beginning of their teacher education program to describe, in writing, a significant experience that they remembered from their elementary school years. Van Hook discovered that the teachers mostly focused on their own teachers. A majority of the student teachers (65%) recounted negative memories of teachers, while 25% described positive memories of teachers, and just 10% described specific interactions with their peers. Based on these findings, Van Hook called for a greater focus on self-reflection in teacher education programs, that "pre-service teachers should recall their memories related to previous school experiences and consider how these memories have impacted themselves and their interaction with teaching pedagogy" (p. 154). Much like other research before and after this, Van Hook highlighted how teacher memories of early childhood and early school experiences, especially the negative and painful ones, may influence one's pedagogical values, beliefs, and expectations (Hollingsworth, 1989; Calderhead and Robson, 1991, Saban 2003). Saban (2003) similarly described how student teachers' negative experiences "endured long in their memories with a lot of hatred of the teachers and his or her subject as the years passed by" (p. 840).

In Chang-Kredl and Kingsley's (2014) research, the authors examined how memories influenced a teacher's reason for entering the profession. When they asked 53 pre-service teachers to write biographical narratives on the topic, the authors discovered that teachers referenced many school and work memories, as well as family memories. These teachers wanted to emulate or oppose past teachers, to fulfill or find present convictions, or to influence or be affirmed by future students (p. 34). These teachers cited memories that were "emotionally charged," either strongly positive or strongly negative, but never neutral. However, in contrast to Van Hook's (2002) findings, the authors discovered that, when asking a teacher about their memories and linking it to the reason why he or she teaches, the majority, almost 75%, were mostly positive reflections. The authors suggested that teacher educators must attend to these "emotional dimensions" when engaging in self-reflection and identity work with teachers, supporting and encouraging teachers to access and articulate how their past connects with their reason for teaching. As a result, Chang-Kredl and Kingsley called for more longitudinal studies on teacher memory in order to more accurately evaluate how it impacted one's identity as a teacher.

In 2016, Miller and Shifflet engaged in similar research and asked 69 pre-service elementary teachers, during a semester-long course, to write about a meaningful memory from when they were students. These students were later asked to connect this memory to their future role as teachers in the field. About half of the students described teachers from their past that they hoped to be like, who had specific characteristics or took actions that were helpful and meaningful to the student. The other half of the students described negative experiences with teachers, which were often associated with some kind of fear. Miller and Shifflet concluded that, like the others in the field, teacher education must foster the art of both recollection and critical reflection to help pre-service teachers both access and analyze their early memories of schooling. However, it is important to point out that in Miller and Shifflet's findings, they noted an outlying trend in their data, a kind of shift or inspiration that emerged among a few of the participants:

> An interesting subtheme emerged from the data, as some participants used fear and past experience or teacher to

> create a desired self. A subpopulation of nine participants described their motivation to approach a desired self, by utilizing a negative memory. Using the negative to inspire a positive action was less common in posts; however, these outliers should not be discounted because they illuminate an interesting appendage to the data (p.25).

This particular theme of teachers using their negative memories to explore and imagine a positive, desire-based self and educator, is an important finding to note, as it emerged as a key finding in this study, as described below.

The body of research on teacher memories reveals that this process of reflection is an important one, as the memories of school are directly linked to a teacher's current pedagogies. To further uncover how teacher memories can be used with in-service educators to promote critical and reflective practice, the field calls for research on collective memory work that employs more in-depth research, over a longer period of study, with educators in small groups, and that is collaborative and intensive in design. This project aimed to address this gap in the research by focusing on the following research questions: How do in-service teachers engage and interrogate their own stories and memories of schooling? What patterns emerged from these stories over the course of a year? And, how does the process known as *collective memory work* help teachers critically reflect on their current teaching pedagogies?

Methods

This study answers the call for research on teacher memory by using an approach to qualitative inquiry that focused on providing a group of in-service teachers with a collaborative space to engage in in-depth discussion and reflection over the course of one year. This research was grounded in the concept that qualitative research is both iterative and fluid, and must adapt to the ever-changing nature of collecting narratives and experiences from participants (Reinking and Bradley, 2008).

Participants & Project Design

The participants of this study were nine female early childhood educators from two rural cities in upstate New York in the United States. These nine educators taught in a variety of school settings and hailed from different pedagogical backgrounds and styles. One was Montessori-trained, two were Reggio-Emilia-trained, and one was earning her masters in Early Childhood Education through an online program that focuses on "culture-centered" early childhood education. The remaining five teachers cited a mix of pedagogical styles that influenced their teaching, including project-based learning and emergent curriculum. All of the names used in this paper are pseudonyms for the participants. These participants were purposefully selected and invited to this group based on their range of experiences in education, their pedagogical beliefs and practices, and their willingness to join a group that would meet over the course of one full year. Of the nine participants, seven of them came from privately-funded programs and two worked in publicly-funded programs. The participants had range of experience in the teaching profession, from 2 years up to 38 years of experience. The sample size was purposefully kept to a small number of participants to foster discussion.

During this study, the workshops were designed and facilitated to encourage in-depth discussions and writing. Throughout the year, the participants were asked to engage in multiple activities that involved writing down their memories of early learning and schooling, and then asked them to share and discuss them with one another. Over the course of one year, they remembered, described and discussed their first memories of school, influential educators from their past, transitions they made from school to school, and the emotional impressions that different schools or classroom environments made on them. They shared their memories by reading aloud what they had written, summarizing what they had recalled, or describing their stories according to the specific prompts they were given. During these discussions, the teachers were asked to reflect on how these memories connected to how they currently teach and care for young children. This kind of reflection and discussion is what is known as collective memory work. Collective memory work involves participants responding to a set of prompts about their memories of a specific event or topic, through writing or discussion, and then analyzing these narratives with a collective research group (Crawford, Kippax, Onyx, Gault and Benton, 1990, 1992; Haug, 1987; Ovens and Tinning, 2009). The goal of this work is to "achieve intersubjective understanding" among the participants of their

experiences in specific past settings (in this case, experiences with early schooling and learning) (Ovens and Tinning, 2009, p.1126).

Data Collection & Analysis

Over the course of the year, with approval from an institutional review board, the following types of data were collected from 10 two-hour workshops and 4 one-hour interviews with the participants: (1) textual productions from the monthly workshops (written narratives and artifacts, questionnaire responses, journal entries, and interviews); (2) audio recordings of the workshops and interviews; and (3) field notes and memos. The audio recordings were transcribed, and along with the field notes and written artifacts, were coded by major themes that emerged from the narratives. The themes were analyzed according to each individual participant, as well as the group as a whole, using an inductive process of open-coding and memoing (Patton, 2002). These codes and themes were shared with the participants throughout the project, allowing for their response and adjustments to the common understandings of the group. In addition, the principal investigator of the project, who served as the facilitator or the workshops wrote a series of memos based on notes and jottings from observations of the workshop discussions. These memos were guided by the following questions: What topics were emerging in the workshop discussions that referenced one's memories, especially when connected to a teacher's current pedagogical choices and practices? What role did memory play in the discussion of teaching and learning? And lastly: what kind of memories of early learning and schooling were referenced in the discussions? These memos were used to better understand and map the major themes and topics that continued to arise during the workshop discussions and how these topics could inform the next stages and direction of the workshop activities. At the conclusion to the project, all of the data was re-coded and analyzed according to the conversational turns in the workshop discussions, noting when and how the topic shifted in the discussion, comparing these shifts and themes with my field notes from the discussions. After passing through the data multiple times, the major trends that emerged over the course of the year was shared with the group, as a check for both clarity and validity.

Findings from the Study

An analysis of the data from this study revealed that the memories that teachers have of their early schooling experiences are emotionally charged, with the teachers passionately recalling both negative and positive experiences of learning. The data revealed a specific shift from negative memories that were shared at the beginning of the project to more positive, desire-based memories towards the end of the project. The shift started to occur during the fifth workshop after the group read and discussed the research by Eve Tuck (2009), who describes the concepts of damage and desire-based research. In her work on the ethics of social science research and educational research, Tuck (2009) calls for a moratorium on solely "damage-centered" research on communities, studies that describe communities, neighborhoods or even cultures as "defeated or broken" (p.412). Citing bell hooks, Tuck stated her concern about this kind of research:

> I am concerned with… research that invites oppressed peoples to speak but to "only speak from that space in the margin that is a sign of deprivation, a wound, an unfulfilled longing. Only speak your pain (hooks, 1990, p. 152)

Tuck asks communities and peoples to "consider the long-term repercussions of *thinking of ourselves as broken*" (p.409). During a discussion on Tuck's research in the educator inquiry group, three of the teachers, Bree in particular, discussed how this work resonated with their way of thinking about their teaching, their students of color, and the communities in which they work. In particular, our group discussed Tuck's urging or "cautionary note" to not see desire as a replacement or opposite to damage, but instead to conceive a desire-centered story as a complex one, which acknowledged the pain and damage but focused on the positive aspects, including survival. The teachers discussed how they hoped to acknowledge and recognize not just the broken and pained experiences of their own histories but also to describe their memories of positive learning experiences and moments.

Stories of Damage

During the first four workshops, seven out of the nine teachers wrote about and shared memories

that were based on negative experiences, controlling teachers or restrictive environments related to their early schooling, despite the open-ended prompts. One early example of this occurred after they created maps of their memories of early learning experiences. One teacher, Laurel, admitted that she couldn't remember a single name of any of her elementary school teachers. She had attended one of the largest public schools in New York City, and she only remembered the emotions she felt about certain teachers, such as "the scary ones", or "the angry ones". She recalled specific details such as how some of those teachers dressed, even the shoes that they wore, but not their names – noting this was a "major block" in her memory of school. Two of the teachers, Laurel and Alison, described how their teachers spoke to them, treated them, or disciplined them for their personalities or behavior. In the excerpt below, Laurel talked about being reprimanded on her first day of kindergarten:

> I had an experience of all of my early, early stuff . . . one of the first things that I wrote down was that I got put in the corner on my first day of kindergarten, I remember what I was wearing, I remember how excited I was, I took a banana peel and I danced it across the table and I got put in the corner and I remember feeling so horrified, and I couldn't figure out what I had done, it was a whole visceral memory. –Laurel

Alison described a memory from her nursery school classroom:

> I was told I was shy and I didn't have any friends . . . we would go around in a circle and say if you are a son or a daughter and I thought girls are bright like the sun and I said "I'm a sun!" and they said no you are not, you are a daughter, and I was like "but I want to be a sun!" These moments—those are what stuck out—these moments of someone telling me something that didn't feel like I am. –Alison

Five of the teachers described some of the negative feelings associated with the structures in a school or classroom setting. Anya described the fear of getting lost or being late to class. Mara and Samara both described not feeling emotionally "safe" in their classrooms. Renee described the stress of taking tests at an early age and how she "shut down" as a result of such anxiety:

> I had an experience in second grade— the one that I remember– I had my first anxiety attack ever, hyperventilating— in fifth grade because I couldn't test well and it set up a whole paradigm for the next two plus years of failing in school and I was placed in junior high—I was placed in lower level classes and I was excelling at them, I was bored, but I can't test—I had just shut down. – Renee

A Shift to Desire-based Memories

During the sixth workshop, one month after the teachers had read Tuck's (2009) work, all but one of the teachers began to reflect on positive memories of their early learning, which were often outside of the school or classroom setting. In these memories, the teachers described moments of learning with their friends, family and mentors.

For one specific teacher, Bree, the experience of desire-based learning emerged once she left the traditional setting of school. At the age of twelve, Bree left school and joined a community of family friends who were engaged in "unschooling" – the process of learning according to your own interests and choices as a young student of the world. Bree described the moment when she decided to leave school – what she described as an "expansive moment":

> I think, what like stuck out to me in the process of writing this was this—I guess for me, were politicizing moments or moments where I know something shifted in my awareness of the world. An expansive moment, where the world got larger. My understanding of things got larger, and they are very specific moments in my life. I guess, my unique experience was leaving school— the act of leaving school at 12 years old and trying to figure out my own thing, that's when I got really interested in the theory behind schooling and learning.– Bree

Bree went on to note how the "world got larger" for her, and she described the different kinds of mentors she met during these years and how they affected her in positive ways, including models for how she wants to presently work with children:

> What I like thinking about is the different people who influenced me is that I feel attached to the idea of the kind of adult or educator that I want to be in a kid's life… it's nice to think about all these different people who have really different personalities and really different approaches and influenced me in different ways, some were super buddies and some were not, but really made an impact anyway so its kind of nice to think about the different models for good educators – Bree

Two of the teachers, Mara and Ella described how their family played a role in their early learning experiences.

> I was really surprised how much my sister was present and often how often my memories that I had - I was doing this, she was doing that – this was really paired, when I was thinking about the good emotional counterparts of [those memories]. – Ella

Family was main theme in Mara's writing and discussion over the course of the entire year of the project. In the following excerpt, Mara wrote about a moment in her childhood that reflects her current work with children:

> It was a sunny, bright day. Warm. I was on the driveway, a wide, light colored cement driveway, not very long, the led up to a modern home and which had a low, stone wall running along one side and grass along the other. I think my uncle and I had been using the hose on the driveway because I remember the color of wet cement. The activity we were undertaking was pulling the petals off of flowers and placing them in cardboard egg cartons so my grandmother could plant the seeds the following spring. When we were done, we carried the egg cartons into the laundry room where they were placed on shelves to be stored until spring.
>
> This memory had always been strong, but it became revelatory in my mid 30s, when for some reason I was engaged in pulling petals off of marigolds and was broadsided by a smell that was SO familiar and in an instant pulled forth the imagery of that day in Colorado. - Mara

In this memory, Mara reflected on the role that her family members, specifically her uncle, played in her learning about seeds and plants. Mara described this memory two other times during the school year, as a very concrete, visceral memory that involved her senses, the sight of the wet concrete and the smell of the flowers. Mara continued on in her writing to reflect on how that memory impacted her perspective on working with young children:

> That moment of brilliant illumination was profound! It moved me! …Knowledge in this form is visceral. It contains sight, sound, relationships, smells. It comes from a place and was part of an activity that was a part of daily life. This approach to knowledge is the knowledge I want to be able to somehow share. Knowing that what I do with children is relevant now, in time, and that it has the potential of re-entering their lives or growing with them through their lives as time progresses, as their lives develop and unfold. That what we do now, what we talk about now, what we discover now, what we question and explore now, has the possibility of living within them and informing them in ways that will be theirs, their story, their memories, their moving forward into and through their lives. - Mara

Here, Mara emphasized the importance of using collective memory work as a framework for both reflecting on one's own teaching practices and acknowledging how influential early learning experiences and environments are to minds and lives of young children.

Discussion

Understanding the role of memories and how they relate to the everyday lives of teachers is both broad and complex. During the course of this year-long educator inquiry workshop, a group of early childhood educators were able to access, reflect, and conceive of memory in a different way than prior research from the field. In this process of reflecting on their own memories of learning, the educators initially described negative instances of schooling. However, with additional and deeper reflection and discussion, they began to share more positive, desire-based stories of learning, which then connected to the kind of teachers they wanted to be today.

In this study, the process of revisiting memories based on the discussion and reflection among the group highlighted an important role that the social context of the group played throughout the project, where memory was not an individual, strictly cognitive-based, neutral act but one that was strongly influenced by the setting and culture of the group and the context. In this way, memory became a situated practice. Ovens and Tinning (2009) described memory, or what they referred to as reflection, using this sociocultural perspective. These authors noted that the use of reflection in professional development and teacher education had grown in popularity over the past 20 years (Clarke and Chambers, 1999; Loughran, 2006; Tinning, 1995). Ovens and Tinning (2009) noted that often the tool of reflection, or using memory, in teacher education had been used to assist teachers in acknowledging how their own experiences and knowledge shapes their "identities and actions as teachers" (p. 1125). However, these authors argued that by viewing memory as a tool and or process, researchers regarded the teacher as a "neutral, self-conscious

agent capable of rational analysis" rather than as an individual socially situated in a specific context. In their research, Ovens and Tinning demonstrated how a group of student teachers, engaged in this kind of group memory work, affected one another. The researchers found that "the nature of the discourse community in which the individual is situated enables different forms of reflection" (pg. 1130). Much like Ovens and Tinning (2009), the teachers in this study were also influenced by the way that they shared with one another, and the social context that they had created. For this community of teachers, their collective memory work became a situated practice, where memories were not neutral but directly related to their sharing processes within the group.

When asked if they felt that this kind of collective memory work was important to their current work, all nine teachers responded positively. Bree described how this work encouraged her to dig deeper into her memories but with a new kind of lens, that of an educator:

> The workshop activities led me to wanting to dig more into my past…bring up memories of learning and schooling and look at them now through the lens of an educator …The process …is absolutely important for educators. It is essential to our growth and skills of reflection and self-development. It's also deeply gratifying and feels like an important form of acknowledgement for a role that often can feel isolating or underappreciated. Feels so important to be thinking/working on larger threads and ideas when classroom time often feels so immediate in its day-to-day demands ….– Bree

For this group of educators, memories and the process of reflecting on those memories became an essential tool in the process and journey of becoming an educator and caregiver of young children. Below is Mara's written response to a prompt asking how collective memory work can impact an educator's reflection on pedagogy:

> Memories. They are key to me and have been for as long as I can remember. And that is a long time. They go back to when I was 2 ½ years old. And they are vivid. They are film clips. They include visual, olfactory, emotional, tactile information. They include important memories of people and places, of activities, of myself and most importantly, how everything made me feel. A range of feelings, responses to events, occurrences, things I saw or felt or heard or smelled.
>
> The importance of having held these memories for so long, and having always considered them somehow important, is that the memories are my sense of self, known only to me. Known only by me, they are the sense of self that supports me, that I wrestle with, that I feel have failed me, they show me my strong side and my weak side, that remind me I always have more work to do. They are battered against and forgotten, only to be remembered again. But, very importantly, they remind me that I am from a time and place. I had an origin and who and what I am now, has continually emanated from the place of origin. I consider it my truest self. My newest self. My enduring self. A self I can go back to. And this is something that supports my work with young children. The early information, the early relationships being formed with things, places and spaces, people, ideas and actions, desires. I must always remember my very dimensional self at those early ages. It is a way in and over time. It is in and of the children I am working and growing with.
>
> What I know now, after half a century of observing and reflecting on my own experiences as a learner, a seeker of knowledge, is that what we learn in our earliest years can often pop-up, through memory, so many years later and support our understanding as older learners.
>
> I think this perspective will aid me in recalling details of my life that have contributed and lead me to where I presently stand in time, as an educator. It may aid me in unfolding my story in a way that is interesting and relevant to others, and which in the process, might serve as a tool, to usher me forward in this work that I do. – Mara

Like Mara, many of the teachers in this group initially connected to the most negative memories of her schooling experiences but were able to, with time and support from the group, access more positive memories of their childhoods. For Mara, it was these positive memories that helped her understand something deeper about what she calls her "truest" self, or an "enduring self." This focus on endurance here, is important, as endurance, the process of sustaining something or bearing with patience, is what many of these teachers have noted as a key component to their work with young children in the institution of schooling and education. When sharing their negative experiences, the teachers described restrictive and controlling environments, so this ability to *endure* those settings, overcome that pain, and emerge from that experience as an adult with a purpose to create transformative and expansive learning environments is one that is admirable. This group of teachers was able to demonstrate a shared commitment to working together to heal their pain, and imagine what type of educator that they can be in the lives of young

children, knowing that they too, are creating the memories of learning that has the power to impact these children's lives and paths for many years to come.

Conclusion

In sum, collective memory work requires extensive critical and reflective analysis of one's early memories, a collaborative space for sharing, a group committed to engaging in such work together, and time to acknowledge the pain and damage one might have experienced in schooling and move towards remembering and connecting to the memories that were focused on the positive. As Samara had noted, working with one's memories involves a complex muraling process of strings and stories that sometimes feel invisible to us. By engaging in collective memory work, educators can make those strings visible and collaboratively work to make meaning of those experiences. It is the complexities and challenges of this work which also leads to the limitations of the study – as we work to understand our memories and how they relate to our current teaching practices, we may also begin to see a re-imagining of those memories. They are, like Plato imagined, impressions in a moldable wax – which can shift and change as we work with that wax, molding it in our collective processing.

It is important to note that this kind of work must not simply involve a recall of the memories of early learning, but must also include a process of questioning the larger contexts in which the early learning occurs – including the power that teachers hold in the classroom, the structures and ways that adults and children interact, the rules and rigidity that exist within a schooling institution. By examining, naming, and acknowledging these contexts, in-service teachers, as they did in this study, can begin to move to imagine alternative, liberatory, expansive and transformative learning spaces where children's voices and choices are acknowledged and respected. Using a combination of collaborative, critical reflection, teachers can engage in collective memory work that acknowledges the pains of early learning but focuses on the possibilities of learning for all students.

