Gender-sensitive Tutoring Programs: A Single Case Study of BoxGirls South Africa's Mathematics Tutoring Program for Female Grade Five Learners.

Kate Houliston

HLSKAT005

Supervisor: Bianca Tame

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See http://www.knowledgeco-op.uct.ac.za or
Contact us at barbara.schmid@uct.ac.za / 021 – 650 4415

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Abstract:

The underrepresentation of women in Science, Technology, Engineering and Mathematics (STEM) degrees and professions has persisted in most nations, including South Africa. As stated by Letsebe (2018) only 13% of South African graduates in the STEM fields in 2017 were women. This historical and continuous underrepresentation has resulted in females having less access to higher paying job opportunities and gender inequality persisting. Therefore there is a need to address the gendered differences in mathematics.

While attention has to be paid to the tertiary level, it is at a primary school level that learners are provided with the foundations upon which their further mathematics education is built. Basic concepts, skills and thinking strategies taught at this level, are essential for the successful continuation of mathematics at a secondary and tertiary school level.

This qualitative empirical study focuses specifically on primary school mathematics by exploring gender-sensitivity as one response to gendered differences and underrepresentation in mathematics. To frame the discussion of gender sensitivity this study looked at a single case, the BoxGirls Mathematics Tutoring program, run in South Africa. Gender sensitivity in mathematics tutoring programs is defined as being an awareness of the challenges and stereotypes young girls face when participating in mathematics (Wood & Lenze, 1991).

This study argues for the importance of increasing gender sensitivity in mathematics which can be achieved with the assistance of gender sensitive indicators. Three broad indicators of gender sensitivity were identified in this study- Environment, Education and Engagement (The Three E's).

These indicators can be used as an aid to reflect upon and assess gender sensitivity in individual tutoring programs. They can play an integral role in reflecting on and encouraging more gender sensitivity in tutoring programs. This study found that using the Three E's promotes a necessary discussion around the importance of gender sensitivity in mathematics education for young girls. This has positive implications and results in greater attention being paid to combating harmful gender stereotypes in tutoring programs. Furthermore, by aiming to address gender stereotypes at a primary school level and encouraging the achievement of girls in mathematics, the Three E's, begins to accounts for the importance of the female voices in more historically male-dominated degrees and fields. Implementing gender sensitivity in mathematics tutoring programs is therefore found to be a practicable solution to begin addressing gender disparities and increasing female representation, within the field of mathematics.

This study found BoxGirls South Africa to be gender sensitive when assessing their program according to the Three E's. BoxGirls is a helpful example to other tutoring programs. Their program illustrates how gender sensitivity can be used to address the challenges and stereotypes young girls face when participating in mathematics.

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Chapter One: Introduction

1.1. Introduction

The underrepresentation of women in Science, Technology, Engineering and Mathematics (STEM) degrees and professions has persisted in most nations including South Africa. Rankings such as the Global Gender Gap Index however do not adequately illustrate the extent of this underrepresentation. The Global Gender Gap Index ranks nations based on the gap between women and men on health, education, economic and political indicators (Malema, 2017). As of 2017 South Africa was ranked 19th out of 144 nations. However as of 2017 as well, only 13% of South African graduates in the STEM fields were women (Letsebe, 2018). This underrepresentation results in females having less access to higher paying job opportunities. Essentially it further perpetuates the gender disparities in wage.

That only 13% of STEM graduates were women points to a need to address gendered differences in these subjects. This study will focus specifically on one of the STEM subjects, namely mathematics. The focus is further narrowed to address gendered differences at a primary school level. There is a need to comprehend the workings of gender and mathematics at this level as it is primary school mathematics that provides learners with the foundations upon which their further mathematics education is built. Basic concepts, skills and thinking strategies taught at this level, are essential for the successful continuation of mathematics at a secondary and tertiary school level. Gender stereotypes however, when perpetuated within these learning environments, negatively influences the ability of young girls to learn these basic concepts and skills. As a qualified primary school teacher and as a female, I am passionate about addressing gender stereotypes and differences in mathematics. I believe that mathematics plays a fundamental role in shaping the future of young females.

This study looked at a single case, the BoxGirls Mathematics Tutoring Program, which teaches female grade 5 primary school learners. Through researching the practices and program of BoxGirls this study found gender sensitivity to be a powerful response to addressing gender differences in mathematics. Gender sensitivity is therefore understood as being able to play an integral role in working so as to address the underrepresentation of females in STEM professions.

Being sensitive to gender requires a constant process of reflection, honesty and a commitment to addressing gender stereotypes and inequality. The BoxGirls program serves as an example of how this can be achieved. This process of reflection can be encouraged and aided through the use of gender sensitive indicators. This study therefore presents three indicators of gender sensitivity that can be used to facilitate an understanding as to whether mathematics tutoring programs are working in a gender sensitive manner. The three indicators put forward are labelled as the Three E's: Environment, Education and Engagement.

The Three E's not only provide a tool to establish whether tutoring programs can be understood as being sensitive to gender, but by requiring reflection into the education, environment and engagement of a program, they also function so as to encourage tutoring programs to be more aware of gender sensitivity. This will have positive implications for young girls learning of, and achievement in, mathematics. By using the Three E's we will

begin to consciously work towards providing young females with the best chance they can have in preparing for their future.

1.2. Outline

There are six chapters in this qualitative study. Chapter One notes the specific research questions that were addressed, before providing definitions of the two key terms used in this paper, that of indicators and gender-sensitivity. This chapter concludes by briefly explaining the context within which this study is positioned.

Chapter Two, critically discusses the three broad categories of literature that are of relevance to this study. These categories are: literature that focuses on tutoring programs, literature that addresses the relationship between gender and mathematics and finally literature that comments on gender sensitivity.

Chapter Three explains the research methodology used to complete this study. The subsections of this chapter look at data collection, data analysis, research constraints and ethical considerations.

Chapter Four presents the findings of this study in five key sections:

- The impact tutoring programs have on the academic performance of young girls.
- The relationship between gender and mathematics.
- Gender sensitivity
- Gender insensitivity
- Critical considerations

Chapter Five introduces the three indicators of gender sensitivity, the Three E's. These indicators are Environment, Education and Engagement. Each of these indicators is explained in this chapter with the use of examples of gender sensitive practices drawn from the BoxGirls Mathematics tutoring program.

Chapter Six is the Conclusion. This chapter notes the importance of gender sensitivity in mathematics tutoring programs in attempting to address the underrepresentation of females in mathematics related fields. It is also noted that when applying the Three E's, it is evident that BoxGirls South Africa serves as a useful example of what a more gender sensitive tutoring program looks like.

1.3. Research Questions

The research question that framed this study is as follows:

- What are the indicators necessary to classify a NGO run mathematics tutoring program as gender sensitive?

To adequately answer this research question however, sub-questions were incorporated, namely:

- What role does mathematics play in shaping the future of young girls?

- What are the differences between the way mathematics is taught in the classroom and the way mathematics is taught in the BoxGirls tutoring session?
- What aspects of the BoxGirls run tutoring program are gender sensitive?
- What are the benefits of a 'girls only' mathematics tutoring program?

1.4. Definitions

Attempting to address the research question necessitated the discussion of two key terms, namely that of gender sensitivity and indicators. It is important that these terms be defined at the onset.

An indicator can be defined as a measurement or value that provides an indication (Collins, 2018). Against an indicator various alterations and developments can be measured. This study however is concerned with indicators of gender sensitivity. Unlike indicators, defining gender sensitivity is more complex.

Gender sensitivity has a variety of definitions which, as this study notes, is dependent upon the specific context. This is because gender itself is context specific and varies from society to society (WHO, 2018). The World Health Organization (WHO) defines gender as the socially constructed characteristics of women and men which are context dependent. This study adopts the WHO's definition of gender and thus understands gender as relating to social and cultural differences, not biological ones.

Aligned with the WHO's definition of gender, this study very broadly understands gender sensitivity as being the constant awareness of the workings of gender within a specific context (Wood & Lenze, 1991). The specific context of this particular study is that of the mathematics tutoring program of BoxGirls South Africa based in Khayelitsha.

1.5. Positioning the Research

As the above definitions have highlighted, context is important when discussing issues surrounding gender. This section shall position this study nationally, regionally and then at the individual tutoring program level.