In the current state of early education in the United States, educators are facing an educational landscape that involves increased academic pressure and a growing focus on standardized methods of instruction and assessment. With this increased focus on academic rigor, early childhood educators may find themselves struggling to create play-based and liberatory learning environments for the learners in their classroom. Opportunities to reflect on how they were offered these kind of spaces as a young child is an essential element to identifying how they can currently create them. While this kind of work and space is challenging to find and sustain, this group demonstrated that with time, this kind of work helps sustain itself as teachers continue to imagine and embody the care and kindness that they promote in their students. By collaboratively reflecting on their memories, these teachers were able to see themselves as learners on a life-long journey, with the ultimate goal of ushering them forward in this important work that they do.

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Research Article

STEM starts early: Views and beliefs of early childhood education stakeholders in Tanzania[1]

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Abstract: For about a decade, Tanzania has intensely focused on developing literacy and numeracy skills in pre-primary and early grades programs. Recently, the attention has shifted towards the significance of teaching Science, Mathematics, Technology and Science (STEM) in the early years. To enhance the 21st century skills necessary for building a middle income and knowledge-based economies, the existing empirical evidence emphasizes the need for STEM education starting from pre-primary level. This paper aims to unpack the state of the STEM education in pre-primary education in Tanzania. By using homogenous purposive sampling, two policy-makers, three ECE academics, eight school principals, and eight pre-primary teachers from rural and urban public schools were recruited. Data were collected by interviews, semi-structured survey questionnaires, and documentary analyses. Though there was consensus among ECE stakeholders that children should be exposed to STEM environments as early as possible, findings indicated that even among ECE practitioners, there is a very vague understanding of what entails of STEM education in ECE. Further, while teachers were aware and guided to facilitate science and mathematics education, they were not aware and there were no specific policy briefs/circular instructions on how to facilitate Technology and Engineering education in ECE. The paper concludes with suggestions on how to integrate STEM in early childhood education, especially for Tanzania.

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Early childhood education; STEM in ECE; Tanzania; ECE stakeholders; Stakeholders' views and beliefs

Introduction

There is sufficient research evidence that the scientific dispositions demonstrated by adults have their roots in early childhood (Edwards, Gandini, and Forman, 1998; Heckman, 2006; Katz, 1999). According to Katz (1999), dispositions are mental inclinations that make an individual respond in specific ways under specific conditions. Some of the typical examples of dispositions include creativity and curiosity (Bowman, Donovan, and Burns, 2001; Stylianidou et al., 2018). For one to develop scientific dispositions, one needs to receive experiences that stimulate and nurture specific mental habits required for scientific thinking (Beghetto and Plucker, 2006). In this paper, we argue that while the current efforts by the government of Tanzania to enhance science and technology tend to target education levels other than early childhood education, more results that are positive would come from a focus on early childhood education.

The need for developing STEM dispositions among young children is a theme whose coverage in the literature is quite high (Beghetto and Plucker, 2006; Doryan, Cautam, and Foege, 2002; Ndijuye and Rao, 2019; Pasnik and Hupert, 2016). While education stakeholders in developing countries are reported to direct most of the resources towards improvements of education offered in levels other than early childhood education (Doryan et al., 2002), the critical window of opportunity is lost and consequently not much can be expected from such investments (Heckman, 2006; Ndijuye and Rao, 2019).The foundations

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for STEM dispositions aredeveloped early in children's lives and forward-looking education systems capitalize on investment in this level of education (Duncan et al., 2007). No wonder, the recent surge of interest in the design and implementation of early childhood programmes targeting to lay strong scientific foundations in Science, Technology, Engineering and Mathematics (STEM) has received enormous attention across the world (see Pasnik and Hupert, 2016). This paper presents an argument that if Tanzania wants to prepare scientists for the future, a focus on early childhood education is inescapable. We argue this by targeting improvements in young children's science laboratories.

Tanzania Education System

The URT follows the 1(2)-6-4-2-3+ formal educational model, which includes one (or two)years of pre-primary education, 10 years of compulsory basic education (six primary and four lower secondary), two years of upper/high secondary, and three or more years of tertiary. The system evolved from the inherited 4-4-4-4+ colonial education system. With Tanzania's rapid economic growth and social changes, and technological advancements throughout the world, by 2003 it was obvious Tanzania's existing education policy was not bringing the desired results. The Education and Training Policy (ETP), (Ministry of Education & Culture [MOEC], 1995) targeted increased access to education without compromising the quality thereof, and to focus on issues related to inclusiveness, class sizes, improved teacher training, and attrition issues (Ministry of Education and Vocational Training [MoEVT], 2015). As such, educational practitioners had started to argue for changing the education policy to meet new demands.

STEM Education in Early Childhood in Tanzania

While teacher education and professional development in the fields of mathematics and science has played significant contributions in the preparation of young children ready for schooling, establishment of science laboratories for children's science learning has recently occupied a central position in research (Eshach and Fried, 2005; Watters, Diezmann, Grieshaber, and Davis, 2000). Overall, the introduction of science laboratories in early childhood classrooms is built on the premise that what happens to the child during early childhood lasts for a lifetime (Black et al., 2016) and that early childhood education contributes to a sustainable society (Pramling and Kaga, 2008). Tanzania would further be a strategy for improving the learning environment for children to explore and experiment on their free will.

Although Tanzania has demonstrated significant efforts to improve early childhood education (MoEVT, 2015; Mtahabwa, 2009, 2010; Ndijuye and Rao, 2018; Tandika and Ndijuye, 2019a), there is sufficient evidence that more effort is needed to improve this education sub-sector in general and science learning in particular. Overall, most early childhood stakeholders in Tanzania have limited understanding of what constitutes best practices in early childhood education and the benefits therefrom (Mtahabwa, 2014; Ndijuye, 2019). In this broad context, it is not surprising to find plans and activities targeted to strengthen scientific dispositions in young children less promising.

The research base in the field of early childhood education in Tanzania indicates that while studies in early childhood policy (see for example, Mtahabwa, 2007; Ndijuye and Rao, 2018; Tandika and Ndijuye, 2019b), and those targeting curriculum and pedagogy (Libent, 2015; Machumu, 2013), have received adequate attention, focus on specific issues in early childhood curriculum areas – STEM education in our case; has received insufficient research attention. As this remains the case, empirical evidence suggests that Tanzania's future in the field of STEM will be problematic unless deliberate interventions are planned and implemented to rectify the current situation (Semali and Mehta, 2012; Tandika and Ndijuye, 2019a). This paper could contribute much to that end.

Objectives of the Study

This study was guided by the following objectives:

1) Explore perceived beliefs and views of teachers on the current status of STEM education in Tanzania,

2) Assess pre-primary school teacher's experiences in teaching and learning of STEM in early childhood education;

3) Examine challenges faced by pre-primary teachers in facilitating STEM dispositions in Tanzania.

Method

Research Approach and Design

The study employed a qualitative research approach with a phenomenological design. This is a design within the interpretivist paradigm that investigates different ways in which people experience something or think about something (Bowden, 2005). This design allowed the researchers to locate commonalities of lived experiences (Patton, 2009) of pre-primary stakeholders related to STEM education in Tanzania

Sampling Technique and Sample Selection

Given the specific status and circumstances of STEM education in Tanzania, participants of the current study were those from schools selected to participate in the project titled "Strengthening foundations for scientific dispositions in Tanzania through improvements in young children's science laboratories". Participants were selected using homogeneous sampling technique to obtain insights and understanding of the status, beliefs, challenges and perceived future of STEM education in Tanzania.

Though the idea of having some kind of childcare centres was conserved in 1982, pre-primary education in Tanzania is relatively a new phenomenon. As such, two policy-makers, three ECE academics, eight school principals (four were from public schools in urban area and four from public schools located in rural area), and from each school, one pre-primary teacher (Total of eight teachers) from rural and urban public schools participating in the project were purposively recruited and involved in the study. Given the objectives of the current study, the selected sample size was large enough to allow triangulation of data sources or informants (Onwuegbuzie, Leech, and Collins, 2012), and data collection methods (Patton, 2009) hence, saturation of analysed data (Creswell, 2012).

Informants' preliminary information.

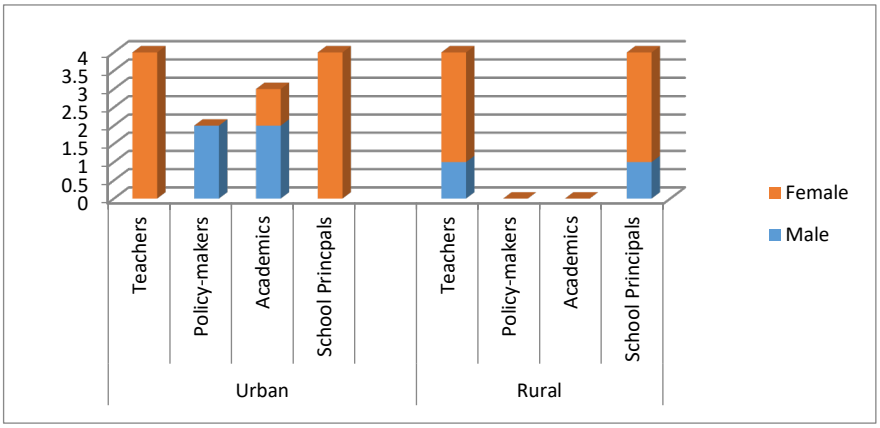

Figure 1: Informants' distribution by Gender and Urbanicity

Informants' educational characteristics

As indicated in the Figure 2 below, teachers in the visited schools had educational qualifications that made them employable by the government serve in public schools. Though all of them had educational qualifications ranging from teaching certificate to Bachelor of Education, however, none had qualifications to teach at pre-primary level. Most of them reported to have attended short in-service training organized by the government to learn about teaching and learning strategies for the pre-primary children, instructional materials preparation, and preparing learning environment for effective and efficient learning to occur.

The in- service training courses attended ranged between ten days (five teachers) and one year (two teachers). The other teacher had attended one year of pre-service training on early childhood education in a private college in Dodoma City. Regarding their working experience at pre-primary level, five teachers had less than a year, while the remaining three had teaching experience in early child hood education ranging between one to two years. Teachers revealed that the age of children ranged between 48 to 72 months.

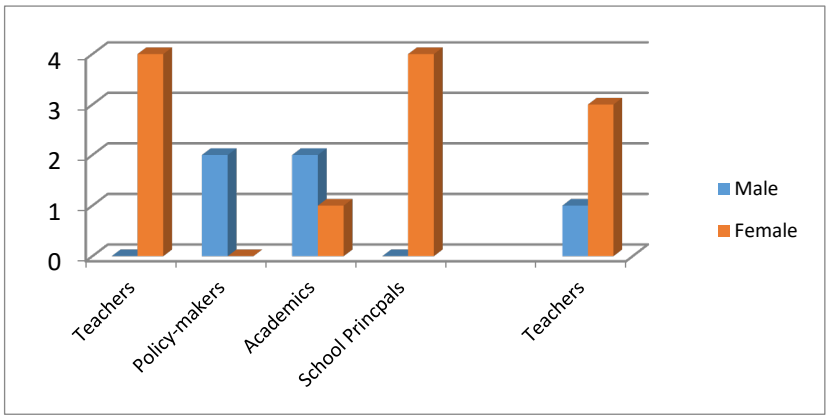

Figure 2: Informants distribution by Gender (Source: Field data, 2019)

Study Area and Context

In 2018, there were 1,340,090 pre-primary pupils enrolled in Tanzania, out of an eligible pool of 1,535,000 pre-primary-aged children. Among those enrolled, 63 percent were in rural areas, while the rest were living in urban or sub-urban centres. In the same year, there were 8,354 qualified pre-primary schoolteachers, making the teacher-pupils' ratio 1:124 compared to a 1:25 official and international standard ratio (Ministry of Education, Science & Technology [MEST], 2017). However, most of the qualified teachers preferred to reside and work in urban areas, resulting in lower teacher-child ratios in rural pre-primary schools (Ndijuye and Tandika, 2019). The exact number of pre-primary teachers in rural areas is still unknown.

Data Collection Tools

This study triangulated interviews, semi-structured survey questionnaires, and documentary analyses in collecting required data. Due to its flexibility and time-efficiency, semi-structured survey questionnaires were used with schoolteachers. Policy-makers and pre-primary school principals were individually interviewed. Classroom setting was surveyed by using semi-structured observation kit which was section in the survey questionnaires. The targeted documents were the current Education and Training Policy, pre-primary guideline, pre-primary syllabus and teachers' lesson plan**.** The predominantly qualitative methods were used to reduce the risk of misinterpretation by informants. The techniques provided a chance of explaining the purpose of the study and clarifying queries raised during the course of discussion (Creswell, 2012). Also, these techniques permitted the establishment of rapport and co-operation between the authors and the informants. This was essential in enabling informants to reveal their views and beliefs in their own words (Creswell, 2009; Patton, 2009).

Data collection procedure

The data collection process involved face-to-face conversations between the researchers and informants where information was noted down in the field notebook complimented by a tape recorder. Later, the responses were compared with those of other groups in the study. For this study, the targeted documents were existing pre-primary education policy briefs and documents. The researchers decided to use this method because these documents could be secured quickly and easily, and covered a wider geographical area and longer reference periods without much cost (Creswell, 2012; Punch, 2005). Further, the selected policy documents and briefs were selected based on the criteria that they informed about current status of ECE in general and pre-primary STEM education in particular.

Ethical Issues

Ethical issues were observed by requesting permission and consent from National Bureau of Statistics, which oversees all research activities in the country, and the University of Dodoma where the researchers are attached. Further, the collected information from each participant was assigned pseudonyms as part of concealing participants' identities. Finally, as part of research ethical conduct; the researchers consulted the school authorities to obtain their consent to include their respective teaching staff in the study. Confidentiality wasobserved by assigning passwords to files of softcopy data, and unauthorized person had no access to the collected hard and softcopy data.

Data Analyses

Data were subjected to interpretational analyses by involving systematic set of procedures to code and classify qualitative data to ensure that important constructs, themes and patterns emerge (Miles and Hubberman, 1994). Specifically, the raw data obtained from semi-structured questionnaires and interviews were coded to obtained relevant texts, repeating ideas, themes, theoretical constructs, research concerns and theoretical narratives. From repeating ideas, themes and sub-themes were developed. Themes were organized into abstract ideas or theoretical constructs and later developed into theoretical narratives (Patton, 2009) which were used to bridge between the concern of researchers and participants' subjective experiences using their own words (Creswell, 2012). Further, some quantitative data were descriptively analysed to respond to some parts of the presented research question and concerns.

In analysing documents, the following two issues guided how themes were developed: (a) how information was presented, and (b) the status of the policy brief/resolution/by-law/decision. In order to maximize objectivity, communicability, transparency, and coherence techniques were deployed (Auerbach and Silverstein, 2003). Specifically, the authors triangulated data sources, data collection instruments, and bracketed all of their previous understandings, beliefs and assumptions during data analyses (Onwuegbuzie et al., 2012). Equally important, the data analyses processes were jointly done by the two authors.

Inter-rater Reliabilities

The two authors with doctorates (PhD) degrees in Early Childhood Education jointly collected and analyzed data. The first author coded the field notes to categorize patterns and constructs of differences in the participants' views. To establish inter-rater reliability, 30 percent of the field notes were coded independently by the co-author, and inter-rater reliability calculated by the percentage of agreement among the three raters; at the end, 90 percent consensus was reached.

Findings

Perceived Beliefs and Views of Stakeholders on the Current Status of STEM Education in Tanzania

This study intended to find out views and beliefs of pre-primary teachers on the status of science, technology, engineering and mathematics education in Tanzania. The authors assumed that there should be some dominant views and beliefs among pre-primary teachers about STEM education in Tanzania. Two sub-themes were developed, namely, teachers' beliefs about STEM education in pre-primary level, and teachers' views about STEM education at the pre-primary level.

Under the sub-theme about pre-primary teachers' beliefs about STEM education in Tanzania, 7 (87.5%) teachers revealed beliefs that pre-primary children should be exposed to STEM environment to build its dispositions for future success in this area. They further indicated beliefs that the foundations for future success in STEM programs solely depended on the experiences gained during the early years. One of them said:

> Most of the children in public schools come from lower SES families. The school is the only place they get some exposures on various knowledge and skills – including STEM dispositions. As such, for the children's future success in STEM programs, it is very important to expose them as early as in pre-primary stage.

One teacher believed that pre-primary children do not need exposure on STEM dispositions because

children are born with intellects that enable them to learn anything at any stage in life. To him, pre-primary children are too young to be exposed to complex STEM disposition, they still need time to grow and enjoy their childhood. In his own words, he said:

> Given its complexities, STEM education and its disposition is such a heavy burden. Pre-primary children are too young to be exposed to STEM. They still need time to mentally and physically grow before embarking in such laborious tasks. At this level, it is good for children to learn to read before they read to learn.

Further, some teachers were of the view that facilitating STEM disposition among pre-primary children contradicts parental and school authorities' expectations to have children learn basic literacy and numeracy skills. Pre-primary teachers revealed that parents, school boards, and the communities around looks forward to having literate and numerate pre-primary children. As such, developing STEM dispositions among pre-primary children is considered a waste of time. One teacher revealed that:

> While children are eager to learn STEM dispositions, parents want them to learn reading and writing as early as possible and so are the school authorities. If you (a teacher) do not teach them such skills, you may find yourself in trouble.

An interesting finding was the revelation that some school principals did not consider classroom arrangement and organization as an important component in facilitating STEM disposition among pre-primary children. Separately, the researchers observed classroom arrangements and later asked teachers' views about the best classroom structure, which may enhance children's dispositions of STEM learning. One of them revealed that:

> Given the importance of STEM education in modern world, we need to equip pre-primary children with a very strong STEM foundation. This can be done in any environment and context. For our context, lecturing is better because these children do not know anything about STEM, so how can I share and exchange STEM knowledge with them?

Findings from the analysed documents indicated that there are neither specific policy briefs nor circular instructions on how teachers should facilitate STEM education in the early years. The current pre-primary syllabus and teacher's guide (Kiongozi cha Mwalimu) does not have specific instruction on how to facilitate STEM dispositions in young children. The existing pre-primary syllabus and teacher's guide has specific instruction on how to facilitate Mathematics foundations such as early number concepts and basics of mathematics.

While there was consensus among ECE academics about almost non-existing STEM disposition in ECE in Tanzania's education system, policy-makers were of the view that STEM disposition is critically important at pre-primary level of education, and it should be given equal consideration and treatment when formulating and financing other domains such as literacy and physical development. However, school principals considered viewed ECE as a preparatory class for grade 1, though not a necessary level in education system. As, STEM disposition was considered as "bombarding children" with a lot of concepts unnecessarily. One of them revealed the following:

> If you look at the current curriculum, pre-primary children are already overwhelmed with a lot of things to study. I don't think we need to add-up more things for them. Remember, they (pre-primary children) are still too young to start learning complex technology and engineering concepts. I think numeracy and science concepts are enough at this level.

Teachers' Experiences in Teaching and Learning of STEM at Pre-primary Level

Some teachers (6 of them) reported to be aware of the teaching and learning of science and math than technology. In their experience and understanding, they experienced that the two subjects (science and math) are among the six overarching competencies underlying the pre-primary education curriculum. Two of them were hesitant and seriously concerned that teaching and learning technology for pre-primary children will be a premature activity. They established that equipment's/materials involved in teaching and learning of technology are so advanced and sophisticated for the children to learn. One of them confided that:

> I do not teach my children/pupils technology because it is mostly based on globalization, which tends to influence children negatively and become addicted with technological equipment, hence pay less to caregivers.

In contrast, few pre-primary teachers revealed to teach technology in different areas of their lessons. One of them said that:

> "Normally I teach technology by integrating concepts/ activities in every session and learning occasion. For instance, moulding different shapes using mud or boxes to make cars and/or balls.

Unlike limited understanding and poor experiences on teaching and learning technology, researchers learnt that science and math's was learnt and taught well. One of them reported that:

> "I teach science by requiring children to mention things found in and outside the classroom including those found at home."

Through identification of things found in different environment (home and school), teachers believe that they develop children in addition to familiarizing with the environment; they also learn to conserve the environment and able to identify things that are dangerous to their life. Teachers identified things that could harm children are those with sharp edges such as nails. Other activities includedwashing their clothes are cleaning the school and home compounds, practice cleaning utensils, tools/equipment they use in playing/filling the land, and watering garden.

Health practices such as children's wearing shoes when going to toilet to protect them from direct contact with bacteria that could cause infectious diseases, enabled them to develop scientific knowledge and skills related to diseases and good health practices. Scientific disposition is developed and enhanced at pre-primary level when children are involved in scientific acts like collection of insects and observe to identify parts and roles of each part. Broadly, children learn to keep their health by doing health-related activities (cleaning utensils, cleaning their shoes, wearing shoes and ensuring that they do not go to the toilet bare feet; and also cleaning their body in general)and learn about things (both harmful and useful) found in their environment (home and school).