Mathematics and literacy results of South African learners in post-Apartheid South Africa are poor. Most literature makes reference to the long lasting impact the segregated and unequal education system of Apartheid has had on the nation and how this continues to negatively impact upon current education results (Fiske & Ladd, 2005: 52). According to data obtained from the Department of Basic Education (DBE) as mentioned in the South African Institute of Race relations report, only 35% of matric candidates who wrote mathematics in 2014 achieved a grade of 40% or above. Furthermore, when the data was broken down by race it became apparent that 83% of white candidates obtained a grade of 40% while an alarmingly low percentage of only 28.5% of African candidates achieved the same result (South African Institute of Race Relations, 2016: 1). Academic performance therefore still lies along racial and economic lines. This study is positioned within this unequal post-Apartheid South African context.

Khayelitsha, which means “New Home” in isiXhosa, has a population of over 500 000 people (BoxGirls South Africa Annual Report, 2015: 6). It is an informal settlement in the Western Cape. As noted in a 2011 consensus of Khayelitsha undertaken by the City of Cape Town and Statistics South Africa, 98.6% of inhabitants were Black African (SDI & GIS, 2011). Khayelitsha has 30 primary schools, 20 secondary schools and 3 special educational needs schools (SII, n.d). However, according to the 2011 consensus only 30.7% of inhabitants over the age of 20 had a Grade 12 level education. This is the Khayelitsha context within which BoxGirls South Africa is positioned.

BoxGirls South Africa is part of an international network for Sport for Development Organizations. Boxgirls International was founded in Berlin in 2001 and in 2009 they were invited to work in primary schools in the townships of Cape Town, South Africa, more specifically Khayelitsha (BoxGirls, n.d). Their objectives are to improve girls’ academic performance and motivation through after school leadership clubs, increase girls’ ability to defend themselves against gender based violence, support leadership development training for girls and young women and to provide advice and learning events to other NGOs, funders and governments on curriculum design, impact evaluation and child protection (BoxGirls, n.d). This study focuses on one of the above mentioned aims, namely that of improving girls’ academic performance and motivation. This is done by positioning this study around the girls-only BoxGirls Homework Club and Tutoring program.

The BoxGirls tutoring program is run in accordance with CAPS and focuses on the two core subjects of English and Mathematics (BoxGirls South Africa Annual Report, 2015: 7). CAPS, which shall be further discussed, stands for Curriculum Assessment Policy Statement and is a single, comprehensive policy document for learning and teaching in South African schools (Department of Basic Education, 2018). The BoxGirls tutors are female paraprofessionals who are trained in the BoxGirls curriculum. They are, like the girls who attend the sessions, from the Khayelitsha community.

It is important to account for the fact that the BoxGirls tutoring program does not exist in isolation. Rather it forms part of this above mentioned context that it impacts and is in turn impacted upon. The consideration to context presented here, has served so as to better situate the discussion that follows on gender sensitivity within the BoxGirls Mathematics Tutoring program.

Chapter 2: Literature Review

Having positioned this research and established the aims thereof, the body of literature that established the foundation of this study shall now be discussed. This study aims to further develop the literature that exists around tutoring programs and the impact thereof, particularly within developing countries, by going beyond research that looks solely at the academic performance of learners. Three main areas of research were made use of: literature referring to tutoring programs, literature that relates to the relationship between gender and mathematics and finally the body of literature that discusses issues of gender-sensitivity.

2.1. Tutoring Programmes

There exists a large volume of quantitative research that assesses the impact of various tutoring programs. However this research yields mixed results. Some literature states that tutoring programs result in significant academic achievement for those that take part in the program. Other literature, presents findings that show that tutoring programs do not produce significant changes. While there is contradictory literature as to the extent of improvement in academic performance produced by tutoring programs, most literature states that at least to some degree tutoring programs have a positive effect on student achievement. Cohen et al. (1982) for example provide a meta-analysis of findings from 65 independent evaluations of schools tutoring programmes. They found that tutoring programs have positive effects on the academic performance and attitudes of those who received tutoring, with tutored students outperforming control students (Cohen et al, 1982: 237). Their study whilst not a recent study, having being published in 1982, is still of relevance to this research as they noted that tutoring effects were larger in more structured programs. Furthermore that these effects were probably larger when mathematics, rather than English was the subject in tutoring programs (Cohen et al, 1982: 243). Cohen et al (1982) also point to the increase of paraprofessionals rather than school teachers and professional tutors running tutoring programs. They understood this as a positive occurrence, as it increases the likelihood of availability of tutoring programs. Ritter et al. (2009) in a later study also refer to an increase in popularity of tutoring programs staffed by adult volunteers rather than school teachers, which shall be touched on in relation to the tutors at BoxGirls South Africa.

A further key piece of literature is that of the work by Rothman and Henderson (2015). In this more recent literature, tutoring is again understood as a powerful way to increase students' marks. They however point to the need for afterschool programmes to be aligned with the regular school curriculum so as best to achieve an increase in academic performance of participating students (Rothman and Henderson, 2015: 2). Rothman and Henderson (2015) stress the importance of continuously communicating and collaborating with classroom teachers. In further touching on why tutoring programs succeed they expand upon the importance of the tutor-tutee relationship. Here it is argued that if students perceive that a tutor cares about them and their learning, their academic achievement improves accordingly (Rothman and Henderson, 2015: 3). The tutoring setting also provides a smaller teacher-student ratio than within the regular school classroom. This provides the opportunity to establish meaningful and influential relationships between the tutors and tutees. The literature by Rothman and Henderson (2015) is therefore of great use to this study as it helps to frame

an understanding of the smaller classroom sizes used by BoxGirls South Africa and how tutoring programs can yield the best results.

Furthermore using the above mentioned literature this study was able to unpack the meaningful relationships learners establish with their tutors and the significance of this upon the academic performance of young girls. This study addresses the claims of Cohen et al (1982) and Rothman and Henderson (2015) but goes beyond them by looking at mathematics specifically and addressing the role played by gender within this context.

2.2. Gender and Mathematics

In addition to the large body of literature that focuses on tutoring programs there exists an extensive body of literature relating to gender and mathematics. Leder (2015) provides helpful definitions including that gender equality in education should be understood as more than the right to gain access and participate in education (Leder, 2015: 146). As defined by UNESCO, gender equality in education includes being afforded the opportunity to benefit from gender-sensitive and gender-responsive educational environments (UNESCO, 2012: 21). Gender sensitive education presents the opportunity for increased participation in social, economic and political development. Gender parity alone is thus not sufficient in attaining gender sensitivity and gender equality.

Leder (2015) explains that the relationship between gender and mathematics has been studied for years in developed countries; however this relationship and the issues that emerge as a result of it are still largely unexplored in developing countries. In Africa specifically, little research has been done until very recently on gender and mathematics education (Leder, 2015: 146). The relationship between gender and mathematics remains relevant within a developing context however, as female participation in mathematics has remained low in these nations. Leder (2015) explores some reasons for the problematic relationship between gender and mathematics in developing countries. In doing so she notes that the factors identified in contributing to the gender problem in mathematics education in the developed countries remain valid for contexts such as Africa. However, she argues that there are additional factors that need to be included when understanding the developing world. This includes negative socio-cultural attitudes held by those in society including parents and teachers, gender biased curriculum, lack of school facilities and resources as well as the role played by a lack of self-confidence present among young girls as a result of gender stereotypes (Leder, 2015: 148). Drawing on these factors mentioned by Leder (2015), this study will account for the specificities of the South African case, with consideration being given to the post-Apartheid South African context the BoxGirls tutoring program is situated in.

The work by Dowker et al. (2012) is also of significance to this study as it is one of the few pieces of literature that addresses mathematics at a primary school level. They argue for the importance of investigating the early development of attitudes to mathematics. Attitudes to mathematics are seen as important as studies suggest that females do not necessarily perform lower in mathematics than males, however they do tend to rate themselves lower than their male peers (Dowker et al, 2012: 2). The work by Leder (2015) echoes the claim made by

Dowker et al (2012), that there is a lack of self-confidence present in young females participating in mathematics.

Incorporated into the work by Dowker et al (2012) is the mention of the integral role mathematics plays in labour market outcomes. They put forward evidence that the individual return to maths skills is much higher than the returns to other skills (Doris et al, 2012: 2). This lack of self-confidence evident in the relationship between gender and mathematics can therefore have detrimental and long-lasting implications, impacting on the future employment and wage prospects of young females. The literature points to the need to address issues of gender and mathematics. These works hint, albeit indirectly, at the need for gender sensitivity within mathematics as a solution to the gendered differences in mathematics at all levels.