Classroom Organization

As part of the study, the researchers surveyed variations in classroom arrangements conducted before interviewing teachers. They came-up with the following findings:

1. Talking walls, that's most of the classroom had some pictures (teacher made) of different science-related things such as fruits, numbers, letters and objects like people or houses; other pictures were of flowers, trees and some furniture.
2. Traditional classroom organization in which arrangement of desks was in rows and columns that made all children face the chalkboard from which teachers lectured and facilitated learning. This implies that learning was more of the whole group discussion with occasional learner-teacher partner interaction. Perhaps, the observed classroom arrangement could be due to extremely large number of children accommodated in the same room for learning.
3. The dominant teaching and learning method was lecturing. All of the observed pre-primary teachers preferred to use teacher-centred teaching and learning strategies. This method limited children's interaction with teachers and content. This may have negative implication on children's learning of STEM and other dispositions.

Generally, in all visited schools, the state of the learning environments were poor characterized by limited materials and poor organization to promote face-to-face children discussion.

Teaching and Learning Environments

There were varying responses regarding the quality of the working environment. About 75 percent of teachers and 80 percent of school principals expressed that the working environments at pre-primary level is poor. They claimed that it's characterized by lack of specific classrooms for pre-primary children and unsupportive climate from school authorities. It was revealed that there was no specific classroom for pre-primary children. As such, they had to shift and change rooms in case any emergency or activity at school. One of the teachers reported that:

> "Almost every other month I had to move from one classroom to the next. For example, whenever there is an examination or tests for upper classes, we (pre-primary teacher and children) have to vacate our classroom for them. I think school authority do not consider pre-primary children as legitimate students of this school hence are least valued"

Limited availability of textbooks to support STEM learning was reported contribute on the state of working environment. Pre-primary teachers reported to have only one copy of textbooks for each overarching competencies. They claimed that though these children have not developed other literacy skills, yet having extra copies of books would help them build strong STEM foundations. Family poverty including failure of caregivers to support their children for early and easy access to school (lack of transport); and poor care in terms of cleanliness, and hunger. This led into children's poor emotional competences such as, inability to bond and interacts with their peers, outburst anger, and isolation.

Challenges facing teaching and learning of STEM in Tanzania

The researchers were interested to understand challenges facing preschool teachers in effectively facilitating STEM disposition in Tanzania. Informants revealed that (i) Limited working resources (instructional materials, textbooks, desks), (ii) Overcrowded classrooms were the main challenges facing pre-primary schoolteachers.

Limited working resources

Findings revealed that there were limited numbers of pre-primary books, play materials and child-sized desks and tables which, in fact, limiting children to sit and learn comfortably. Consequently, teachers reported that children could inadequately develop fine-motor skills (Holding and using writing materials such as pencil and exercise books) and lacked freedom to move within and outside of the classroom. Further, it was revealed that, even the available desks and tables were insufficient given the large number of children. The adult-sized desks and tables could accommodate between four to five pre-primary children. One of the school principals revealed that:

> "My school has about 2000 pre-primary and primary children. However, I have only 300 desks, which cannot serve all these children. In such context, the priority is given to examination grades (Examination grades in Tanzania are Grades four and seven). Equally important, though it is important, but I don't have child-sized furniture for pre-primary children"

Overcrowded classrooms and teacher qualifications

Informants' responses and classroom observation data revealed that there are too many children occupying the same classroom with mixed ages. In all the observed schools, pre-primary children were found occupying a single room while they are at or above 150. Great number of children in the single room under one or two facilitators, high number of children impacts teacher's initiatives to reach every child to learn about their strength and weakness for appropriate support. Teacher's inability to reach each child during learning is a challenge as there are only 20 minutes allocated for a learning competency among the six they are required to learn. Therefore, in the 20 minutes, it is difficult for the teacher to reach every learner and determine his or her achievement level for scaffolding.

While working environment in terms of inadequate resources and fewer classrooms/ use of one classroom for many children was the major challenge in teaching and learning STEM, children's ability to learn was found to be good hence being not among the challenges impacting effective learning. This implies that children are eager and participate well in learning, as they are knowledgeable on many things that are found in their environment.

The most interesting and perhaps important challenge revealed by teachers was absence of qualified pre-primary teachers. All of the teachers in this study were trained to teach at primary school level – none was trained at pre-primary level. However, school principals reported that they regularly send their pre-primary teachers to attended various seminars and workshops related to teaching at this level. However, these in-service training were very rare and did not last more than 7 days each. Nevertheless, something is better than nothing as one teacher revealed the following:

> "I'm a trained primary school teacher with experiences of about 10 years. Now, as you can see, I teach pre-primary class. These are very young children overcrowded in a single classroom of about 182 of them. Teaching them is not the same as teaching more disciplined grade 4 children. Last year I attended a 7-days workshop about teaching literacy at this level. I hope you guys will organize a workshop on how to facilitate STEM learning as well."

The current circular on teachers' scheme of service (2016) instructs that each individual teacher should be assigned responsibilities as par his/her professional qualifications. In other words, teachers trained and qualified to teach at primary level should be appointed and assigned to teach at that specific level. If Tanzania does not have qualified pre-primary teachers to cater for the fastest-growing subsector, it is unlikely to find these unqualified teachers to facilitate STEM dispositions for children in this cohort.

Discussion

The current study aimed to explore perceived beliefs and views of teachers on the current status of STEM education in Tanzania, assess pre-primary school teacher's experiences in teaching and learning of STEM in early childhood education; and examine challenges faced by pre-primary teachers in facilitating STEM dispositions in Tanzania.

Beliefs and Views of Teachers on the Current Status of STEM Education in Tanzania

Most of the Tanzanian teachers were of the view that children should be exposed to STEM during pre-primary stage to build a strong foundation for future academic and profession success in STEM fields. This is consistent with other studies which indicated that young children are much more capable of learning STEM concepts and practices than originally thought by the ECD research community (Institute of Medicine [IOM] and National Research Council [NRC], 2015). A growing body of empirical evidences indicates a very strong correlation between early experiences with and exposure to STEM subjects with later success in those subjects and career in those fields (Duncan et al., 2007; Duncan and Magnuson, 2011; IOM and NRC, 2015; Kilbanoff, Levine, Huttenlocher, Vasilyeva and Hedges,2006; Saçkes, Trundle, Bell, and O'Connell, 2011).

Early exposure to mathematics during pre-primary years is said to predict later math achievement even during high school years (Kilbanoff et al., 2006; Saçkes et al., 2011). And the skills gained during the pre-primary years has been said to predict later academic achievements more consistently than early attention and reading skills (Kilbanoff et al., 2006; Saçkes et al., 2011). Early math skills – including reasoning skills is considered to be an integral part of children's development of "learning to learn" skills – such as fostering children's ability to reason and talk about their mathematical thinking (Kilbanoff et al., 2006; STEM Smart, 2013).

Further, available evidence supports children's early exposure to science and technology inquiry (Eshach and Fried, 2005; Kilbanoff et al., 2006; STEM Smart, 2013). Children who are exposed and engage in scientific and technological activities as early as prekindergarten age develop attitudes toward science and technology fields (Osborne, Simon, and Collins, 2003; Saçkes et al., 2011; STEM Smart, 2013). The developed positive attitudes also correlate with later academic achievements in scientific and technological related subjects (Patrick, Mantzicopoulos, Samarapungavan, and French2008; Saçkes et al., 2011). And these children are more likely to pursue STEM expertise and careers later on as adults (Duncan et al., 2007; IOM and NRC, 2015).

In Tanzania, with limited supportive environments for STEM learning, teachers' supportive views and beliefs towards STEM disposition during the early years becomes critical (Semali and Mehta, 2012; Tandika and Ndijuye, 2019a). Teachers' beliefs are critical in children's learning and development (Farell and Ives, 2015; O-saki, 2007; Semali and Mehta, 2012) since their teaching reflects their beliefs (Farell and Ives, 2015; Tam, 2015). This is because pre-primary children develop STEM disposition in informal and formal settings, and by engaging in experiential learning (Osborne et al., 2003; Saçkes et al., 2011).

In Tanzania, the existing education policy and circular documents are silent on how pre-primary children would be exposed to STEM education. One of the indicators of the public seriousness and commitments in addressing needs of a social group is how those needs have been addressed in the existing

policy and practice documents (Mtahabwa, 2010) and having clear implementation plans to handle and solve the underlying problems facing that group (Mtahabwa, 2010; Ndijuye and Rao, 2018). The fact that pre-primary education policy and practice documents are quiet about how, when, and why children should be exposed to STEM concepts and practice suggest that Tanzania needs to comprehensively integrated approach to this matter.

Teachers' Experiences in Teaching and Learning of STEM at Pre-primary Level

Findings of the current study revealed that pre-primary teachers in Tanzania had experiences teaching math and science concepts than technology and engineering. This may be rooted in the existing pre-primary curriculum. The analysed documents disclosed that there is neither existing policy brief nor curriculum guideline about STEM education at this compulsory level of education. However, such experiences are not uncommon in early childhood research. While there is a consensus among pre-primary researchers that children come to school with sufficient knowledge about the natural world (Pantoya, Aguirre-Munoz, and Hunt, 2015; Shonkoff and Phillips, 2000), can abstractly and concretely think (IOM and NRC, 2015), but the early technology and engineering realms are less understood and taught (National Association for the Education of Young Children [NAEYC] and Fred Rogers Center for Early Learning and Children's Media, 2012; Pantoya et al., 2015). This may be due to misconceptions among many pre-primary stakeholders that engineering and technology as subjects at pre-primary levelmeans using digital and/or electronic technology, such as touch-screen tablets and construction of block buildings and bridges in a classroom.

It is a well-known fact that STEM dispositions at pre-primary level requires conducive and supportive teaching and learning environments such which facilitates children's hands-on learning (Clements, 2002; Sarama, Lange, Clements, and Wolfe, 2012). These environments include proper classroom organizations, learning corners, and "talking walls". However, findings revealed that pre-primary teachers preferred to use traditional, non-interactive methods such as lecturing and demonstrations. This may have unpleasant implications on the STEM foundations for these children. Use of teacher-centred methods may have been partly the result of exceedingly unmanageable class sizes of between 160 to 180 children congested in a single classroom with one or two teaching assistants. It is important to note that in Tanzania the official teacher-child ratio is 1:25 (MEST, 2017).

Further, it was found that most of the teachers serving public pre-primary classes in Tanzania were not trained to cater for this age cohorts. They were trained as primary school teachers – were not even trained to serve early grades children. A growing body of empirical evidences indicates that in most developing countries with limited educational resources, quality of teachers complemented with supportive home learning environment, is a single most important factor in enhancing children's development and learning (Aboud and Hossain, 2010; Melhuish et al., 2008; Ndijuye, 2019). Teacher quality becomes more critical at the foundational pre-primary level, especially for fundamental fields such as STEM (Lauwerier and Akkari, 2015; Tandika and Ndijuye, 2019a). However, it is important to note that something is better than nothing – while Tanzania has successfully improved access to pre-primary services (MEST, 2017), it is now a very high time to focus on quality of services so much so that to improve practices.

Challenges Facing Teaching and Learning of STEM at Pre-Primary Level in Tanzania

Limited teaching and learning materials such as STEM-related play materials and books were reported to be one of the challenges facing teachers when facilitating STEM dispositions in Tanzania. This challenge is not new in public pre-primary classes in Tanzania (Ndijuye and Rao, 2018; Tandika and Ndijuye, 2019b). Comparatively, it is understandable that public budgetary investment in this subsector is relatively low (Mtahabwa, 2015; Ndijuye and Rao, 2018), and not a priority of most primary school principals (Mghasse and William, 2016; Mtahabwa, 2015). However, scarcity of teaching and learning resources is exceedingly overstated.

For example, while Tanzania has abundant supply of natural and environmental-friendly play

materials for pre-primary children, teachers tend to poorly improvise such materials to serve specific purpose of the lesson such as STEM dispositions (Mtahabwa, 2015; Tandika and Ndijuye, 2019a). Most of the science concepts can be taught by using Tanzania's exceedingly rich green environments, which are familiar, and fits well into the mental schema of children. Nevertheless, improvisation of teaching and learning materials requires satisfactory teacher's qualifications, commitments and adoptability (Buckler, 2015).

Having an extremely overcrowded classrooms led with lowly qualified teachers is not something to be proud of. While Tanzania has made tremendous gains in broadening access to basic education – including pre-primary education (MEST, 2017; Ndijuye, 2019) quality of services for these children is still low. In the context of the current study, quality pre-primary education is conceptualized to refer to both structural and process aspects of quality. The existing pre-primary guidelines instructs 1:25 teacher-child ratio (MEST, 2017), however, the study revealed that on average, there were about 160 children in a single classroom in urban public primary schools served by two teachers, while in rural areas, the average classroom had about 180 children served with only one teacher. Overcrowded classroom may have negative implications on how pre-primary teachers facilitated and children learned STEM dispositions.

Conclusion and Recommendations

Available empirical evidences suggest that generally Tanzanians have limited exposure to STEM learning. In other words, they struggle to understand why it matters and how it works. At pre-primary level, even important stakeholders of this subsector such as teachers and school principals do not a clear understanding of the importance and processes involved in equipping children with STEM foundations. Providing a clear illustration of a STEM learning program—what participants learn and how they learn it, with what goals and outcomes—sketches a memorable picture that can fill in cognitive gaps.

Therefore, in a context with limited education resources, it is critically important to equip pre-primary teachers and school principals with clear understanding of STEM education and its importance to pre-primary children. The findings of this broaden our empirical understanding of the current status of STEM education in one of the low-income contexts and how we can make use of the available limited resources to maximize children's STEM dispositions. Given the socio-economic importance of STEM education, there is a need for more research to examine the best ways to facilitate early STEM dispositions in contexts with limited educational resources coupled with relatively low quality pre-primary teachers. Further, while presence of excellent STEM education policy does not guarantee good practices at classroom level, however, it is a very important milestone in improving children's STEM disposition. Lack of policy and practice guidelines on how to facilitate STEM education among pre-primary children in Tanzania should be addressed. STEM education should be inserted in the existing pre-primary teachers' training curriculum. This should be done while exposing teacher's college tutors to STEM education.

Declarations

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Research Article

Parents' role in adolescents' leisure time use: From goals to parenting practices

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Abstract: Inspired by Ann Swidler's toolkit theory, this qualitative study aims to achieve a better understanding of social class differences in parenting practices and, in turn, in young people's leisure time use. To that end, 32 semi-structured face-to-face interviews with parents from middle- and working-class families were conducted in a small city in Belgium. An inductive thematic analysis revealed substantial social class differences with respect to three parenting practices: (1) setting an example, (2) resolving conflicts and (3) facilitating leisure activities. The interviews showed that these differences were mainly linked to social class differences in parents' resources: working-class parents more often lacked flexible time, financial resources, an extensive social network on which they could rely and the institutionally required attitudes, skills and experience to engage in the above-mentioned parenting practices. We conclude that young people's (continued) institutional leisure participation puts high requirements on parents and not all (working-class) parents are able to live up to such requirements. In that way, contemporary leisure settings reproduce rather than mitigate inequality in the use of leisure time.

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Introduction

Today, policymakers and researchers pay a lot of attention to young people's participation in adult-supervised, regular and rule-led activities that occur in an institutionalised setting (Bennett, Lutz and Jayaram, 2012). Such organised activities are believed to contribute to young people's skills and attitudes, and in that way, prepare them for their adult lives (European Commission, 2015; Muyters, 2014; Wyn and Woodman, 2006). However, young people's participation in organised activities differs according to socio-economic status: working-class young people are often underrepresented (Bennett et al., 2012; Furlong and Cartmel, 2007). As these young people are believed to miss out on important learning opportunities, policymakers and researchers problematise their non-participation and try to increase their participation levels (Van de Walle, Coussée and Bouverne-De Bie, 2011). Based on the finding that parents play an important role in young people's leisure time use, policymakers and researchers approach parents as 'leisure providers' and 'facilitators', who are expected to make sure that their children's leisure time is well-spent, that is, in assumed beneficial organised leisure activities (Council of Europe, 2003; Fawcett, Garton and Dandy, 2009; Zeijl, 2001). Research demonstrates, however, that there are persistent social class differences in the role parents play in their children's leisure time use. Lareau (2003) and Vincent and Ball (2007) found that while middle-class parents actively encourage their children's involvement in organised leisure activities, working-class parents impose less structure on their children's activities and focus less heavily on such participation. For middle class parents, steering their children to a great variety of organized activities was a key component of the planned 'developmental trajectory' they designed for their

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children.

Although it is not yet clear why social class differences in the parents' role and, in turn, in young people's leisure time use, come about in practice, researchers and policymakers plea for initiatives to inform, advise, convince and educate parents of these so-called non-participants (i.e. often working-class parents) about the educational benefits of organised leisure participation (Council of Europe, 2003). What is remarkable, though, is that we found in an earlier study that there are no large differences in the educational goals that parents from different social class backgrounds pursue for their children: our earlier work documented that when asked about the educational goals parents attached to their young people's leisure time, both middle- and working-class parents referred to the same goals to which leisure activities should contribute: teaching young people skills and societal values and norms, having social contexts, fostering independence and offering relaxation (see Van der Eecken, Spruyt and Bradt, 2019). This means that differences in young people's leisure time participation cannot be explained by differences in educational goals of working- and middle-class parents.

Given this lack of clarity, this study aims to gain a better understanding of social class differences in the role of parents and, in turn, in adolescents' leisure time spending using data from 32 interviews with a socio-economically diverse group of parents of adolescents (aged between 12 and 18 years old) in Flanders (the Dutch-speaking part of Belgium). The class perspective used in this paper is inspired by the work of Pierre Bourdieu (1986, 1993). According to Bourdieu, tastes, attitudes and behaviour vary with cultural (skills, knowledge, values, educational degrees and professional titles), social (resources accrued by virtue of possessing a network) and economic (material and financial resources) capital. The overall volume of capital can be seen as a continuum on which individuals occupy different positions (Bourdieu, 1986; Woodman and Wyn, 2015). In this paper, we are interested in parents who strongly differ in terms of their general volume of capital: middle- and working-class parents. Though we recognize that both middle- and to a lesser extent working-class parents cannot be considered as homogenous groups (and in fact vary in terms of their capital composition), in this study we aimed at identifying clear dimensions of stratification between working-class and middle-class parents. We, therefore, categorise parents into two groups. In the following section, we first go into the Toolkit theory of Swidler as our main theoretical framework.

From Goals to Strategies of Action: Culture as a Toolkit

This paper aims to advance our understanding of social class differences in the role parents play in adolescents' leisure time activities. In this section, we argue that a shift from a focus on people' *goals* to people's *strategies of action* might help us to get a better grip on these differences.

As already mentioned, previous research (Van der Eecken et al., 2019) suggests that social class differences in parents' role cannot be explained by social class differences in the goals that parents pursue through their children's leisure participation. This finding aligns with a more general observation that what people want contributes little towards explaining their effective behaviour (Swidler, 1986). Indeed, Ann Swidler was one of the first scholars to show that people may have similar aspirations while remaining profoundly different in the way they act. Her ideas criticised the traditional view of culture in which, for example, poor people were thought to hold low aspirations and to reject middle-class values and norms, and for these reasons did not seize opportunities to improve their situation. In contrast, Swidler (1986, p. 275) holds that poor and lower-class people share the goals and ideals of the middle class: "In repeated surveys, lower class youth say that they value education and intend to go to college, and their parents say they want them to go". Given the similarities, she concludes that values and aspirations are of little use in understanding differences in behaviour. In changing circumstances there is a continuity in the way of life, not because the ends people want to achieve remain stable but because of the persistence of *their strategies of action*:

> If one asked a slum youth why he did not take steps to pursue a middle-class path to success (or indeed asked oneself why he did not pursue a different life direction) the answer might well be not 'I don't want that life' but instead 'Who, me?' One can hardly pursue success in a world where the accepted skills, style and informal know-how are unfamiliar. One does better to look for a line of action for which one already has the cultural equipment (Swidler, 1986, p. 275).

Swidler's work has influenced scholars who approach culture as a toolkit of resources that people rely on for constructing *strategies of action* (see also Lamont and Small, 2008; Lizardo and Strand, 2010; Vaisey, 2010). These strategies do not refer to a conscious and fully thought out action plan that is directed towards certain predetermined goals, but rather to habitual ways of ordering action through time. From a more analytical point of view, then, the toolkit approach argues that people fail to take up chances to reverse their situation not so much because they remain committed to their 'cultural values' but because they have adopted strategies of action for which they already possess the resources. Thus, instead of strategies being developed on the basis of values or ends, actions and values are organised to benefit from the resources that are available to them. This is not because people despise the possible advantageous effects of new strategies of action but because the resources needed to develop them would demand strong retooling.