Although this research focuses on a primary school level and more specifically a grade five level, it is important to address the relationship between gender and mathematics beyond the classroom. As touched on earlier, the underrepresentation of women in Science, Technology, Engineering, and Math (STEM) college majors and thus professions, persists in many nations. South Africa is no exception. Less than 30% of students registered for undergraduate degrees in engineering and computer science in 2012 were women (Shepherd, 2017: 2). This statistic must be understood in conjunction with a further statistic, namely that 65% of all undergraduate students were women. Shepherd (2017) also stresses the importance of addressing gender equity in STEM education, as it will give women access to higher paid job opportunities. This is one of the aims of BoxGirls South Africa who are fully aware of the gender and race disparities in STEM degrees and professions.

Shepherd (2017) expands upon the previous work done by those addressing the relationship between gender and mathematics. She highlights how classroom interactions that follow gendered differentiated patterns can be harmful and serve so as to communicate different learning expectations for boys and girls (Shepherd, 2017: 8). Importantly Shepherd (2017) states that gender-differentiated interaction patterns and stereotypes are more prevalent in stereotypically male sex-typed subjects such as mathematics. In addition to noting the importance of gender in mathematics, she provides examples as to how classroom structures and engagement can be addressed and remedied through gender-sensitivity (Shepherd, 2017: 8). One suggestion put forward is the incorporation of teaching methods that may be less harmful to girls. For example teachers and tutors can adopt less mechanical styles of teaching and teach in a way that better supports the girls' facilitation of knowledge (Shepherd, 2017: 36).

Forgasz et al. (2010) also provide the reader with some suggestions as to what a gender sensitive mathematics lesson may look like. While there is no one size fits all model or approach that can be implemented, they mention that rather than only relying on competitive or individual activities in mathematics lessons, teachers should include pedagogical practices such as inquiry-based learning in cooperative groups. This less mechanical and more interactive approach has been studied in previous literature and found to work better for girls. The combined findings of Shepherd (2017) and Forgasz et al. (2010), therefore emphasize the pivotal role the teacher or tutor plays in establishing a mathematics learning environment that

is more gender-sensitive. This is in accordance with the older literature by Wood and Lenze (1991) as well as Roop (1989) that shall be further discussed in the section on gender sensitivity.

In concluding the discussion of gender and mathematics it is relevant to incorporate a brief account of the impact of single-sex education on academic performance. Jackson's 2002 article focusses on the value of introducing single-sex classes, concluding that girls-only classes may have positive effects for girls (Jackson, 2002: 37). Jackson (2002) makes reference to previous research that suggests that within a girls-only environment, the atmosphere is calm and supportive and that girls seem more willing to engage in learning than within a mixed classroom environment. Forgasz et al (2010) seem to concur with the findings of Jackson (2002) and present a similar view of single-sex mathematics learning environments for young girls. While it is noted that further evidence is required to more accurately explore the benefits and potential drawbacks of a single-sex classroom, most research addressing single-sex learning environments, seem to be in agreement that programs for girls, be they after-school programs like BoxGirls, or in school activities can improve girls' confidence, academic performance and attitude towards mathematics (Forgasz et al, 2010: 66). However debate continues among scholars and educators as to whether single-sex learning spaces should be encouraged.

2.3. Gender Sensitivity in Education

Unlike the literature on tutoring programs and gender and mathematics, there exists a relatively small pool of literature that addresses gender sensitivity within education. Subrahmanian (2005) provides a valuable piece of research that argues that gender sensitivity involves looking beyond formal equality and embracing substantive equality. Formal gender equality focusses on the equal treatment of males and females and is premised on the notion of sameness, whilst substantive gender equality requires comprehending the social construction of gender identity and the gender roles within a specific context (Subrahmanian, 2005: 398). Subrahmanian (2005) states that gender inequalities are often institutionalized in norms and attitudes in addition to the teaching practices of teachers and the curriculum. This is in agreement with the literature referred to earlier in this literature review that found that gendered socio-cultural attitudes held by teachers as well as gendered curricula, can further perpetuate disparities in mathematics.

Subrahmanian (2005) in discussing the important role gender sensitivity can play in education notes that gender sensitivity should be developed for use by educators at a ground level (Subrahmanian, 2005: 404). Again Subrahmanian (2005) is in agreement with the literature mentioned above, including the work by Shepherd (2017) and Forgasz et al (2010) which highlights the important role played by the teacher or tutor. These tutors are the ones who are able to identify and monitor the quality of the learning experience for all the learners in their class. Gender sensitivity requires an expanded sensitivity to the learner and her environment as well as to the learning process.

Sharma et al (2013), look specifically at NGO CARE India and how this organization invested in training so as to work towards sensitizing staff about gender issues. This piece

provides a critical reflection on negotiating meanings of gender justice, providing the reader with insight into the movement of gender centred development and gender sensitivity. Sharma et al (2013) account for the role played by the world conference on women held in Beijing in 1995. This continued the efforts of gender mainstreaming initiatives that had commenced during the UN decade for Women in the 1980s (Sharma et al, 2013: 577). Following on from this, it is necessary to include a discussion of the adoption of the 8 UN Millennium development goals which aimed at being achieved in 2015. This study is particularly concerned with the third development goal to "empower women and promote gender equality". This development goal is aimed at eliminating gender disparity (MGD Monitor: 2016). In addition to this goal, South Africa's Constitution (1996), as well as policies such as the National Development Plan (2012), emphasize the importance of gender equality (Statistics South Africa, 2015: 56).

As of 2015 gender parity in South African primary school enrolment rates had been achieved, however the attainment of substantive educational equality, specifically for young black girls, remains poor (Statistics South Africa, 2015: 58). The rate of primary school completion has remained lower for historically marginalised girls. As mentioned in the introduction, BoxGirls South Africa is situated in the informal settlement of Khayelitsha where 98.6% of the inhabitants are Black African (SDI & GIS, 2011). As of 2011, only 30.7% of inhabitants over the age of 20 had a Grade 12 level education (SDI & GIS, 2011). BoxGirls aims to remedy these alarming statistics and tutors historically marginalized, young black girls from the Khayelitsha community.

Both Sharma et al (2013), and the Statistics South Africa report (2015), highlight the need for gender sensitivity and addressing gender equality to take into account the sociocultural contexts. For gender sensitivity to be effective, it needs to be contextualized. BoxGirls South Africa, in placing individuals from the Khayelitsha community in tutoring roles, takes context into consideration. These tutors are able to relate to the girls and are aware of their lived realities. The BoxGirls tutoring program therefore does account for the sociocultural contexts of the learners and are able to implement gender sensitivity that considers the specific context of the program.

As noted in the Statistics South Africa Report on South Africa's achievements of the development goals, substantive equality within education is essential as there is the need to address the disparity between boys and girls in completing mathematics which is essential for their full participation in the nation's economy (Statistics South Africa, 2015: 59). The development of policies surrounding gender equality mentioned above, serve as supporting evidence for the claim made by Subrahmanian (2005), namely that gender equality is more than formal equality and parity. Rather, it necessitates substantive gender equality.

Due to the contextualized nature of gender and thus gender-sensitivity, there is no exact definition for gender sensitivity. Like Shepherd (2017), Roop (1989) provides some helpful examples that assist in establishing a broad conception of gender sensitivity within a classroom. It is necessarily to note that Roop (1989) was writing specifically about an English context rather than a mathematics context. However the examples put forward in this

piece of literature are broad enough to still be of relevance to this study. For example, Roop (1989) states that one illustration of gender insensitivity is that in some classes boys are permitted to interrupt or overrule girls in discussions (Roop, 1989: 90). Roop (1989) however expands on this example of gender insensitivity and states that by organizing classroom activities in a manner that accounts for the role of gender and education, teachers can work so as to improve the participation of female students (Roop, 1989: 91). This is a more gender-sensitive approach and an approach similar to the ones outlined by Shepherd (2017) and Forgasz et al (2010) years later.

Wood and Lenze (1991) can be understood as building upon the premises put forward by Roop (1989). While neither of these pieces are the most recent look at gender in education, they are still useful as they highlight the need to move beyond just identifying issues of gender inequality and insensitivity. They highlight the need to address these issues. Of specific relevance to this study however is the reference made by these authors to the important role teachers play in addressing gender insensitivity. Wood and Lenze (1991) speak in detail about the importance and characteristics of gender-sensitive teaching. They explain what gender sensitive teaching looks like and argue that it incorporates gender sensitive language, the classroom style and the supportive manner in which teachers respond to learners (Wood & Lenze, 1991: 17). This is all done in such a way so that it is not only the male way of learning that is accepted and encouraged but that gender and its position in education are incorporated.