The toolkit approach enables us to understand the apparent inconsistencies between what people *want* and what people actually *do*. For instance, even though a mother may find it important that her children are signed up for an organised activity, she may give her children a freer rein in choosing their own hobbies. She may not want to waste her limited financial means on activities that turn out to be not interesting. Thus, as some people do not have the necessary resources (here: money), they are not likely to pursue certain courses of action. In other words, the toolkit theory shifts the attention from the goals people pursue and directs it to the resources that are available to them and which form the basis for their action.
Informed by the preceding arguments, this study examines the *parenting practices* related to adolescents' use of leisure time and aims to better understand social class differences in these practices. Parenting practice is here used not in the conventional sense of goal-oriented parenting actions (Fletcher, Elder and Mekos, 2000), but rather to refer to the routine practices of parents in relation to their adolescents' use of leisure time.

Method

This study is based on 32 interviews with middle- and working-class parents living in Ninove, a medium-sized city in Flanders. Ninove has a population density of 526 inhabitants per km² (Population Affairs Department Ninove, 2016). Choosing a medium-sized city has the advantage that people live in relatively close proximity to each other. In that way, we attempted to rule out differences in parenting practices attributable to local differences in accessibility and availability of the leisure facilities and programmes between the respondents. In addition, as this city is the first researcher's living environment, the researcher had prior knowledge (e.g. knowledge of the city's leisure facilities, meeting places and youth policy) that allowed her to ask more specific questions and to understand subtle remarks.

Ninove is an average Flemish municipality, which is like many other cities in Flanders, characterised by a diverse population in terms of income, migration status and family composition. Ninove scores average on income statistics. In 2013, the average income per tax return in euro was 31,521, which is comparable to the average income per tax return in the Belfius medium-sized cities where it was 31,088 and slightly lower than in the Flemish region, where it was 32,275 (Agency Internal Governance and Research Department of the Flemish Government, 2016). Some statistics, however, indicate that some households live in adverse financial circumstances. In 2016, the number of persons with an (equivalent) minimum substance income in the context of the Right to Societal Integration per 1,000 inhabitants was 4.9 in Ninove (compared to 5.0 in the Belfius medium-sized cities and 5.4 in the Flemish region) and the number of persons with an increased allowance in the sickness insurance – in Belgium this allowance is only granted in case of high costs and proven low financial means – per 1,000 inhabitants was 147.7 in Ninove (compared to 143.0 in the Belfius medium-sized cities and 137.2 in the Flemish region) (Agency Internal Governance and Research Department of the Flemish Government, 2016). In 2015, the number of persons (18 years and older) that fell behind on financial loans per 1,000 inhabitants was 30.3 in Ninove (compared to 28 in the Belfius medium-sized cities and 26.4 in the Flemish region.

To summarise, although we do not claim that Ninove is a municipality with severe poverty and disadvantage, the statistics illustrate that there is a group that is suffering hardship (as in other Flemish

municipalities).

Recruitment of Participants and Data Collection

In setting up the methodology, we followed the general ethical protocol of the Faculty of Psychology and Educational Sciences of Ghent University (https://www.ugent.be/pp/en/research/ec/overview.htm). As mentioned above, we aimed to involve both middle- and working-class parents in our study. As it is well-known that families from different socio-economic groups live in different districts of the city (Hamnett, 2001), parents were recruited from two predominantly working-class districts and two predominantly middle-class districts in the city centre of Ninove. Most respondents were randomly addressed on the street (20 parents of whom 13 were working-class), asked whether they had a child in the age group 12 to 18 years old and, if so, they were invited to take part in our study. We also recruited one working-class respondent through an advert in a local social media group, five middle-class parents via the local neighbourhood committees and four middle- and two working-class parents via snowball sampling. Parents were free to choose whether they did the interview alone or together with their partner. In general, the mother preferred to do the interview (alone), which is common in research on parents (see Wheeler, 2014).

After parents gave their written consent to participate in the study, semi-structured audio-recorded face-to-face interviews were conducted between September and December 2016. Respondents were informed that all information of the interview would remain confidential, that they did not have to answer questions they did not feel comfortable with, and that they even could end the interview without having to give a specific reason for this. The length of most interviews varied between one and two hours. As a starting point and to gain insight into adolescents' use of leisure time, parents were asked to provide an overview of how the adolescent spent his/her leisure in the week before the interview. For that purpose, parents relied on their personal definitions of 'leisure' and 'leisure time'.1 The interviews further focused on how young people's use of leisure time came about and the parents' role therein. Examples of specific questions included, but were not limited to: 'How did s/he get involved in a particular leisure activity?', 'Were there moments that s/he wanted to give up on an activity and how did that go?' and 'Are there activities that you prefer and how do you facilitate them?'

Sample

We interviewed 37 (step-)parents (i.e. biological parents and/or their partner). The interviewees consisted of 27 mothers and 10 fathers (five mothers and fathers were interviewed together) with at least one (step-)child2 in the 12 to 18 years old age group. The families had between 1 and 6 children with ages ranging from 0 to 31 years. The mean age of the child in the 12 to 18 years old age group was 14.8 years. As middle-class parents may live in working-class districts and vice versa, parents were asked about their own and their partners' highest educational qualification as an 'individual check'. As argued before, we were primarily interested in parents who strongly differ in terms of their general volume of capital (Bourdieu, 1986). Education was used as a proxy for parents' volume of capital because (1) it provides a clear hierarchy (especially in Flanders where differences according to educational institutions are small, people's level of education is an excellent indicator of people's general volume of capital3) and (2) it applies to everyone (i.e. in contrast with occupational categories). When applicable, the educational level of both parents was taken into account because we assume that parents influence each other's ideas and behaviours (Schofield and Weaver, 2016). Families were categorised as 'middle-class' in our study if at least one parent had obtained a tertiary education degree and 'working-class' if none of the parents had done so. Sixteen families were categorised as working-class and 16 as middle-class families. If we look at our sample, the data

[1] Thereby, little social class differences were found: both middle- and working-class parents defined leisure activities as activities that the adolescents have chosen themselves, that aren't obligatory, that suit them, that interest them, that they enjoy, that develop them, that are useful and that relax them.

[2] Stepchildren refer to the biological children of one's partner.

[3] Indeed, research indicates that people in Belgium with a bachelor's and master's degrees have seen their wages rise more sharply in recent years than employees without higher education (see: https://statbel.fgov.be/en/themes/work-training/wages-and-labourcost/overview-belgian-wages-and-salaries)

confirmed that parents in families with different educational qualifications indeed differ in ways that are typically associated with the distinction between the middle- and working-class. After all, in higher educated families at least one of the parents had a job involving responsibility and accountability and/or requiring higher qualifications. For instance, occupations mentioned by respondents in higher educated families were manager, director, advisor, teacher, (higher) clerical employee, technician, driver, nurse and social worker. Parents in lower educated families, on the contrary, had jobs without these features: they mentioned labourer, cleaning lady, (routine) clerical worker and patient care assistant. Three working-class respondents were disabled[4] and four were housewives. There were eight single parent families (of whom four were working-class) and six stepfamilies (of whom four were working-class). No systematic class differences in family forms could be noticed. Five families had a migration background,[5] amongst whom four working-class families had a non-European background. In line with previous findings of Bennett et al. (2012) and Lareau (2003), we found social class differences in young people's leisure patterns: while children of middle-class parents participated extensively (and simultaneously) in different types of organised leisure activities (the average number of organised activities per adolescent was 1.63, based on 27 children of middle-class parents), children of working-class parents were more likely to spend their leisure time in an informal setting (the average number of organised activities per adolescent was 0.46, based on 24 children of working-class parents). Two examples serve to illustrate this observation: Lucas, a 14-year-old middle-class boy, participated in Scouts, athletics, hockey, music school and harmony and combined this with gaming, using the internet, reading books and meeting friends. Levi, a 13-year-old working-class boy, spent most of his time BMXing in the park and in the city, gaming, using social media, watching television and engaging in family activities. A schematic overview of the participants and their children's leisure activities can be found in the supplementary material (see Table 1 as an appendix).

Analysis

The interviews were transcribed. Though the interviews dealt with both parents' educational goals and parenting practices, for the purpose of this study we only focus on the data in relation to parenting practices in relation to young people's leisure time. Our analysis was theory-inspired in the sense that the toolkit theory directed our attention to the routine parenting practices in the domain of adolescents' leisure activity. Inductive thematic analysis was used to code the interview transcripts. The first author coded all passages referring to the routine parenting practices and found that these could be organised into three themes (Hsieh and Shannon, 2005). Additional coding identified the resources necessary for engaging in particular parenting practices. It was thus the researcher who looked for connections between parenting practices and resources. As explained in the introduction, the focus of our study was directed to comparisons *between* middle- and working-class parents (and not so much on *within class variation*). The discussion and revision of the results together with the second and third authors ensured the trustworthiness of our study (Lietz, Langer and Furman, 2006). To enable readers to adequately judge whether the findings of this study can be transferred to other settings, we have provided a clear and detailed description of the recruitment and characteristics of the participants, the interview procedure and the analytical process. The underrepresentation of fathers in our study is a limitation and must be kept in mind when interpreting and transferring the results.

In the following section, the results of the study are presented. In doing so, we focus on the parenting practices for which the largest social class differences could be noticed. In no way we claim that this is an exhaustive list of differences. One cannot determine *in abstracto* how large a difference must be in order to consider it as important. This decision always depends on the aim of the analysis. The aim of this analysis was gaining a better understanding of social class differences in parents' role and, in turn, in adolescents' use of leisure time. Therefore, we used the following criteria for including parenting practices in our study: there are class differences in (1) relying on a specific parenting practice and (2) the impact of that practice on young people's leisure time use (e.g. continued involvement versus dropping-out). Social class

[4] Disabled refers to being unable to work for more than one year.

[5] Families with a migration background are families where at least one of the parents is immigrated themselves or had parents who did.

differences were more remarkable in parenting practices related to young people's organised leisure participation. As a result of particular characteristics of organised leisure activities (e.g. the presence of formal rules, the regular, consistent and timely attendance), young people's organised leisure participation, as we will show, placed heavier demands on parents, that is, required more resources which are unequally distributed across social class (Mahoney and Stattin, 2000).

To illustrate our findings we added quotations. All names used are pseudonyms. The letters 'MC' and 'WC' after the pseudonyms in the citations refer respectively to middle- and working-class parents. The letters 'I', 'M' and 'F' in the citations refer respectively to interviewer, mother and father.

Results

The largest social class differences were found in the following parenting practices: (1) setting an example, (2) resolving conflicts and (3) facilitating leisure activities. While setting an example was related to guiding young people into leisure activities, resolving conflicts was concerned with preventing young people from dropping out from activities. Facilitating young people's leisure activities was concerned with both aspects.

Setting an Example

Although it may sound obvious, setting an example is an important mechanism for guiding young people into particular leisure activities. As expected, the interviews showed that middle- and working-class young people grew up in families where different kinds of leisure activities were undertaken. Through engagement in particular leisure activities (as a participant or as a professional/volunteer), parents awoke their children's interest in them. Such parenting actions were not always based on rational calculation.

> Because my wife plays music, my daughter is also interested in piano, singing, guitar, … (Dirk, MC, 17-year-old daughter)

> I watch a lot of television. […] He also spends a lot of time on his - what's that thing again… where he can watch movies on… he does that a lot! […] Or he watches television with me. (Peter, WC, 15-year-old daughter and 15-year-old stepson)

Especially middle-class parents also took their children with them to leisure activities such as cultural performances, exhibitions, concerts and sports, to stir up their interest:

> XXX never was attracted to museums and he certainly does not do that spontaneously. If we go on a trip, he reads in the foyer but in Germany, children could get in free and then I said: 'At the end, I'll come for you and then we go look at two or three paintings that I like to show you!' (Lea, MC, 18-year-old daughter and 14-year-old son)

Thus, if passing on leisure interests did not happen spontaneously, middle-class parents actively guided their children into certain activities. Because middle- and working-class parents differed in their leisure time patterns, simply 'being themselves' created and reproduced class differences in their children's leisure time patterns. While middle-class parents were engaged in a diversity of leisure activities outdoors, several working-class parents spent most of their leisure time engaging in 'passive activities' at home, such as watching television. These activities are cheap and require little physical effort. Such activities are dominantly seen as less valuable because they are sedentary and do not improve health, social skills and cognitive thinking. Working-class parents' less intensive leisure life (outdoors) was related to their more physically exhausting jobs and to their lack of flexible time. Indeed, middle-class parents had more time for leisure activities outdoors primarily because of flexible working arrangements: they were able to telework, start and stop earlier and alternate shorter with longer workdays, which improved their ability to schedule their outdoor (family) leisure activities. Working-class parents, however, generally had fixed working hours:

> If you're working full time, you don't have an excessive amount of free time. […] Ever since August, I am thinking: 'Hmm, what if I were to do sports one evening a week? […] [But] I don't even have any time for that. […] How do they [other parents] do sport in the week? I don't get it. (Alice, WC, 16-year-old daughter)

Moreover, several working-class parents declared that they were too tired to take part in outdoor

leisure activities. They perceived their leisure time as a time they required to rest, recharge their batteries and to sit around with the family:

> Watching television, going shopping once… but real real [activities]… No, we don't have any of that. We just don't get around to it. F: If I come home from work, I'm not in the mood to do anything anymore. (Mira and Ben, WC, 13-year-old daughter)

Middle- and working-class parents further differed in the extent to which they were able to let their children experiment with a broad range of leisure activities. Common to many young people is that they want to experiment and try out different kinds of leisure activity before they find one that fits their interests and talents. In this context, middle-class parents' financial resources enabled them to give their children more opportunities to get a taste of different activities. They could better afford the cost of an activity that their children ultimately quit doing and in many cases they also had the financial means to present those activities repeatedly (as a deliberate attempt to get their children to like the activity). In contrast, working-class parents were less inclined to introduce their children to (costly) outdoor leisure activities. They reasoned that if the adolescents did not enjoy them, they would have paid tickets for events, membership dues, leisure materials, etc. for nothing. They preferred to let their children follow their own leisure preferences to ensure that they 'stuck with' the activity:

> She may do anything she wants but it isn't acceptable that she chooses a sport and that you're starting to make arrangements and that she says a month later: 'I don't like it!' Sorry but I also need my money! […] My two other children did that. They followed dancing lessons in the sports hall until I had paid for those t-shirts and stuff. Then they said: 'Mom, I don't like it anymore!' Then I said: 'God damn it!' (Karen, WC, 14-year-old daughter)

Not only their financial means but also their familiarity with (institutional) leisure activities outdoors enabled middle-class parents to present their children with a greater diversity of activities. Working-class parents had less experience with such activities (for young people), which was related to their own life history: they were not engaged in such activities as a child.

> I never have played [organised] sports [as a child]. (An, WC, 18-year-old son)

Interestingly, the (working-class) parents' limited resources and experienced barriers (e.g. being tired after work) could be 'circumvented' by leisure clubs' attempts to recruit young people via the school:

> They came to her school in September to recruit new members and she immediately wanted to start with it [the youth organisation]. She brought a folder home, which she showed to her brother and sister. All three then started. And they really like it so… (Elisa, WC, 14- and 12-year-old daughters)

All the quotes given so far clearly illustrate that leisure interests are created by parents as much as they are discovered by children. For instance, visiting museums was not an activity that Lea's son would do spontaneously. Young people's leisure interests are not 'innate' but (at least partly) the result of an everyday family modelling process (Bourdieu, 1993; De Graaf, De Graaf and Kraaykamp, 2000; Mullan, 2010). Those informal learning processes are not available to all: working-class parents generally lack resources (e.g. flexible time, money and experience) for and experience barriers (e.g. being exhausted at the end of a workday) to transmitting societally valued leisure interests to their children.

Resolving Conflicts

Parenting practices were not only concerned with getting young people involved in particular leisure activities, but also with preventing young people from dropping out from activities. Most (young) people reach a certain point where they want to quit an activity (Allison, Adlaf, Dwyer, Lysy and Irving, 2007; Furlong and Cartmel, 2007). On such occasions, especially middle-class parents then intervened (at an early stage) to prevent their children from giving up the activity. They felt (1) a sense of urgency, (2) a responsibility for finding a solution for issues and problems in the leisure setting, and (3) entitled (collectively) to call to account trainers/leaders/youth workers:

> Letting a child of fourteen years old play [only] 2 minutes in the football game… that is actually a punishment! […] XXX went through that once. […] I said to the coach that I didn't like that. [Thereafter, it didn't happen anymore.] (Karel, MC, 17-year-old daughter and 15-year-old son)

> We just undertook action with the parents. We called all parents after the 'transition weekend'. We grouped our

> thoughts – about the things that happened – and then we struck up a conversation with the leaders. […] There were two things that weren't right at all for us. […] Humiliation or pain, psychological pressure. […] And also, the drinking of alcohol. They are old enough but they were even forced to drink alcohol. […] We then asked the leaders: 'Can we come by to talk to you?' and then they said: 'Yes, after a meeting on Sunday, you are certainly welcome!' […] They were going to discuss it with the group leaders but I still haven't heard from them. I also don't know if we will receive any feedback. But they make house visits, you can indicate that when signing them up. Then they give information about their operations for the year and then we definitely can talk about that once. (Lea, MC, 18-year-old daughter and 14-year-old son)

Working-class parents were more hesitant about approaching youth workers[6]:

> I'm not a person that would immediately say: 'Yes and my child that and my child that…'. They have to figure it out themselves and do it on their own. Until a boundary is crossed where I say: 'Now I have to take action!' Or if something happens, then I will say my opinion. But otherwise I think: 'Yeah, they have to handle it themselves!' (Alice, WC, 16-year-old daughter)

This quote demonstrates that 'once a line was crossed', working-class parents also intervened. However, at this later stage, problems had already worsened to an extent that a solution was no longer possible with drop-out as a result:

> He had to sit on the bench because he hadn't got enough ball technique and then I was thinking: 'I'm not paying to just sit on the bench, I'm not investing my time to always watch to a bench!' And finally, I asked him [the coach] about that and he said: 'Yes but he isn't good enough and I want to demote him to a lower group'. But he didn't want to do that. I said: 'Look, he doesn't want to do that, then I quit with it and he doesn't come anymore!' (Sien, WC, 13-year-old son)

The interviews made clear that resolving problems was facilitated by intervening rapidly and frequently in young people's leisure activity and mobilising other parents to respond collectively to incidents. A rapid intervention ensured that problems did not reach such proportions that they become insoluble. Especially middle-class parents were proactive in seeing that their children's needs were met; they felt entitled to demand more from leisure organisations. Working-class parents waited longer – until a line was crossed – to take action because they were more likely to see youth workers as experts that should not be questioned. Moreover, several working-class parents had not (completely) mastered the Dutch language, which operated as a barrier to opening up a dialogue. Further, addressing problems in a group put more pressure on youth workers to find a solution. Middle-class parents were – due to their extended parental networks (see below) – able to react collectively when confronted with problems. Working-class parents, however, often responded to problems individually: only the parent and youth worker were involved.

However, in this context we also found examples of youth workers who managed to resolve problems by breaking down barriers for (working-class) parents. For example, by proactively addressing parents in an effort to resolve prevailing problems, youth workers ensured that problems or issues did not grow and remain soluble:

> Here they [the leaders] are very good, really! Attentively, attentive to differences. They pose questions… I was positively amazed about the fact that they talked to me about it [her daughter's language disorder] on the phone and I went down there… like an appointment… […] They will make the necessary adjustments. For example, XXX will not have to recite the law of the Scouts. (Rosalie, WC, 13-year-old daughter)

Youth workers who guided the same group of children for years could anticipate difficulties without any need on the part of the parents to intervene repeatedly:

> XXX has a lack of empathy and she has some difficulties with [accepting] authority. That has always been a problem but I have discussed that with the coach and in the meantime, he already knows how she is because she has had the same coach for years. He kept his team each year. (Ines, WC, 18-year-old son and 14-year-old daughter)

To conclude, although middle- and working-class parents were confronted with similar issues/problems, especially middle-class parents succeeded in resolving them (and assuring continued leisure participation) and in making leisure clubs work to their advantage.

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[6] Youth workers here refers to the volunteers and people professionally qualified in a range of different types of work with young people (e.g. youth organisation, sports and music lessons).

Facilitating Leisure Activities

Facilitating leisure activities was related to both guiding young people into, and preventing them from giving up on, particular leisure activities. Parents paid membership dues, provided leisure materials (e.g. books, sports equipment, skateboard and BMX), brought their children to their activities by car, gave permission to undertake informal activities outdoors (e.g. playing football, skating and meeting peers), accommodated family life to meet their children's leisure schedules, washed their sports equipment and 'trained' their children at home.