The need for constant self-reflection on behalf of the educators is also incorporated into the argument put forward by Wood and Lenze (1991). In self-reflecting teachers can uncover their own biases and patterns of behaviour. For example, teachers can pick up how often they call on male students as opposed to female students or the type of language they make use of when discussing the learning material (Wood & Lenze, 1991: 19). The piece by Wood and Lenze (1991) culminates in the understanding that through actively working to make classrooms more gender-sensitive, educators work so as to facilitate the possibility of beginning to empower all individuals within the classroom. Educators are therefore understood in previous literature and in this study as being able to teach in a manner that moves beyond gendered stereotypes.

From the above discussion, a very broad understanding of gender sensitivity emerges. Gender sensitivity is understood in this study as being the constant awareness of the workings of gender within a specific context. Critically, this literature has presented the argument that context will always be relevant for an adequate understanding of gender sensitivity. This paper will look at gender sensitivity and gender-sensitive indicators, within the post-colonial, post-Apartheid context of the Khayelitsha South Africa and the BoxGirls-run mathematics tutoring program.

2.4. Limitations of Literature

The three categories of literature referred to above have all been integral in approaching this study. However there are limitations in this previous research that need to be mentioned. Firstly, most of the literature that addressed tutoring programs was quantitative; therefore it

did not provide rich and insightful descriptions that could be adopted when looking specifically at the BoxGirls tutoring program. Furthermore there was a much larger pool of literature on language tutoring programs than mathematics tutoring programs.

Additionally, when looking at the literature on gender and mathematics, it was apparent that most studies looked at high school students rather than primary school students. There is however a need to comprehend the workings of gender and mathematics at a primary school level as primary school mathematics provides learners with the foundations upon which their further mathematics education is built. BoxGirls South Africa notes the importance of relatively early intervention and thus focuses on Grade 5 Mathematics. At this level the tutoring program is able to build on the pupil's understanding of basic operations in mathematics such as multiplication, addition, subtraction and division. It is of great relevance therefore that the body of literature surrounding gender and mathematics at a primary school level be increased. This will benefit BoxGirls and other tutoring programs working at this level.

Finally, the focus of the above mentioned literature is largely on developed nations. This is at the expense of understanding the relationship between gender and education, more specifically mathematics, in developing nations. There is a need to increase literature on the relationship between gender and education in developing nations such as South Africa.

This study aims to build upon previous research and the above mentioned limitations, by presenting a detailed qualitative empirical study of a mathematics tutoring program run at a primary school level in a developing country, namely South Africa, and what gender sensitivity means within this context.

Chapter 3: Research Methodology

This chapter shall address the research methods adopted by this study. Specific attention is paid to the process of data collection and data analysis. This study made use of qualitative research methods and was a single case study. After discussing data collection and analysis respectively, mention is made of the research constraints that were experienced throughout this study, including time and language constraints. Finally this chapter addresses the ethical considerations that were adhered to, with attention being paid to the rights and safety of the minors who participate in the BoxGirls South Africa tutoring program.

3.1. Data Collection

This study is based upon a qualitative research design. This was so as to acquire in-depth details and descriptions of BoxGirls tutoring program to be able to present thick descriptions and interpretations of this single unit and best address the aim of this study (Babbie & Mouton, 2001: 273). While there are three main design types for qualitative research, the one adopted by this study was that of a case study (Babbie & Mouton, 2001: 278). The general design principles in case study research can be found in the work by Yin (1994), which was used to shape the research methods for this study.

Yin (1994) discusses the importance of clarifications in not only the particular case but the unit of analysis. Therefore before commencing the process of data collection these specifications were outlined. The particular case to be studied was that of BoxGirls, based in Khayelitsha. This study focused solely on their mathematics tutoring program. The individuals that form part of BoxGirls include the Head of BoxGirls, the program coordinators, the BoxGirls tutors, external educators associated with the program and the Grade five pupils.

Beyond these clarifications, there were also important considerations to be made when selecting methods of data collection because this is a case study. Yin (1994) addresses the four tests of construct validity, internal validity, external validity and reliability and how a case study can satisfy these tests (Yin, 1994: 33). Additionally, Yin (1994) presents an argument for the strength of case study research, which is its ability to account for and examine an extensive array of evidence.