Although facilitating young people's leisure activities was at times difficult for all parents, the crucial difference was that middle-class parents' flexible working arrangements, financial means and social network offered them many more opportunities to cope with challenging situations. Indeed, the data showed ample examples of how small advantages accumulated over time into larger benefits and in this way created and reinforced class differentials. Many leisure organisations (and certainly those that are youth-led), for example, occasionally make late changes and/or communicate at the last minute about what is going to happen. Middle-class parents' financial means enabled them to manage these last-minute arrangements more easily. After all, money not only provides for paying membership dues and buying clothes or other leisure attributes but also for having (a) car(s). While middle-class parents generally had two cars, several working-class parents indicated that they could not afford a car. Not having a car made it difficult to be flexible in anticipating changes in leisure schedules:

> If they said: 'We meet up there at that hour' and then it was at another time and another place, then I thought: 'Yeah but….', you know? All very last minute… You always must ensure that you could jump, as a manner of speaking. (Alice, WC, 16-year-old daughter)

Another example is that all parents were sometimes pressed for time because of work and/or family demands, which limited their options for facilitating their children's leisure activities. Feeling short on time was, however, even worse for employed working-class parents because they did not have flexible working arrangements:

> Sometimes it [driving her children] is difficult, because I work in shifts. If I have to work in the morning, then there is no problem but if I have to work in the evening, then it is difficult. […] I also work every other weekend. (Ines, WC, 18-year-old son and 14-year-old daughter)

Being a single parent also reinforced parents' time problem.

> The problem is that the activities [of my children] overlap. If you have a partner, then it is easier. One goes to that activity and the other to another activity. Then you can arrange it. But I'm single. (Eva, MC, 15- and 13-year-old son)

Middle-class parents not only had more flexible working arrangements, they also had sufficient financial resources and a strong, extended and available social network to compensate for their lack of time. For example, in one case their financial means enabled them to hire a nanny to drive their children to and from their activities:

> On Monday and Wednesday, it is training and on Saturday match. On Saturday, my husband does it and on Monday, Tuesday and Thursday, we have a nanny for the children. She comes here after school and she brings XXX to the football training. (Katrien, MC, 12-year-old daughter)

The middle-class parents made carpooling arrangements with co-participants' parents, neighbours or family members. Working-class parents did not have close contacts with residents in their district and faced difficulties in building up relationships with other parents at the leisure setting. They rather relied on kinship networks which were, however, generally less resourceful (e.g. not having flexible time and an available car). Some family members of parents with a migration background were also living far away.

> I have always lived in this district but things here have become much worse… I: In what sense? M: Scum… Boorish [people]… A lot of immigrants came [to reside in this district]… (Mira, WC, 13-year-old daughter)

> There was already an introduction, to let us know how it is going there [the youth organisation]. […] I'm not in contact with them [the co-participants' parents]. […] You see that they aren't that open. You see that they aren't such social people. I have the quick tendency to talk to everyone. If I am at the butcher and a stranger is standing next to me, I can say: 'What are you going to eat today?' I would dare that! But there it wasn't like that… (Elisa, WC, 14- and 12-year-old daughters)

This last quotation illustrates that institutional leisure contexts demanded a certain 'code of behaviour' that was less familiar to working-class parents. In addition, middle- and working-class parents often lack a shared frame of reference (e.g. different working conditions and leisure activities), which hindered communication. On top of that, several working-class parents (with migration background) spoke another language, which may have served as an additional barrier.

When working-class parents did establish relationships with co-participants' parents, the relationships were rather weak and weak ties were less likely to bring advantages such as carpooling arrangements. Especially middle-class parents forged strong ties: they undertook activities together, independent of the young people's leisure activities, often stimulated by their children's involvement in the same activity for several years and/or their children's participation in the same range of activities. Working-class parents' encounters with other parents were generally limited to those at the leisure venue:

> We meet each other also outside the ice hockey [setting], not everyone, but two couples. Because of [the children's] ice hockey [involvement], we became friends. We even go on ski trips with them. (Charlotte, MC, 15-year-old son)

> The parents of XXX [daughters' friend] have a tearoom… sometimes we go there… [but] it's not like we sit together. (Sarah, WC, 18-year-old daughter)

Middle-class parents in our study thus benefitted from more extensive toolboxes, which allowed them to build strong ties with other parents who also had more flexible working hours, larger social networks, etc. In this way, the homophily of social networks clearly further reinforced already existing class differentials in parental support for children's leisure time consumption.

A last example is that, although all parents had some difficulties with giving their children more autonomy as they got older, facilitating (cf. giving permission for) young people's informal leisure activities outdoors (with friends) was less evident for working-class parents because their children were more 'at risk' of putting up with 'wrong' peers they met in their immediate living environment:

> In the park, there is a lot of 'mixture'. It is true that there are youngsters that play basketball or football or that ride on BMX bikes but there are also people using drugs. (Aida, WC, 12-year-old son)

> Also in the school of XXX, there are youngsters using drugs and who got into trouble with the police. (Malika, WC, 18- and 13-year-old sons, 16-year-old daughter)

Thus, the working-class families involved in our study were not only constrained by their 'individual tools' but also by their living environment (neighbourhood and school).

In sum, although all parents struggled with facilitating their children's leisure activities, middle-class parents' larger, resourceful and nearby social network, flexible working arrangements, financial means and immediate living environment enabled them to overcome their difficulties more easily. Thereby, relatively small benefits accumulated into greater benefits. No matter how persistent and challenging, this accumulation of advantage for middle-class parents (and relative disadvantage for working-class parents) is, however, not inexorably determined. Indeed, a crucial observation was that in some cases (working-class) parents' lack of flexible time, an available car and a (strong) social network to rely on could be bypassed by carpooling systems organised by clubs, as well as other initiatives such as hiring buses:

> They could ride with the football trainers and with the other parents. (Gertie, WC, 18- and 13-year-old sons and 12-year-old stepson)

Conclusion and Discussion

This study aimed to advance our understanding of social class differences in the parents' role and, in turn, in young people's use of leisure time. Based on 32 interviews with a socio-economically diverse group of parents, substantial social class differences were found with respect to three parenting practices: (1) setting an example, (2) resolving conflicts and (3) facilitating leisure activities. These differences were systematically related to social class differences in resources: although middle- and working-class parents faced similar difficulties when it came to young people's use of leisure time (e.g. last-minute changes in organisations and young people's changing interests), middle-class parents' flexible time, financial means,

extensive social network, institutionally required attitudes, skills and experiences and immediate living environment enabled them to overcome such difficulties more easily and engage smoothly in the aforementioned parenting practices. Although, it often came down to small, subtle (though persistent) things, the sum of small things led to big consequences (see also Currid-Halkett, 2017). Overall, it confronted working-class parents with more difficulties in shaping their children's spending of leisure time.

Our findings are in line with previous studies on social class and parenting. Similar to previous studies on parental involvement in the school context, we found that working-class parents felt less entitled to question the approach of professionals (De Graaf et al., 2000; Lareau, 2003). In their study on parental cultural capital and educational attainment, De Graaf et al. (2000) noted that middle-class parents feel more confident to intervene in (school or leisure) institutions because they are 'insiders' in the (school or leisure) field (i.e. parents participate (d) themselves in higher education and institutional leisure). Related to this, Horvat, Weininger and Lareau (2003) drew attention to the different personal network composition of middle- and working-class parents: in contrast to middle-class parents, who included parents of peers and professionals in their network, working-class parents mainly relied on support from relatives and neighbours. Parents of peers and professionals provide middle-class parents with resources which they can use to overcome difficulties. For instance, middle-class parents can call upon other parents to collectively respond to problems in school institutions (Horvat et al., 2003). Largely similar results were found in this study. An exception is that only a minority of the working-class parents referred to neighbour support. Time and context may explain these different findings. The study of Horvat et al. (2003) is based on data collected in 1989-1990 in the (ethnically) segregated USA. There was a large inflow of migration over the last years and ethnic segregation is less pronounced in Belgium. Not surprisingly then, we observed that the working-class parents in our study lived in increasingly ethnically mixed districts with limited interactions among neighbours. Our findings also somewhat deviate from those of Horvat et al. (2003) in the sense that we found that the support working-class parents receive from relatives had rather limited compensatory value. The fact that we included several working-class parents (with migration background) whose family members did not live nearby (e.g. they lived in the capital of Belgium or in another country) may at least partly explain these differences. However, the family was definitely a major source of emotional support for parents and especially working-class parents. Because of working-class children's less organised use of leisure time, working-class families had more room for time with family members (e.g. calling to, skyping with and/or visiting relatives).

The 'culture as toolkit' framework (Swidler, 1986) enables us to understand the paradoxical observation made in the literature that even though working-class parents value (institutional) leisure activities, they – at least at first glance – less actively encourage their children's participation in them. Our interviews showed that young people's continued (institutional) leisure participation placed heavy demands on parents and not all parents, especially not working-class parents, were able to live up to such requirements. Institutional leisure settings are predominantly organised around middle-class standards of good parenting whereby parents are seen as 'leisure providers' and 'facilitators' (Zeijl, 2001; Zinnecker, 1995). For example, parents are (implicitly) expected to make their children aware of the wide array of interesting (i.e. educationally important) activities available, to make the first approach to the youth workers should problems or issues arise, to drive young people to football games, etc. As a result, leisure initiatives are not always tailored to the living conditions of working-class families. Being aware of that is crucial to our understanding of inequality because it enables us to see how leisure organisations unwittingly contribute to inequality in the use of young people's leisure time.

What do these findings imply for future leisure time policymaking and practice? The current focus of policymakers on changing parents' presumed unawareness of the importance of their children's participation in (organised) leisure (see e.g. Council of Europe, 2003; Geudens, Costanzo, Hofmann, Amorim and Pavlovova, 2013) will not change social class differences in leisure time use patterns. As our findings show, young people's non-participation in institutional leisure activities stemmed not so much from a lack of interest from parents as from the availability of resources that enabled them to engage in

particular institutionally valued parenting practices. Reversing inequality in leisure participation demands that leisure institutions critically reflect on how their way of working might hinder or facilitate vulnerable young people (and their parents) to take part in particular activities. In other words, it demands that leisure settings no longer start from middle-class conceptions of the parents' role in young people's use of leisure time (institutionally driven) but from families' concrete living conditions (lifeworld-oriented): what is happening in concrete situations and how can we tailor our way of working to the practices and living circumstances of these families? Our study shows that a number of relatively small adjustments can already have a major impact. For example, our findings showed that there were leisure clubs that used the school as a recruiting station, facilitated carpooling by connecting parents seeking respectively passengers and drivers, hired buses for young people's movement to games or performances, took the first step to approach parents if problems showed up, ensured continuity in youth workers, etc. Such relatively small things often had big consequences in the sense that they appeared to contribute to maintaining young people's participation in leisure activities. Our findings show that this kind of pedagogical engagement of these clubs can be important in circumventing parents' constrained resources.

In view of the finding that the 'small problems' experienced by families were relatively easy for youth workers to overcome, youth workers must reflect on the actions that they can undertake to reverse exclusionary processes (e.g. selective dropping out) and on what they can do to take the parenting practices and living conditions of all families into greater account. This suggests that instead of being occupied with organising young people's leisure time and guiding young people into organised leisure activities, youth policymakers should be more concerned with supporting young people in their (family) context (Coussée, 2006).

To get a complete picture of the strategies youth workers (can) use to circumvent exclusionary mechanisms within their organisation, further qualitative research with youth workers from diverse leisure contexts (football clubs, music school, youth organisations, etc.) is needed. Furthermore, longitudinal data is needed to establish unequivocally whether and how the identified strategies of parents and youth workers influence young people's leisure participation.

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APPENDIX

Table I

Overview of the Participants

Interview	Pseudonyms	Parents' gender	Adolescents' gender (and age)[7]	Number of children in the family[8]	Family composition	Families' migration background[9]	Parents' occupation	Families' educational level[10]	Assigned social class position[11]	Adolescents' leisure activities[12]
I1	Sofie	Mother	Girl (16)	2	Two-parent family	No migration background	Social assistant	High	Middle class	Ballet (*), youth organisation (*), fitness, going out, going to a pub, using social media, surfing the internet, watching series, meeting up with boyfriend, reading books, family activities (e.g. shopping and going to a restaurant).
			Girl (14)							Ballet (*), youth organisation (*), using social media, watching series, watching (creative) YouTube videos, baking, family activities (e.g. shopping and going to a restaurant).
I2	Laurien	Mother	Girl (14)	2	Two-parent family	Migration background	Nurse	High	Middle class	Playing soccer (*), youth organisation (*), using social media, surfing the internet, gaming, playing soccer with friends at home, doing nothing, family visits.
	Cristiano	Father	Boy (13)				Technician			Ballet (*), kickboxing (*), using social media, activities with friends (e.g. going to the city and going to a movie theatre).
I3	An	Mother	Boy (18)	2	Single parent	No migration background	Disabled[13]	Low	Working class	Fitness, activities with friends (e.g. playing paintball, bowling, going to a movie theatre), swimming, watching television, gaming, surfing the internet, family activities (e.g. going to a movie theatre and doing sports).
I4	Dirk	Father	Girl (17)	2	Two-parent family	No migration background	Teacher	High	Middle class	Singing, playing piano and guitar, reading books, watching television and movies, meeting friends at home, cooking and baking, family activities (e.g. making city trips, travelling), family visits.
I5	Charlotte	Mother	Boy (14)	2	Two-parent	No migration	Administrative assistant	High	Middle class	Hockey (*), horticulture, using social media (e.g. class chat), watching television, family activities (e.g. making city trips and day trips),

[7] Biological as well as stepchildren (i.e. the biological children of one's partner).

[8] Biological as well as stepchildren.

[9] Families with a migration background are families where at least one of the parents or the grandparents had immigrated.

[10] The families' educational level is based on both parents' highest educational qualification. We call families' educational level as 'high' when at least one of the parents has a higher education and 'low' when none of the parents obtained a higher education.

[11] The assigned social class position is based on the families' educational level.

[12] Activities with an asterisk (*) are organised leisure activities (i.e. adult-supervised, regular and rule-guided activities that take place in an institutional setting (Bennett, Lutz & Jayaram, 2012)).

[13] Disabled refers to being unable to work for more than one year.

	Michael	Father			step-family[14]	background	Driver			activities with relatives (e.g. bowling and playing snooker with cousins), family visits.
I6	Rosalie	Mother	Girl (13)	3	Single parent	No migration background	Sick leave	Low	Working class	Youth organisation (*), music school (*), watching television, using social media, surfing the internet, family activities (e.g. shopping, doing household tasks, watching television, helping with cooking and cleaning, going to a restaurant, sitting on a terrace).
I7	Aida	Mother	Boy (12)	3	Two-parent family	Migration background	Cleaning lady	Low	Working class	Kick- and Thai boxing (*), running, riding a scooter, surfing the internet, gaming, reading books, playing football in the park with friends, phoning with family (e.g. on Skype), family activities (e.g. going to a Fite Nite, going to a restaurant, praying, enjoying food at home).
I8	Eva	Mother	Boy (15)	3	Single parent	No migration background	Teacher	High	Middle class	Playing soccer (*), going out, attending parties, meeting friends at home, meeting friends in the city and in the park, etc., gaming, using social media, family activities (watching television, going to the seaside, watching movies, doing daytrips, etc.).
			Boy (13)							Gaming, riding a scooter, BMXing (in the skate park and in the city), meeting friends in the city, in the park, using social media, surfing the internet, family activities (watching television, going to the seaside, watching movies, doing daytrips, etc.).
I9	Keicha	Mother	Girl (14)	5	Two-parent step-family	Migration background	Housewife	Low	Working class	Watching television, reading strips, family activities (watching television, sitting together in the living room, joining her younger brother at his soccer training and games, making apple fritters, etc.), family visits.
I10	Alice	Mother	Girl (16)	2	Two-parent family	No migration background	(Routine) clerical worker	Low	Working class	KSA (*), weekend work, babysitting, using social media, watching television, going out, going to a pub, surfing the internet, activities with relatives (parties, day trips, meeting cousins, etc.), family activities (e.g. watching television).
I11	Marie	Mother	Boy (18)	2	Two-parent family	No migration background	Teacher	High	Middle class	Floorball (*), following Swedish lessons, visiting museums, drawing, reading books, surfing the internet, going to a pub, watching television, babysitting, using social media, gaming, meeting up with girlfriend, doing chores, watching television.
			Boy (16)							Floorball (*), fitness, meeting friends in the city, watching television, surfing the internet, using social media, gaming, babysitting, doing chores, meeting up with girlfriend.
I12	Sien	Mother	Boy (13)	1	Two-parent family	No migration background	(Routine) clerical worker	Low	Working class	BMXing, skateboarding, riding a scooter and penny board in the skate park and in the city, activities with friends at home (e.g. gaming), using social media, meeting friends in the city and in the park, watching television, watching movies, family visits, family activities (e.g. watching television, shopping, going to a restaurant,

[14] Stepfamily refers to a family where the children of at least one of the parents are not biologically connected to the partner of the parent.

										watching movies).
I13	Katrien	Mother	Girl (12)	2	Two-parent family	No migration background	Finance director	High	Middle class	Dancing (*), youth organisation (*), watching television, watching movies, using social media, being busy with her mobile phone, activities with friends at home, surfing the internet, family visits, family activities (watching television, city trips, etc.).
I14	Stijn	Father	Boy (14)	3	Two-parent family	No migration background	Bank manager	High	Middle class	Playing soccer (*), youth organisation (*), gaming, playing soccer at home with friends, watching YouTube videos, skateboarding and BMXing in the skate park and in the city, watching television, activities with cousins.
I15	Diara Denzell	Mother Father	Girl (13)	5	Two-parent family	Migration background	Housewife Labourer	Low	Working class	Watching television, reading books, babysitting, family activities (e.g. watching television, going to church and praying).
I16	Carol	Mother	Boy (17)	2	Single parent	No migration background	Entrepreneur	High	Middle class	Cycling, gaming, playing football with friends at home, watching football games in real life or on television, activities with friends (e.g. going to a movie theatre, going to a show/performance), doing nothing, letting the dog out, helping with household tasks (e.g. cooking, mowing the lawn), weekend work, using social media, being busy with his mobile phone, reading books, family activities (e.g. watching television).
			Girl (16)							Going out, going to a pub, watching movies, meeting friends at home, activities with friends (e.g. going to a movie theatre, going to a show/performance), using social media, surfing the internet, being busy with her mobile phone, reading books, doing nothing, helping with household tasks (e.g. cooking, mowing the lawn), letting the dog out, family activities (e.g. watching television, shopping).
I17	Sarah	Mother	Girl (18)	1	Two-parent family	No migration background	Sick leave	Low	Working class	Meeting friends in the city, going to a pub, going out, meeting up with boyfriend, watching television, helping out with household tasks, surfing the internet, using social media, doing nothing, family activities (e.g. shopping, going to a restaurant, watching television).
I18	Celien	Mother	Girl (16)	2	Two-parent family	No migration background	(Higher) clerical employee	High	Middle class	Athletics (*), youth organisation (*), hockey (*), going out, meeting up with boyfriend (at home), going to a pub, using social media, watching YouTube videos.
	Nathan	Father	Boy (14)				(Higher) clerical employee			Playing Soccer (*), youth organisation (*), gaming, watching YouTube videos, watching television, family activities (e.g. watching television).
I19	Karel	Father	Girl (17)	3	Two-parent family	No migration background	Computer scientist	High	Middle class	Fitness, meeting friends at home, going to a pub, drawing, tinkering, being on her own in her room, doing chores, surfing the internet, using social media, family activities (e.g. city trips), family visits.
			Boy (15)							Playing soccer (*), youth organisation (*), gaming, watching football games in real life or on television, doing chores, using social media, family activities (e.g. city trips), family visits.

I20	Lore	Mother	Boy (17)	1	Single parent	No migration background	Advisor	High	Middle class	Playing soccer (*), watching football games in real life or on television, watching television, gaming, using social media, going out, surfing the internet, attending a stand-up comedian show, cooking, family visits, family activities (e.g. city trips, voluntary work).
I21	Peter	Father	Girl (15)	4	Two-parent step-family	No migration background	Disabled	Low	Working class	Meeting friends in the city, watching television, using social media, going out, doing someone's hair, family activities (e.g. shopping with her stepmother, going to a restaurant).
			Boy (15)							Activities with friends (going to a movie theatre, going to the city), watching television, weekend work, gaming, watching YouTube videos, playing with the dog, family visits, family activities (e.g. going to a restaurant).
I22	Mira	Mother	Girl (13)	4	Two-parent step-family	No migration background	Housewife	Low	Working class	Watching (creative) YouTube videos, being busy with make-up, going to the city with friends, meeting friends at home, watching television, listening to music, being busy with her mobile phone, surfing the internet, using social media, doing nothing, helping out a little bit around the house, family activities (e.g. resting together, going to an amusement park).
	Ben	Father					Labourer			
I23	Lea	Mother	Girl (18)	3	Two-parent family	No migration background	Teacher	High	Middle class	Harmony (*), music school (*), youth organisation (*), youth orchestra (*) symphony orchestra (*), reading books, tinkering, sewing, family activities (e.g. going out for an ice cream, going to museums, voluntary work).
			Boy (14)							Youth organisation (*), athletics (*), hockey (*), music school (*), harmony (*), using social media, watching television programmes and YouTube videos, reading books, learning to cook, meeting friends at home, family activities (e.g. going out for an ice cream, going to museums, voluntary work).
I24	Emma	Mother	Girl (15)	5	Two-parent step-family	No migration background	Teacher	High	Middle class	Music school (*), drawing academy (*), watching television, reading books, going to the opera, doing chores (e.g. emptying the dishwasher), family activities (e.g. going to a movie theatre, classical concert, cultural centre).
			Boy (14)							Hockey (*), youth organisation (*), watching television, reading books, using social media (e.g. class chat), listening to music, doing chores (e.g. emptying the dishwasher), family activities (e.g. going to a movie theatre, classical concert, cultural centre).
			Girl (12)							Music school (*), using social media, watching television, listening to music, doing chores (e.g. emptying the dishwasher), family activities (e.g. going to a movie theatre, classical concert, cultural centre).
I25	Malika	Mother	Boy (18)	4	Two-parent family	Migration background	Housewife	Low	Working class	Fitness, activities with friends (e.g. going to the city, swimming), weekend work, gaming, watching television, using social media, watching YouTube videos, praying, going to a mosque, family visits.

			Girl (16)							Watching television, using social media, watching YouTube videos, family activities (e.g. shopping), household tasks (e.g. doing the dishes), activities with friends (e.g. shopping, eating a snack), praying, going to mosque, family visits.
			Boy (13)							Watching television, gaming, praying, going to a mosque, family visits.
I26	Elisa	Mother	Girl (14)	3	Single parent	No migration background	Cleaning lady	Low	Working class	Youth organisation (*), using social media, surfing the internet, watching television, activities with friends (going to the fair, the city, etc.), meeting friends at home, meeting up with boyfriend, family activities (e.g. shopping, going to a fair, an amusement park, the seaside).
			Girl (12)							Youth organisation (*), using social media, watching television, surfing the internet, family activities (e.g. shopping, going to a fair, an amusement park, the seaside).
I27	Karen	Mother	Girl (14)	3	Single parent	No migration background	Cleaning lady	Low	Working class	Using social media, meeting friends in the city and in the park, watching television, family activities (e.g. shopping, going to the seaside), family visits, listening to music, doing nothing.
I28	Ines	Mother	Boy (18)	2	Two-parent family	No migration background	Patient care assistant	Low	Working class	Watching television, activities with friends (e.g. going to (birthday) parties, a movie theatre, holiday parks), gaming, surfing the internet, using social media, weekend work.
			Girl (13)							Gymnastics (*), activities with friends (e.g. Halloween tours, birthday parties, shopping, going to a movie theatre), reading books, watching (creative) YouTube videos, watching series, using social media, tinkering.
I29	Martin	Father	Boy (16)	2	Two-parent family	No migration background	Sick leave	Low	Working class	Playing soccer (*), watching television, meeting up with girlfriend (at home), using social media, family activities (e.g. watching television, visiting amusement parks, doing nothing, having dinner together), family visits.
			Boy (12)							Playing soccer (*), watching television, using social media, playing pool and snooker with father, family activities (e.g. watching television, visiting amusement parks, doing nothing, having dinner together), family visits.
I30	Tine	Mother	Girl (13)	1	Two-parent family	No migration background	(Higher) clerical employee	High	Middle class	Water ballet (*), activities with friends (e.g. going to the city, eating an ice cream), meeting friends at home, family activities (e.g. going to the movie theatre, doing day trips), surfing the internet.
I31	Mona	Mother	Girl (17)	2	Single parent	No migration background	Teacher	High	Middle class	Ballet (*), youth organisation (*), guitar lessons (private), weekend work, meeting up with boyfriend (e.g. going to a movie theatre), meeting friends at home (e.g. cooking together), going out, watching television, using social media, being busy with her mobile phone, watching YouTube videos, doing chores (e.g. cleaning the table), family activities (e.g. going to a restaurant, travelling together),

										family visits.
			Boy (14)							Playing soccer (*), youth organisation (*), gaming, watching television, using social media, doing chores (e.g. cleaning the table), family activities (e.g. going to a restaurant, travelling together), family visits.
I32	Gertie	Mother	Boy (18)	6	Two-parent step-family	No migration background	Disabled	Low	Working class	Gaming, meeting up with friends in the district, going to a pub, weekend work, being busy with his mobile phone, using social media, doing chores (e.g. doing the dishes), family activities (e.g. swimming, watching television, walking, going to an amusement park).
			Boy (13)							Gaming, meeting up with friends in the district, using social media, watching television, doing chores (e.g. doing the dishes), family activities (e.g. swimming, walking, going to an amusement park).
			Boy (12)							Playing soccer (*), meeting up with friends in the district, gaming, using social media, watching television, doing chores (e.g. doing the dishes), family activities (e.g. swimming, walking, going to an amusement park).

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Early childhood preservice teachers' debugging block-based programs: An eye tracking study

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Abstract: Learning computational skills such as programming and debugging is very important for K-12 students given the increasing need of workforce proficient in computing technologies. Programming is an intricate cognitive task that entails iteratively creating and revising programs to create an artifact. Central to programming is debugging, which consists of systematically identifying and fixing program errors. Given its central role, debugging should be explicitly taught to early childhood preservice teachers so they can support their future students' learning to program and debug errors. In this study, we propose using eye-tracking data and cued retrospective reporting to assess preservice teachers' cognitive strategies while debugging. Several eye-tracking studies have investigated learners' debugging strategies though the literature lacks studies (a) conducted with early childhood preservice teachers and (b) that focus on block-based programming languages, such as Scratch. The present study addresses this gap in the literature. This study used mixed methods to triangulate quantitative findings from eye movement analysis and qualitative findings about employed debugging strategies into the creation of descriptive themes. Results showed that participants developed strategies such as simultaneous review of output and code, use of beacons to narrow down the area to be debugged, and eye fixation on output to form hypotheses. But most often, debugging was not informed by a hypothesis, which led to trial and error. Study limitations and directions for future research are discussed.

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Introduction

Learning computational skills such as programming is important for K-12 students given the increasing need for a workforce proficient in coding and computing technologies (Burke, 2012; K-12 Computer Science Framework Steering Committee, 2016; Obama, 2016). Various resources have been created to inspire programming instruction in K-12 classrooms such as low threshold block-based programming languages (Bau, 2015; Cooper, Dann, and Paush, 2000; Resnick et al., 2009) that are easy and appealing to youth, open access courses for teachers on computer science (Code.org, n.d.; Google, n.d.), exemplary instructional materials for integrating programming into subject areas (Computer Science Teachers Association & International Society for Technology in Education, 2011; Project Growing Up Thinking Scientifically (GUTS), n.d.), among others. However, little has been done as professional learning on programming in early childhood preservice teacher preparation programs (Kim, Yuan, Vasconcelos, Shin, and Hill, 2018).

Training preservice teachers to program involves not only teaching how to successfully apply computer science concepts and commands, but also fostering important computational thinking practices

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such as debugging (Basu, 2016; Brennan and Resnick, 2012; Vasconcelos and Kim, 2019). Debugging is a fundamental part of programming that entails addressing program errors or an unintended output on the screen (McCauley et al., 2008; Yen, Wu, and Lin, 2012). Training on programming and debugging is essential for early childhood preservice teachers to properly support their future students' learning to program and debug errors (Kim et al., 2018).

Debugging

Programming is an intricate cognitive task (Vihavainen, Airaksinen and Watson, 2014) in which one combines units that encapsulate specific concepts and commands from a computer science language to create an output. Given the complexity of this task, it is unlikely that one will create a program that does not need revisions in one attempt. Therefore, it is critical to explicitly teach error debugging skills during programming instruction.

Debugging, also known as troubleshooting, is defined as the process of identifying error(s) in a program and using problem-solving strategies to fix it (McCauley et al., 2008; Proctor, 2019; Yen et al., 2012). Debugging is an inherent part of programming, and programmers spend a significant amount of time doing it (Alqadi and Maletic, 2017; Beller, Spruit, Spinellis, and Zaidman, 2018). Different from random trial and error, debugging is a systematic and thoughtful process in which one tests hypotheses and applies strategies to locate and overcome the cause of a program error (Kim et al., 2018; Shute, Sun, and Asbell-Clarke, 2017). Despite its importance, explicit instruction about debugging strategies is rarely featured in computer science instruction (Proctor, 2019).

Debugging for early childhood preservice teachers. Teaching K-12 students to program has emerged as a crucial instructional goal for school teachers (Kalelioğlu, 2015; Kazimoglu, Kiernan, Bacon, and MacKinnon, 2012; Lye and Koh, 2014). And yet, preservice and in-service teacher education programs are still in need of a nationwide curriculum that supports integration of programming and other computational skills such as debugging at the K-12 level (Paul, 2016). Learning to program and debug program errors can be a daunting task for preservice teachers, especially if they are novice learners with limited to no background in computing. This is because novice learners tend to overestimate the complexity of programming tasks, encounter a higher number of program errors, and consequently experience decreased motivation towards learning to program (Isong, 2014; Sun and Hsu, 2019; Yukselturk and Altiok, 2017).

Integrating programming and debugging into K-12 teaching does not entail adding another component to the curriculum. It can help young learners develop crosscutting concepts and skills such as abstraction, conditional logic, and pattern identification (Grover and Pea, 2013; Sengupta, Kinnebrew, Basu, Biswas, and Clark, 2013). Empirical studies on debugging strategies used by early childhood preservice teachers are limited. Recent studies found that preservice teachers who are learning to program struggle at systematically forming and testing hypotheses to guide their debugging as well as explain the cause of an error even when a problem is fixed (Kim et al., 2018). In another study, preservice teachers ended up simplifying a program by removing a problematic area to avoid problem solving (Kim et al., 2016). Further empirical studies are needed.

Professional learning on programming and debugging for preservice teachers may have a crucial impact on their future students, such as providing underprivileged populations (e.g., females, students with special needs, people of color) with access to STEM learning experiences, and influencing students' dispositions to advance their education and pursue jobs in STEM fields (Leonard et al., 2016; National Research Council, 2011).

Use of eye movements in programming education. Research that uses eye-tracking devices to assess learning in computer science has increased in recent years. A survey on the use of eye-tracking in programming instruction research revealed that program comprehension and debugging are two mostly studied areas (Obaidellah, Al Haek, and Cheng, 2018). Among these studies, several have used eye movement data to assess "learners' problem-solving processes objectively" (Sun and Hsu, 2019, p. 67) as

learners attempt to understand and/or debug programs. For instance, Lin et al. (2015) examined university students' cognitive processes during debugging tasks. The study found that novice learners in programming followed a linear, line-by-line approach as they debugged computer programs whereas students with prior programming experience followed a more logical, strategic approach. In a similar study, Bednarik (2012) used eye movement data to investigate visual attention patterns as a function of expertise during debugging. Findings showed novices' eye transitions between code and output areas early in the debugging task but later on they focused on the program itself. Alternatively, experts demonstrated systematic eye transitions between the code and output with focused attention on the output area throughout the debugging task. Further, Papavlasopoulou, Sharma, Giannakos, and Jaccheri (2017) used eye-tracking data to examine children's learning processes of coding during block-based programming activities. They grouped children into two groups: (1) ages of 8-12 and (2) ages of 13-17, and compared visual attention patterns, time spent on Areas of Interests (AOIs), and transitions between AOIs. Results indicated that younger children focused mostly on sprites, the visual aspects of the programming tasks, whereas older children focused mostly on script, output, and command areas. Papavlasopoulou et al. (2017) also asserted that a higher number of transitions between these areas indicate two types of processes, active debugging and hypothesis testing.

Eye tracking devices have been used not only as a data collection method, but also as part of an intervention to support programming education. Sun and Hsu (2019) implemented an eye-tracking scaffolding system that instantly gauged learners' attention by providing just-in-time hints as learners worked on programming tasks. The system tracked participants' eye movements (i.e., fixation positions and durations) to evaluate the level of attention. If, for instance, a participant did not fixate on the area that contained key information, then the system would highlight the area to direct the participant's attention. Compared to peer scaffolding and mixed scaffolding, learners using the eye tracking scaffolding demonstrated higher programming self-efficacy. However, no difference was found in terms of learning performance between experimental conditions. In another study, Bednarik, Schulte, Budde, Heinemann, and Vrzakova (2018) explored the effect of eye movement modeling examples on program comprehension and program reading. Researchers recorded eye movements of an expert programmer when s/he was working on programming tasks and used the video as a model to support novice learners' program comprehension and program reading. Findings revealed significant improvements in novice learners' program comprehension.

These studies demonstrate the potential of using eye trackers to understand learners' cognitive processes during complex programming tasks. However, most research has been conducted with higher education individuals from the field of computer science, and involved text-based programming languages (Obaidellah et al., 2018). To our knowledge, the present study is the first attempt to use eye tracking to understand preservice teachers' cognitive processes during debugging block-based programs. Hence, the present study addresses this gap in the research literature.

Purpose and Research Question

This study examined how early childhood preservice teachers used cognitive strategies while debugging block-based programs using eye movement data and cued retrospective reporting. This research question was investigated: What cognitive strategies do early childhood preservice teachers use during debugging block-based programs?

Method

This was a mixed methods case study (Leedy and Ormrod, 2013) in which we used qualitative and quantitative data to provide an in-depth understanding of early childhood preservice teachers' cognitive processes while debugging block-based programs. Quantitative and qualitative data were concurrently collected, had equivalent weight (Leech and Onwuegbuzie, 2009), and consisted of eye movement data and cued retrospective reporting transcripts respectively.

Research Setting

After approval by an Institutional Review Board (IRB), data was collected in two sections of a course on early childhood mathematics teaching offered at a large Southeastern university in the United States. One of the week-long modules of this course covers STEM education in early childhood. During this week, researchers hosted a 2-hour workshop on block-based coding during a class meeting in a computer lab. A total of 41 preservice teachers attended the workshop, 19 in course section A and 22 in course section B. During the workshop, preservice teachers learned to program with Scratch, a free block-based visual programming tool and language. Each preservice teacher worked individually in an assigned computer.

After an introduction about Scratch features (e.g., block palette, output), preservice teachers followed step-by-step instructions to create an animation in Scratch such as making a sprite fly and coding a knock-knock joke. Next, they completed two debugging activities in which they attempted to identify and fix a problem in a faulty program. They debugged the code to make a sprite move between two points on the screen and to make a sprite travel on a square pattern.

At the end of the workshop, preservice teachers were invited to participate in an individual data collection session about coding and debugging. A gift card was offered as incentive though only two participants, one from each course section, accepted to join the individual session.

Participants

Participants were two 21-year old female preservice teachers in the senior year of their Bachelor's degree in early childhood education. Pseudonyms are used in this paper. Convenience sampling was used given that these were the two preservice teachers who accepted to partake in individual activities after the workshop. Regarding ethnicity, Mila was White, and Emmy was African American. Prior to attending the Scratch workshop, neither one had previous experience with text- or block-based programming languages. According to a self-rated prior knowledge test administered before individual debugging activities, both participants reported that they knew the functions of most of the blocks used in the debugging activities.

Study Procedures

Participants attended one individual data collection session in a human computer interaction lab. First, each participant was explained the purpose of the study, and their informed consent was collected. They were introduced to the eye tracking equipment (Tobii X3-120), which was attached to a 22 in computer monitor. Then, participants' eye movements were calibrated by following a red ball, called calibration dot, on the screen. This calibration adjusts the eye tracking system to the geometric characteristics of participants' eyes. After calibration, participants completed the first debugging activity in Scratch. While working on debugging activities, eye movements were tracked and video recorded. Participants had 10 minutes to identify and fix the fault in the code. Next, researchers replayed participant's eye movements and conducted cued retrospective reporting. Cued retrospective reporting was video recorded with the Tobii Pro Studio software. The same procedure was repeated for a second debugging activity.

Individual Debugging Activities. Two debugging activities were designed based on the content covered in the workshop. Ten minutes were allocated to each debugging activity, and participants worked independently, without validation from researchers. Participants were informed that they could add, delete, or reorder blocks, as well as undo their own actions to start over.

Instructions for the first debugging activity were "Liam wants to code his cat to dance until the end of the song, but he noticed the cat continues dancing after the song stops. Can you help Liam fix the bug in the code?". Figure 1 presents the faulty program and output. Reducing the number of loops in one of the repeat blocks would solve this problem.

In the second debugging activity, participants were instructed: "Lucia would like the cat to move following a rectangle path, though the code that she put together is not working. Let's help Lucia fix this code." Figure 2 shows the faulty program and output. To debug the error, participants could place the first move block inside the loop (repeat) right before the first turn block, and increase the number of steps in

one of the move blocks.

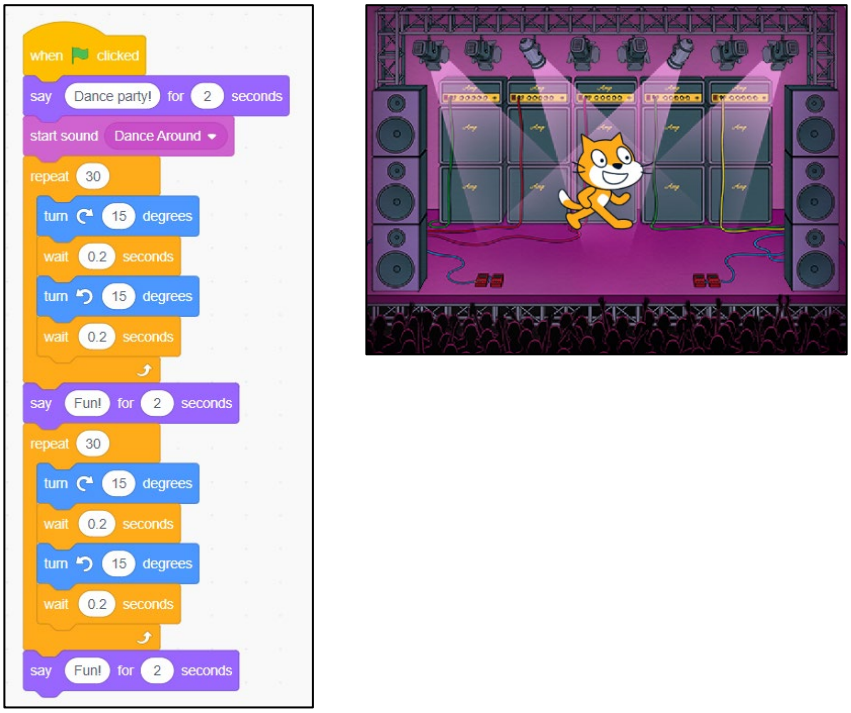

Figure 1. First Debugging Activity in Individual Coding Section

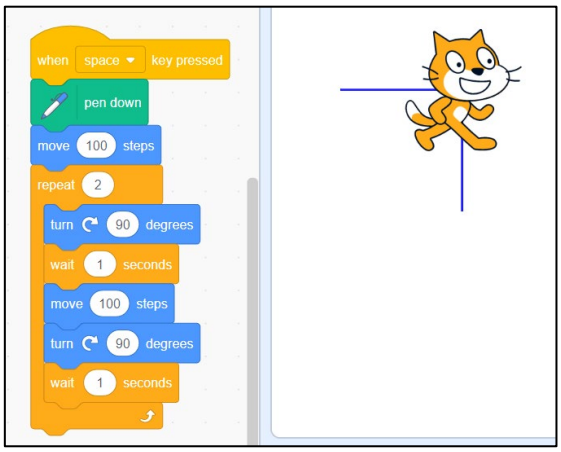

Figure 2. Second Debugging Activity in Individual Coding Section

Data Collection Methods

To collect data that answers the research question about early childhood preservice teachers' cognitive strategies during debugging block-based programs, an eye tracking device and cued retrospective reporting were used. Also, participants' prior knowledge of programming was measured with a prior knowledge test.

Prior knowledge test. To assess prior knowledge of programming, participants rated 12 statements about their knowledge of specific blocks on a 5-point scale ranging from ''I don't know at all" (score 1) to ''I know very well" (score 5). Statements targeted blocks used in debugging activities. For example, "I know the functions of *repeat* block." and "I know the functions of *when I receive* block." Moreno and Mayer (1999) also used a similar self-assessment instrument on a different topic.

Eye tracking device. While working on the debugging activity, participants' eye movements were recorded with a Tobii X3-120 eye tracking device using the sample rate of 120 Hz. Tobii X3-120 is a screen-based portable eye tracker that attaches to the bottom of a computer monitor. It uses near infrared sensors to capture eye gaze. Tobii Pro Studio software was used to calibrate, record, and analyze eye movements.

Cued retrospective reporting. Cued retrospective reporting is a verbal reporting technique in which the participant watches their recorded eye movements and retrospectively verbalizes what they were thinking as well as their problem-solving strategies. This cued retrospective reporting technique is adopted from van Gog, Paas, van Merriënboer, and Witte (2005). Participants were told "Please watch the recording of your eye movements and tell me what you were thinking during debugging." While watching their eye movements, participants were asked questions, such as "Where in the screen did you look to fix the error?" and "What was the cause of the problem in the debugging activity?" Researchers paused or replayed the video recording as needed. Participants' reporting was video recorded with the retrospective reporting feature in the Tobii Pro Studio software.

Data Analysis Methods

Tobii Pro Studio software was used to analyze participants' eye movements. First, eight specific sections of the screen were assigned as Area of Interests (AOIs), and they remained constant throughout debugging activities (see Figure 3). Description of AOIs are provided in Table 1.

Figure 3. Eight AOIs of Scratch

Table I
Description of AOIs

AOIs	Description
Block categories	General categories of blocks, such as motion or sound
Blocks palette	Available blocks within a selected block category.
Script	Area where a program is created by dragging and connecting blocks.
Control panel	Buttons to control the program output. The green flag runs a program and the red octagon stops it.
Output	The visual output of a program is displayed in this area.
Sprite control panel	Controls to change sprite features, such as size and direction.
Sprites	Thumbnails of sprites (characters) that the program controls.
Backdrops	Thumbnails of backdrops used in the Scratch output

Quantitative data consisted of total fixation duration and total fixation count calculated for each AOI.

Fixation duration refers to how long participants looked at a specific area on the screen, while fixation count reflects the number of times participants looked at that same area. Percentage values were calculated given that participants completed debugging activities at different times. Also, transitions between AOIs were calculated to deepen the understanding of each participant's cognitive strategies during debugging. Two types of transitions were calculated: (1) between script and output and (2) between blocks palette and script. Specifically, transitions were computed by summing up the number of times the eye fixation is moved from the script to output and from output to script. Transitions between AOIs are often used as metrics in eye-tracking research (Sharafi, Soh, and Guéhéneuc, 2015), including studies that assess program comprehension or debugging (e.g., Bednarik, 2012; Lin et al., 2015; Papavlasopoulou et al., 2017).

Qualitative data included researchers' notes about trends and patterns in participants' eye movements, transcriptions of cued retrospective reporting, and heatmaps. Heatmaps provide visual evidence of participants' eye movements based on the distribution of eye fixations on the screen (Sharafi et al., 2015). The first and second authors used constant comparison methods from qualitative grounded theory research (Glaser and Strauss, 1967; Strauss and Corbin, 1998) to review eye movement videos and transcripts line by line. Open coding techniques were used as "a starting point to provide the researcher with analytic leads for further exploration" (Saldaña, 2013, p. 101). Specifically, salient patterns and interpretations from each data source were compared with patterns and interpretations from other data sources for triangulation of findings (Greene, 2007, 2008). For example, researchers noticed that (1) eye movements frequently alternated between code and output, (2) participant reported that she was trying to connect certain animated actions with specific blocks in the script area, and (3) the heatmap showed significant eye fixation on the specific block mentioned by the participant. Finally, all authors reviewed findings about participants and created qualitative themes (Braun and Clarke, 2006) to describe employed cognitive strategies while debugging block-based programs.

Results

Eye Movement Analysis

Mila. Mila completed the first debugging activity in 516.90 seconds. During this activity, Mila had more eye fixation on scripts (57.07%) and output (34.34%) followed by sprite control panel, blocks palette, and control panel in descending order (Table 2). Alongside that, Mila's fixation count relied predominantly on scripts (56.06%) and output (34.03%). Eye movement analysis revealed that Mila's eyes often alternated between scripts and output areas as an attempt to understand the script, especially at the beginning of the debugging activity. During cued retrospective reporting, Mila explained that she tried to focus on the output, but not the script, to inform hypothesis creation. As she said, "I just kept watching it to I guess just to see what he was doing. So I didn't really have an idea." In other words, Mila did not have a hypothesis about what caused the error, which was reflected in the patterns and number of eye transitions captured by the eye tracker. There were 129 transitions between the scripts and the output area but only 5 transitions between the block palette and the scripts area (Table 3). This suggests that Mila did not consider adding a new block and/or replacing an existing one in the program. Further, Mila often mentioned during cued retrospective reporting that she was "just trying things" as she moved blocks around and/or changed block parameters. She found a clue that the repeat (loop) block was the problematic one, and she tried two debugging strategies: (1) entering zero as parameter to prevent the block from running, and (2) deleting blocks within the repeat block, but not the repeat block itself. By trial and error, Mila was able to fix the error in the first debugging activity.

Mila mentioned that she found the second debugging activity easier, and she completed it in 416.306 seconds. Eye fixation duration was predominantly on the scripts (65.32%), and output (23.23%) and fixation counts were also mostly on scripts (61.60%) and output (24.58%) (Table 2). This time, however, Mila was more strategic in her debugging. When prompted to share if she had a hypothesis about how to fix the faulty program, Mila said that "There wasn't enough turns and moving, so that's why you had to add more.". Mila then searched for blocks in the palette to add to the code sequence, which explains the higher number of eye fixation on the blocks palette area (6.87%), and more transitions between code and

palette area (n=34) compared to the first debugging activity (Table 3). When she encountered an unexpected error (e.g., sprite drawing a square rather than a rectangle), Mila knew that she had to change the move block to increase the number of steps for two sides of the shape. She was able to use the output (cat drawing a shape) and her mathematical knowledge about rectangles to inform her debugging strategies. In summary, she implemented three strategies while debugging: (1) deleting blocks, (2) changing the number of steps in the move block, and (3) deleting blocks within the repeat block.

Table II

Fixation Duration and Fixation Counts for Each Debugging Activity

Participant	Debugging activities	Backdrops	Block Categories	Blocks Palette	Control Panel	Output	Scripts	Sprite Control Panel	Sprites
Mila	Debugging Activity 1								
	Fixation Duration (%)	0.06	0.09	1.53	1.12	34.34	57.07	3.62	0.71
	Fixation Count (%)	0.07	0.07	2.61	0.07	34.03	56.06	3.35	1.21
	Debugging Activity 2								
	Fixation Duration (%)	0	0.15	4.77	3.24	23.23	65.32	1.90	0.20
	Fixation Count (%)	0	0.31	6.87	2.82	24.58	61.60	2.14	0.31
Emmy	Debugging Activity 1								
	Fixation Duration (%)	0.18	1.53	20.76	1.34	31.56	41.65	0.36	0.30
	Fixation Count (%)	0.38	2.36	25.97	1.45	23.08	42.50	0.61	0.61
	Debugging Activity 2								
	Fixation Duration (%)	0.04	1.28	8.80	1.13	31.08	53.72	1.42	0.90
	Fixation Count (%)	0.11	1.87	10.26	1.47	28.40	52.61	1.98	2.04

Table III

Transitions Between Block Categories and Script, and Script and Output

Participant	Block Palette-Script		Script-Output	
	Debugging Activity 1	Debugging Activity 2	Debugging Activity 1	Debugging Activity 2
Mila	5	34	129	100
Emmy	35	26	82	114

Emmy. Emmy fixed the error in the first debugging activity in 479.80 seconds. During this time, she fixated the most on three of the AOIs, scripts (41.65%), output (31.56%), and blocks palette (20.76%) (Table 2). Emmy seemed more strategic about debugging strategies. After examining the script from top to bottom, she reviewed the output to evaluate the outcome of the program. Then, her eye movements alternated between the script and output areas to find the error. After she figured out the error, she focused on the block palette to locate blocks to fix the error. During this process, her eye movements alternated between block palette and scripts 35 times. As Emmy was watching her recorded eye transitions between block palette and scripts, she explained that she was "trying to figure it out what [I] should add or take away." Further, she said that she created two hypotheses: (1) to make the cat stop dancing and (2) to stop the music. After she was not able to stop the cat, she tried the second hypothesis. While trying to test both hypotheses, Emmy added new blocks and made transitions between the blocks palette and scripts. The high number of fixation counts on scripts (42.50%) and blocks palette (25.97%) AOIs aligns well with her explanations. After Emmy updated the script, she assessed the output. After multiple trials, she went back to the top of the script to review it. During the first debugging activity, Emmy's transitions between script and output areas amounted to 82 times total (Table 3). Overall, she used three debugging strategies to fix the error in the first debugging activity; (1) changing the parameter of the repeat block, (2) adding a new block named stop at sounds, and (3) deleting the second repeat block along with all other blocks within that loop. Emmy successfully completed the activity after removing one of the loops from the code and using trial and error to tweak the number of loops that controlled the cat movement.

Emmy's eyes fixated on scripts (53.72%) and blocks palette (8.80%), and these parameters changed dramatically compared to her fixation durations in the first debugging activity. This time, Emmy focussed less on the blocks palette but more on the scripts. Her fixation durations on the output in both debugging activities were very similar (Table 2). Emmy found this activity harder as she explained that she could not

remember how the pen down block works. To figure out its function, she disconnected all other blocks except for the pen down block and searched the block palette to find a clue. However, this strategy did not help her in identifying the block function. Compared to the first debugging activity, there were more transitions between the script and output (n=114) as Emmy tried to interpret the script and figure out the error. She removed blocks and changed parameters, and she was able to make the sprite draw a square. By using her mathematical knowledge, she created a hypothesis, but she did not know how to execute it in the script. As she explained, "I was trying to think how I could make the size shorter. So I put both 50 [number of steps in move block], but that didn't work the way I thought. And it just made the square bigger." Therefore, Emmy spent more time on the script (53.72%). Also, even though she did not add new blocks to the code, she had a high number of fixations on the blocks palette (10.26%). In her cued retrospective reporting, she explained "I didn't know what I was actually looking for." This confusion is also evident in her rapid eye movements from one area to another area on the screen. Emmy was not able to successfully complete the second debugging activity within the allocated time.

Cross-case Analysis: Qualitative Themes

1. Frequent and continuous eye fixation on output for hypothesis generation. Participants' eye fixation focused significantly on output, which served as an aid for hypothesis generation about the cause of the problem. Output was the second most fixated AOI for both participants in both debugging activities (Table 1). The pattern of their eye fixation on output is well represented in Figure 4, which is a heatmap of one participant's fixation. Participants ran the code multiple times (see fixation counts in Table 2) to craft a hypothesis/idea, and then they would review the program. When prompted to explain this, Mila said "I was trying to see why he [cat] was not stopping. I think at this point I didn't really know where to go, so I just kept watching it just to see what he was doing." This behavior is indicative of hypothesis generation through interpreting the output first and relating corresponding actions of the character to the code blocks to identify where the error(s) might possibly be located.

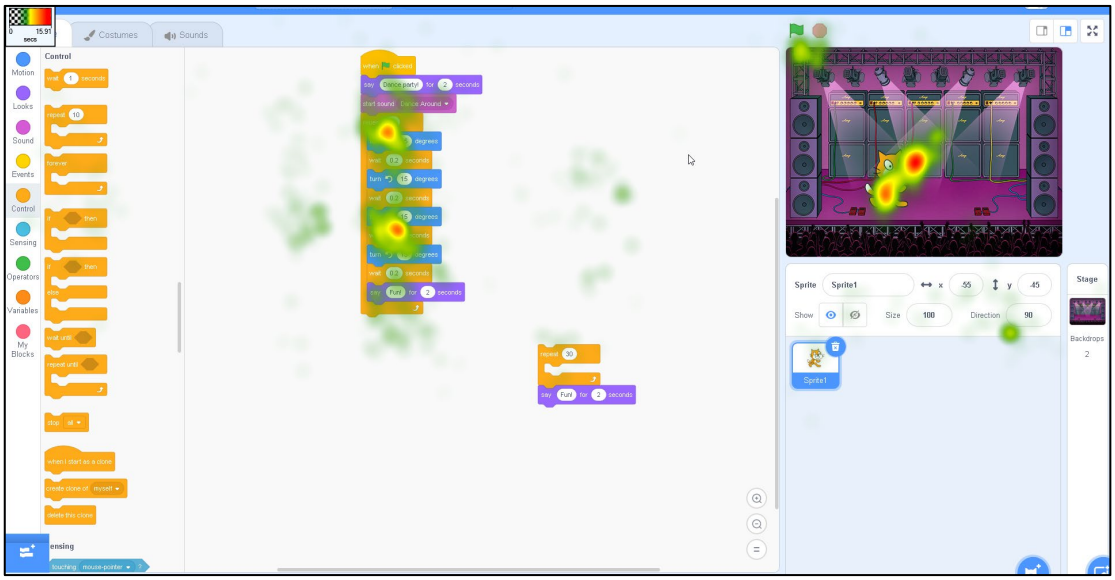

Figure 4. Heatmap as Example of Mila's Eye Fixations in the First Debugging Activity (based on fixation duration). Green Represents Short Fixation Duration While Red Represents Longer Fixation Duration

2. Simultaneous output visualization and top-down block review. Early in the debugging activity, participants played the program multiple times. Analysis of their eye movements revealed that they attempted to simultaneously observe the output and perform a top-down analysis of the block sequence. They used this strategy to understand the function of blocks even before debugging the code, and participants confirmed this during cued reporting. Indeed, the number of script-output transitions was much higher than the number of block palette-script transitions (Table 3). When showed her eye movements, Emmy recalled that she reviewed the code from "top to bottom", and that she was "looking at everything and then pressed play (...), trying to understand everything, looking at every step [block]."

This aligns with the literature on novice learners' program comprehension and debugging, as they often follow a linear, line-by-line approach.

3. Eye fixations and debugging targeted the bottom of a block sequence. Participants primarily focused on the bottom of a block sequence, which led to them adding and deleting blocks rather than reordering blocks or tinkering with other blocks at the top. When Emmy was asked about why her eye movements were focusing at the bottom of the code, she said "The most important stuff is usually up top." This suggests the participant may think of bugs as errors that occur towards the end/bottom of a code sequence. Because their debugging was often limited to adding/removing blocks at the bottom, they ended up with inefficient and long programs, even when they successfully accomplished the goal.

4. Eye fixation on faulty block only occurred if participant had a hypothesis. Participants were only strategic about reviewing a faulty code if they had a hypothesis for fixing the error. Their eye movements pointed straight to the hypothesized faulty block. For instance, Mila said that "The repeat part [block] was throwing me off because there were two repeats." When asked to elaborate on this, she added "I thought, well if it's repeating it, if it's just going and going, it must be an issue with like the repeats in the code." Although it was not possible to calculate fixation counts and time on specific blocks, the videos clearly showed Mila repeatedly fixating on the repeat block.

5. Random eye movements indicative of random trial and error. Participants often used trial-and-error techniques, and this was reflected in random eye movement transitions between AOIs, as well as along the block sequence. When asked about this, participants simply argued that they did not have a hypothesis. Interestingly, both participants acknowledged using trial and error. Mila added that another factor was helpful in fixing the faulty block: "a little bit of luck." Participants were unsure if they had a hypothesis, even when they actually had one. This could be indicative of a misconception in which they associate having a hypothesis with correctly understanding the cause of the problem and mastering a programming concept.

6. Recognizing a key block helps narrow down area to be debugged. Participants used cues in the output to identify the faulty block area. As they reviewed the output, they associated the fun speech bubble with the block "say fun for two seconds". As Mila said, "I thought that the problem was like after the fun." Eye movements showed participants alternating between output and the analogous block. This recognition led participants to narrowing down the part of the program to be debugged, given that they used debugging strategies such as adding/deleting blocks after that block.

7. Eye fixation relied more on block palette when they understood the program. When participants understood the program, they made more attempts to add new blocks to the script. Consequently, there was a higher number of eye fixations on blocks from the palette. Mila focused on the blocks palette AOI and added new blocks in the second debugging activity, which she confirmed was the easiest because she understood the block sequence. On the other hand, Emmy acknowledged that she did not understand the second debugging activity as much as the first activity, which led to fewer fixation counts on the blocks palette AOI. Emmy reported in the prior knowledge and cued retrospective interview that she did not know what the pen down block does. Analysis of her eye movements showed that she focused on the pen down block for a longer period of time as she attempted to understand it.

Discussion and Conclusion

This mixed methods study used eye movement data and cued retrospective reporting techniques to explore early childhood preservice teachers' cognitive strategies as they debugged block-based programs. Quantitative analysis of eye movements revealed that participants' eye fixation relied mostly on the output and scripts AOIs, and consequently, there were more script-output eye transitions. Participants primarily fixated on the output as an attempt to form hypotheses although participants often reported that they failed at it during retrospective reporting. In a study about cognitive strategies and visual attention during debugging, Bednarik (2012) found that novice programmers reviewed output first to form hypotheses while more experienced programmers used only the scripts or a combination of output and scripts. In a

study with kids, Papavlasopoulou et al. (2017) found that those who spent more time on output and/or characters while coding in Scratch were outperformed in terms of learning gains by kids who spent more time reviewing scripts. It is important to support preservice teachers in purposeful and strategic consideration of both scripts and output for hypothesis generation. Follow-up research could feature scaffolding prompts (Ge and Land, 2004) that guide preservice teachers in associating certain events in the output with corresponding blocks/commands in the scripts. This could be helpful for program comprehension, identification of the faulty code area, and purposeful hypothesis generation.

Study participants had a significantly higher number of script-output transitions as they attempted to simultaneously review output and script. A study that compared programming performance in experts and novices found that experts switched between scripts and program more often than novices (Hejmady and Narayanan, 2012). Frequent eye movement between script and output is considered typical behavior of hypothesis testing as one modifies the program and refers to the output to evaluate it (Papavlasopoulou et al., 2017). However, Mila's and Emmy's debugging strategies were rarely informed by a hypothesis. They identified critical AOIs to focus on, but they could not systematically review output and block script. Further, they did not know how to structure their debugging process, as they would say "I didn't know where to go." Qualitative data analysis revealed that participants mostly resorted to trial and error techniques to identify and fix errors in a faulty code. Other debugging strategies include using a zero parameter in a block to prevent it from running, deleting blocks within a loop (repeat), and adding/deleting blocks at the bottom of a block sequence. Participants were not sure of the cause of the error even when they correctly completed the task.

Mixed methods analysis combined qualitative and quantitative findings into themes that provide in-depth accounts of participants' debugging. It was noticeable that participants (1) frequently and continuously fixated on output for hypothesis generation, (2) attempted to simultaneously visualize the output and review the program from top to bottom, (3) primarily fixated on and debugged the bottom of a program, (4) only fixated on faulty blocks if they had a hypothesis to inform such eye movement, (5) often engaged in random trial and error and random eye movements, (6) identified key blocks to help narrow down which area to be debugged, and (7) fixated more on the block palette when they properly understood the code sequence.

Creating a conceptually grounded hypothesis while programming is critical (Brooks, 1983) as it informs debugging actions. It was noticeable that participants in this study often engaged in random trial and error, which was also evident in random eye movements. This finding is extensively supported by the literature, which characterizes trial and error as a debugging strategy that is repeatedly used by novice learners (Fitzgerald et al., 2008; Jadud, 2005; Simon et al., 2008). Creating a hypothesis and strategy prior to debugging is typical of more experienced programmers (Gould and Drongowski, 1974). In this study, participants would only review the block palette AOI if they had a hypothesis and understood the scripts, such as Mila's idea to use a stop block to make the cat stop. She scrolled through block categories in search of that block.

Identifying where the bug is in a long code sequence is critical for effective and efficient debugging. Research has found that a line-by-line, top-down approach to understand and debug code is typical of novice learners (Alqadi and Maletic, 2017; Busjahn, Schulte, and Busjahn, 2011; Yusuf, Kagdi, and Maletic, 2007). Experts, on the other hand, are more strategic about processing the code, which occurs in a nonlinear manner compared to novices (Busjahn et al., 2011). Expert programmers often search and locate beacons (Crosby, Scholtz, and Wiedenbeck, 2002), which are defined in the computer science literature as a structure, statement, or operation that aid programmers in creating and testing a hypothesis (Lin et al., 2015). Both participants in this study successfully identified an event in the output (fun bubble) and an analogous block (say fun for two seconds) during the first debugging activity. They used the block as a beacon to realize that the faulty part of the code was located after that block. Studies on comprehension of text-based languages found that experienced programmers recognize beacons to create and verify hypotheses (e.g., Aschwanden and Crosby, 2006; Crosby et al., 2002). However, in most instances, participants in the present study tried to modify the bottom area of a code sequence as a strategy to debug

the code. Perhaps it would be beneficial to provide not only visual cues on the screen to guide participants' attention to key information (Sun and Hsu, 2019), but also a guided framework for hypothesis construction, testing, evaluation, and revision. The latter of these two recommendations has been proposed by Kim et al. (2018), who identified preservice teachers' struggles with hypothesis-driven programming of educational robots.

Professional learning that prepares preservice teachers to address the learning needs of 21st century students is critical so preservice teachers can feel more confident in offering integrated STEM learning experiences to their students. In fact, it has been found that most K-12 students in U.S. are not offered instruction that features coding until they reach high school (Google and Gallup, 2015). Results of this study will inform and inspire teacher educators to design and develop professional learning on coding and debugging for teacher preparation programs so that preservice teachers can integrate developmentally appropriate coding instruction in early childhood grades and beyond.

Limitations and Future Research

There are several limitations to this study. First, this case study examined the cognitive strategies of only two early childhood preservice teachers, which limits the generalizability of findings to larger populations. Follow-up studies with larger populations are invited. Second, participants attended a 2-hour workshop about coding, which means they still had limited knowledge about Scratch and block-based coding. The duration and content of the workshop should be expanded in future research to provide preservice teachers with opportunities to develop a more sophisticated conceptual understanding of key computer science concepts (e.g., loops, variables) prior to data collection about debugging. Third, both study participants were novice programming learners. Follow-up studies could compare cognitive strategies used by novice and more experienced early childhood preservice teachers. Fourth, study participants worked on debugging activities individually. Literature on programming instruction states that pair programming is an effective strategy (Braught, Wahls, and Marlin Eby, 2011) given the potential for peer scaffolding. One possible avenue for research is to investigate pairs' co-construction and implementation of debugging strategies using interaction analysis (Jordan and Henderson, 1995), as well as to examine similarities and differences in pairs' eye movements (Pietinen, Bednarik, Glotova, Tenhunen, and Tukiainen, 2008). Finally, debugging activities were created by the researchers. However, early childhood preservice teachers will need to fix errors in programs created by children when they become in-service teachers. It is quite likely that children's programs may not produce an output and/or may include many blocks that were not supposed to be attached to each other. Therefore, to make the debugging experience more authentic, future research might consider using block-based programs developed by children.

Declarations

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Research Article

Colombian retrospective study of the association between breastfeeding duration and eating behaviors

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Abstract: The current retrospective cross-sectional study included 175 Colombian caregivers of children ranging between 24 and 59 months old (M=47.08, SD=7.08) enrolled in childcare centers located in the Caribbean region. 58% of the children are male, and all of them belong to low-income families. Breastfeeding duration ranged between children's 0 to 37 months old (M=10.84, SD=8.48); 64 of them had exclusive breastfeeding for during their first 6 months (i.e., no fed with bottle). Results showed that the variance of Food Responsiveness explained by the model was 2% (R^2=.02, F(3,161)=1.081, p=.359). Breastfeeding duration did not significantly predict Food Responsiveness (β=-.004, p=.219), as well as age (β=.004, p=.346) and gender (β=.056, p=.354) did not significantly explain the dependent variable. Likewise, Satiety Responsiveness variance was not explained by duration of breastfeeding (β=.002, p=.548), age (β=.003, p=.489), and gender (β=.040, p=.561). Overall, the explained variance was less than 1% (R^2=.008, F(3,161)= .428, p=.733). Breastfeeding duration does not significantly change the child's likelihood of being unhealthy (β=-.010, p=.616), while being male and getting older increase the odds of being healthy. Future directions and limitations are discussed.

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Introduction

Duration of breastfeeding is an important subject of cross-national debate given the importance of breastfeeding for child development and parenting practices (Biks et al., 2015; DiSantis et al., 2011; Ip et al., 2007; Li et al., 2010, 2014; Rodríguez et al., 2009; Savino et al., 2009; World Health Organization, 2012, 2013). Studies in different countries like India, Egypt and Zimbawe have revealed that social, economic and cultural factors may be potentially risky or protective for breastfeeding (Abou-ElWafa & El-Gilany, 2019; Borkhoff et al., 2018; Kumar et al., 2015; Miani et al., 2018; Reyes et al., 2014).

In terms of child nutrition, studies have reported that breastfeeding may influence different health dimensions, including weight (Falcão et al., 1991; Fiese et al., 2019; Gibson et al., 2017; Rogers & Blissett, 2016; Vogelezang et al., 2018), dietary habits (Borkhoff et al., 2018; Fiese et al., 2019), eating behaviors (Borkhoff et al., 2018) and others. Findings consistently showed significant correlations between breastfeeding and children's body mass index (BMI) (Borkhoff et al., 2018; Caleyachetty et al., 2013; Carling et al., 2014; Fiese et al., 2019; World Health Organization, 2013). Moreover, the literature also highlights the role of the duration of breastfeeding as a key factor of nutrition (Harder et al., 2005; Yan et al., 2014). For instance, Vogelezang and colleagues (2018) revealed that breastfed children in the Netherlands had lower BMI and a lower fat mass index than those who were never breastfed. In fact, larger breastfeeding may also

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decrease the risk of overweight or obesity (Caleyachetty et al., 2013; Harder et al., 2005; Rogers & Blissett, 2016; Yan et al., 2014).

Association among Eating Behaviors, BMI and Breastfeeding.

Eating behaviors such as food responsiveness and satiety responsiveness are associated with weight status (French et al., 2012). In fact, a predictive study conducted in the Netherlands concluded that children who have higher BMI tend to show more food responsiveness and less satiety responsiveness (Derks et al., 2018). In this study, satiety responsiveness is defined as the child's ability to recognize and adjust their food intake considering their physiological cues and their internal perception of satiety during and after the act of eating (Birch et al., 2001; Brown & Lee, 2015; Llewellyn et al., 2008; Obregón et al., 2014; Sinopolou et al., 2015). On the other hand, food responsiveness is defined as the child's reaction to an external stimulus, in this case the food, rather than their internal or physiological cues (Birch et al., 2001; Llewellyn et al., 2008; Obregón et al., 2014).

Several studies revealed that children tend to demonstrate certain predominant eating behaviors according to their nutritional status (Carnell & Wardle, 2007; Croker et al., 2011; Denney-Wilson & Campbell, 2008; Gregory et al., 2010; A. Jansen et al., 2003; P. W. Jansen et al., 2012; McCarthy et al., 2015; Santos et al., 2011; Spence et al., 2011). For instance, Webber, Hill, Saxto, van Jaarsveld, & Wardle (2009) identified that obese/overweight children showed higher scores of responsiveness to food cues and lower scores of satiety responsiveness. Croker and colleagues (2011) reported that food responsiveness mean scores decreased across weigh categories (M=2.1 for underweight, M=2.4 for healthy weight, M=2.8 for overweight and M=3.1for obese), while satiety responsiveness mean scores increased across weight categories (M=3.1 for underweight, M=2.7 for healthy weight, M=2.6 for overweight and M=2.1 for obese). Consistent findings were reported for Chilean children. Children with higher BMI were more likely to show high scores in food responsiveness, while children with higher BMI showed lower scores in satiety responsiveness (Santos et al., 2011).

Beyond weight, eating behaviors may be also associated with breastfeeding. A considerable number of studies have revealed that breastfeeding is also associated with practices and interactions of individuals during food consumption in the early years (Borkhoff et al., 2018; Brown & Lee, 2015; Hathcock et al., 2014; Li et al., 2014; Mallan, Nambiar, et al., 2014) across different cultural contexts and geographical regions (Abou-ElWafa & El-Gilany, 2019; Caleyachetty et al., 2013; Muchacha & Mtetwa, 2014). Likewise, a study with Chilean Latino adolescents showed that shorter breastfeeding duration decreased the presence of satiety responsiveness and increased the risk of suffering overweight (Reyes et al., 2014). However, the existing literature has also revealed a lack of association between breastfeeding and satiety responsiveness. For example, Hathcock and colleagues (2014) did not reported mediation effect of satiety responsiveness on the association between breastfeeding and nutritional status in the early years

Breastfeeding Practices in Colombia

There is well-established evidence about the short-term and log-term benefits of breastfeeding for improving quality of life and decreasing the risk of death of young children living in middle-low income countries (World Health Organization, 2013). Duration of breastfeeding is one important factor that influences the estimation of the overall effect of breastfeeding. The recommended duration is exclusive breastfeeding (EBF) for first six months of liger, and partial breastfeeding (breastfeeding combined with solids) until two years old (World Health Organization, 2013). Several breastfeeding duration studies using Colombian samples have reported inconsistent results (Benjumea et al., 2011; Cabrera et al., 2004; Gómez-Aristizábal et al., 2013; Mateus, 2012; Niño, 2014; Rodríguez-García & Acosta-Ramírez, 2008). Most of these studies concluded that breastfeeding duration was shorter than the recommended breastfeeding duration proposed by international organizations and the Colombian government (Benjumea et al., 2011; Cabrera et al., 2004; Gómez-Aristizábal et al., 2013). Conversely, Niño (2014) found higher EBF rates than the duration proposed by national and regional governmental intervention programs in Colombia.

Given the inconsistency of the existing literature and considering breastfeeding and eating behaviors

as a multidimensional construct determined by socio-emotional, cultural and economic factors (Behar et al., 2018; DeCosta et al., 2017; Llewellyn et al., 2011; Mallan, Daniels, et al., 2014; Sparks & Radnitz, 2012; Wardle et al., 2001), more research is needed to address the debate about breastfeeding duration and eating behaviors in different contexts like Colombia. Consequently, using a sample of 175 caregivers who are served by childcare centers of the Colombian Caribbean Region, the current retrospective cross-sectional study aimed to analyze the association between breastfeeding duration and eating behaviors of Colombian children ranging between 24 and 59 months old. In addressing this objective, the study will make a key contribution to the literature by providing a detailed understanding of the similarities and differences in the breastfeeding practices of Colombian low-income families from a cultural-responsive perspective.

Method

Sample

Data come from a dissertation study, entitled *Feeding practices of families with preschoolers in Colombia and USA: A cross-cultural multiple case study* (Escalante, 2016). The study was approved by the I RB from University of Nebraska-Lincoln (U.S.). The subjects of this current retrospective cross-sectional study were 175 Colombian caregivers of children ranging between 24 and 59 months old (M=47.08, SD=7.08) enrolled in childcare centers located in the Caribbean region. 58% of the children were male, and all of them belonged to low-income families. Breastfeeding duration ranged between children's 0 to 37 months old (M=10.84, SD=8.48); 64 of them had exclusive breastfeeding for during their first 6 months (i.e., no fed with bottle).

Measures

Breastfeeding Duration. Caregivers were asked to fill a demographic questionnaire that included retrospective questions to report whether the children were breastfed, its duration, and the age at which they were bottle-fed (Escalante Barrios, 2016).

Eating Behaviors. Data was collected using the Child Eating Behaviors Questionnaire (CEBQ) (Wardle et al., 2001), which was completed by parents. Specifically, two scales of the CEBQ (Wardle et al., 2001) were used: food responsiveness and satiety responsiveness. Validation evidences of data collected with this instrument in the Caribbean region showed close model fit of the factor satiety responsiveness ($\chi 2(5)=12.334$, p=.0305; CFI=.956; SRMR=.037) and a good model-data fit of the factor responsiveness to food ($\chi 2(4)=5.107$, p=.2765; CFI=.997; SRMR=.019) (Escalante Barrios, 2016).

Body Mass Index (BMI). Information about children's size and weight was reported by nutritionist and/or nurses who worked at the health services of the childcare centers (Escalante Barrios, 2016). BMI and nutritional status (underweight, normal range, overweight, obese) were estimated using WHO Child Growth Standards conventions (World Health Organization, 2011).

Data analysis plan

Regression analysis was conducted in order to test the hypothesis of whether breastfeeding duration predicts eating behavior (food responsiveness, satiety responsiveness) and BMI, after controlling for children's age and gender. The Shapiro-Wilk hypothesis of normal distribution failed to be rejected for eating behavior variables at 0.01 level of significance; while it was rejected for BMI. Therefore, BMI was dichotomized such as the subjects were classified as healthy if nutritional status was normal range for the child, and unhealthy otherwise (underweight, overweight or obese) and logistic regression was conducted on this data. Food responsiveness and satiety responsiveness were treated as normal, and thus multiple linear regression was used to model the data. There was no missing data for any of the dependent variables, age, and gender; while breastfeeding duration had 7.4% of missing values. These cases were not included in the models. The analysis was conducted using SPSS 21 (IBM Corp, 2012).

Results

Table 1 shows the descriptives of children's eating behaviors scales as well as their correlation with breastfeeding duration. As can be seeing, the correlation coefficients are low, and statistically not different from zero, for both food responsiveness (r=-.092, p=.242) and satiety responsiveness (r=.051, p=.519). Likewise, the table reports the duration of breastfeeding for those children who were encountered to be healthy (M=10.6, SD=7.67) to be close to those found to be unhealthy (M=11.1, SD=9.42), on average. It is expected, then that the models report similar results.

Table I

Children's Eating Behaviors

Dependent variables	M	SD	Min	Max	*r* with breastfeeding duration
Food Responsiveness	2.95	.38	2.11	4.14	-0.092, *p*=0.242, *n*=162
Satiety Responsiveness	3.48	.44	2.30	4.60	0.051, *p*=0.519, *n*=162
HealthyC	0.56 (56%)	0.50	--	--	*Healthy* M=10.60, SD=7.64, *n*=162 *Unhealthy* M=11.12, SD=9.42, *n*=162

Table II

Regression Results

Dependent variable	Type of analysis	Constant (s.e.)	Breastfeeding duration (s.e.)	Age (s.e.)	Gender (s.e.)	R^2
Food Responsiveness	Linear reg.	β=2.797 (0.205), *p*=0.000	β=-0.004 (0.004), *p*=0.219	β=0.004 (0.004), *p*=0.946	β=0.056 (0.060), *p*=0.354	R^2=0.02, *F*(3,161)=1.081, *p*=0.359
Satiety Responsiveness	Linear reg.	β=3.243 (0.236), *p*=0.000	β=0.002 (0.004), *p*=0.548	β=0.003 (0.005), *p*=0.489	β=0.040 (0.070), *p*=0.561	R^2=0.008, *F*(3,161)=0.428, *p*=0.733
Healthy	Logistic reg.	β=3.158 (1.216), *p*=0.009, exp(β)=23.5	β=-0.10 (0.19), *p*=0.616, exp(β)=0.990	β=-0.052 (0.024), *p*=0.032, exp(β)=0.949	β=-0.89 (0.335), *p*=0.008, exp(β)=0.411	

Table 2 shows the results of the different regression analysis conducted on the data. As can be seen, the variables, as a whole, only explain a small proportion of the dependent variance. In the multiple linear regressions, the R^2 was very low. The variance of food responsiveness explained by the model was 2% (R^2=.02, F(3,161)=1.081, p=.359). Breastfeeding duration did not significantly predict food responsiveness (β=-.004, p=.219), as well as age (β=.004, p=.346) and gender (β=.056, p=.354) did not significantly explain the dependent variable. Likewise, satiety responsiveness variance was not explained by duration of breastfeeding (β=.002, p=.548), age (β=.003, p=.489), and gender (β=.040, p=.561). Overall, the explained variance was less than 1% (R^2=.008, F(3,161)=.428, p=.733). Breastfeeding duration did not significantly change the child's likelihood of being unhealthy (β=-.010, p=.616), while being male and getting older increased the odds of being healthy. That is, for an increase of 1 month in the child's age, the odds of being healthy are expected to change by a factor of .949, holding all other variables constant. While being male increases the odds of being healthy by a factor of .411, holding all other variables constant.

Conclusion and Discussion

The current retrospective cross-sectional study assessed the association between breastfeeding duration and eating behaviors of Colombian children ranging between 24 and 59 months old, using a sample of 175 caregivers who are served by childcare centers of the Colombian Caribbean Region. Our findings revealed that only 56% of children showed normal range of nutritional status, while the rest of children were identified as underweight, overweight or obese (World Health Organization, 2011). The high percentage of low-income preschool children that showed unhealthy weight suggest awareness of the efficiency and quality of the nutrition services provided by ECE centers in the Colombian Caribbean Region. Consequently, it is important to design and implement pertinent and relevant nutrition intervention programs with the purpose to address this public health problem. For this purpose, causal inferences might be necessary to identify children at risk for unhealthy nutritional status and provide targeted nutrition services based on their specific needs.

We hypothesized that breastfeeding duration may be associated with nutritional status (Falcão et al., 1991; Fiese et al., 2019; Rogers & Blissett, 2016). However, our findings showed that breastfeeding duration does not significantly change the child's likelihood of being unhealthy in this sample. In this regard, the study would need to be replicated in order to confirm this finding given the retrospective nature of the study in which the caregiver recall data method could generate bias (World Health Organization, 2013). Most of the children who participated in the study were 47 months old and the majority of them were reported by the caregivers as breastfeed until ten months old. Moreover, only 36% of children were exclusively breastfeed for six months. Consequently, the length of the recall was 37 months approximately, which could have an influence on the misclassification of the breastfeeding duration. After an elapsed time, higher than 24 months, caregivers may tend to report the desired duration rather than what was practiced (World Health Organization, 2013). Then if this were the case, the study would show a lower desired breastfeeding duration than the duration -six months for exclusive breastfeeding and 2 years for continued breastfeeding combined with solids- proposed by national governmental guidelines from Colombia and/or international organizations like WHO (Niño, 2014; World Health Organization, 2013).

Furthermore, we found no evidence that breastfeeding duration was associated with eating behaviors in the Colombian context. Specifically, our results showed that breastfeeding duration did not significantly predict neither food responsiveness nor satiety responsiveness. This finding is consistent with the results reported by Hathcock and colleagues (2014) who found a lack of association between satiety responsiveness and breastfeeding. Notwithstanding that many studies have shown an association between breastfeeding and eating behaviors (Borkhoff et al., 2018; Brown & Lee, 2015; Hathcock et al., 2014; Li et al., 2014; Mallan, Nambiar, et al., 2014), caregivers recall bias in breastfeeding duration may lead to underestimate the measure of potential association (World Health Organization, 2013). Therefore, recall bias may tend to decrease the likelihood of reporting significant associations between breastfeeding duration and other variables in research studies (World Health Organization, 2013).

In terms of eating behaviors, perceptions of caregivers may play an important role to explain the current results. Despite only 44% of children showed unhealthy nutritional status (World Health Organization, 2011), caregivers perceived that their children often show the ability to reduce the food intake at a mealtime in relation to their internal cues (medium-high satiety responsiveness). In fact, caregivers also considered that their children sometimes showed the tendency to eat in response to food cues in standard conditions (medium food responsiveness). Further in-depth exploration would contribute to examine if the current findings may be influenced by social desirability of the Colombian contexts and understand the perceptions of low-income caregivers regarding their children's eating behaviors and the nutritional status in this geographical region.

Moreover, gender and age may be key factors for the prevention of unhealthy weight in low-income population living in the Colombian Caribbean Region. Our findings revealed that being male and older increased the odds of being healthy in the early years. Consequently, an increase of one month in the child's age, the odds of being healthy are expected to change by a factor of .949, holding all other variables

constant. While being male increases the odds of being healthy by a factor of .411, holding all other variables constant. From this perspective, young girls would need to be closely monitored by ECE centers and families. Moreover, nutrition intervention programs targeting female preschool population may be beneficial to improve the nutritional status of children living in this geographical region.

Moreover, the current study provides a unique contribution to expand the literature on the breastfeeding duration and eating behaviors in Latino populations, especially for Latinos living in Colombia. Though, there were several limitations in the present study that would need to be addressed in future studies. First, given the cross-sectional nature of the study, the possibilities to explore causal effect among variables were limited. Second, the retrospective nature of the study and the maternal recall method data could generate bias. On the other hand, the current study may illuminate the selection of measures and methods of data collection (e.g. accrual method) for future studies about this topic in order to improve the quality of the data and the reliability of analysis (World Health Organization, 2011). Third, the sample was no probabilistic and relatively smaller and less homogenous than the samples used in research studies conducted in other countries such as Netherlands (Derks et al., 2018), United Kingdom (Brown & Lee, 2015) and even in Hispanic nations (Falcão et al., 1991; Reyes et al., 2014; World Health Organization, 2012). This methodological issue may lead to inconsistent results and may limit the generalization of the results.

Finally, similar studies conducted in Colombia and other countries have explored multiple socioeconomic variables (e.g., work, government policies) that were not considered in this study (Abou-ElWafa & El-Gilany, 2019; Benjumea et al., 2011; Cabrera et al., 2004; Caleyachetty et al., 2013; Mateus, 2012; Muchacha & Mtetwa, 2014; Rodríguez-García & Acosta-Ramírez, 2008). Thus, future studies would need to address these limitations in order to provide a wider and holistic picture of the association between breastfeeding duration and preschoolers' eating behaviors in low-income Latino populations living in their country of origin.

Declarations

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Authors' contributions:

R., C: literature review, methods, conclusion and discussion, editing

E., E: literature review, design of the study, methods, conclusion and discussion, editing, funding, project management

S., S: methods, data cleaning, results, conclusion and discussion

E., J: methods, data cleaning, results

A., M: literature review, editing

H., A: literature review

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