The convergence of more than one source of evidence serves so as to increase the reliability of a study (Babbie & Mouton, 2001: 282). In conducting four interviews this case study's findings should be understood as being reliable as it draws on information from more than one individual involved with the NGO BoxGirls. Additionally, the NGOs annual reports, as well as magazine and newspaper articles written about BoxGirls South Africa were used. Beyond this, field notes from observations were incorporated to further increase the reliability of this study. This study successfully incorporated and analysed more than one source of evidence, increasing its validity and reliability. While generalizability was not the main aim of this single case study, the rich descriptions within this study have attempted to be made with enough precision that this research could possess a degree of transferability and generalization for other tutoring programs.

It is necessary to note that this study was done in association with the University of Cape Town's Knowledge Co-Op. The UCT Knowledge Co-op establishes a channel through which external constituencies, such as BoxGirls South Africa, can access knowledge, skills and resources from the university (University of Cape Town, 2018). Working with UCT Knowledge Co-op afforded me the opportunity to engage directly with the NGO BoxGirls South Africa. Once all parties had signed a Memorandum of Understanding the process of collecting data could commence. The project manager of BoxGirls South Africa assisted in the data collection process by putting me in contact with individuals that could potentially be interviewed for this study.

The individual interview was the main qualitative method used for data collection. Four interviews were conducted, three of which were conducted with women and the fourth interview which was conducted with a male participant. Including a male perspective was important as gender and gender sensitivity do not exist in female only spaces and discourses. The male participant was able to provide information from a different lens than the three women. As a result, broader perspectives of gender and gender sensitivity in mathematics could be incorporated into this study.

All of the participants were either directly involved with the BoxGirls Program as a tutor, facilitator or project manager, or indirectly involved through association with the organization. Three of the four participants reside in Khayelitsha, or very near to it, and are thus familiar with the context in which the girls attending BoxGirls live. They are a part of the same community and are better positioned to account for the sociocultural experiences of those who attend BoxGirls.

The profiles of the participants were as follows:

	Respondent 1	**Respondent 2**	**Respondent 3**	**Respondent 4**
Age	27	28	28	49
Gender	Female	Female	Female	Male
Race	Black	Black	White	Black
Occupation	BoxGirls Facilitator	BoxGirls Facilitator	BoxGirls Project Manager	Educator
Nationality	South African	South Africa	German	South African

Image 1: Table of the profiles of participants

The interviews were conducted with one individual at a time and conducted in person for three of the interviews and one over skype. The three face-to-face interviews were conducted in Khayelitsha at the BoxGirls offices and at Vuzamamzi Primary School.

In line with the work of Sampson (2004), which states the importance of pilot work, this qualitative study adopted a form of a pilot approach so as to refine the interview schedule and highlight gaps within the interview approach. After conducting the first interview, notes were

taken as to where improvements could be made in the interview process, specifically in relation to the asking of questions surrounding definitions of complex terms such as gender sensitivity. This assisted in reflecting on the nature of the information and concepts being discussed within the interview and shaped the manner in which the three other interviews were conducted (Sampson, 2004: 390). Rigour in qualitative research is of importance, as stated by De Wet and Erasmus (2005). In adopting a pilot approach and collecting and analysing data in a systematic manner, this study worked towards achieving high degrees of academic rigour and good quality qualitative research.

All the interviews were conducted in English and were approximately 40-60 minutes in length. They were recorded using two separate electronic devices and then each interview was manually transcribed word for word through my personal capacity on MS Word. These were transcribed personally so as to ensure confidentiality as well as accuracy. Beyond issues of confidentiality, this was done so that I could better situate myself in the research and be able to pick up patterns and key points of reference from the transcripts.

The interviews were semi structured (open-ended) interviews that made use of a strong topic guide so as to combine structure and flexibility. This was done in accordance with the literature of Herbert and Rubin (1995) who state that qualitative interviews are characterized by being flexible, iterative and continuous, rather than rigid and fully prepared in advance (Babbie & Mouton, 2001: 289). This style of interview allowed for important topics necessary to answer the research question to be addressed but also allowed room for the participants to address what they felt was important, allowing for unanticipated topics to arise. These semi-structured interviews were also used so as to be in accordance with a more feminist approach to research.

While feminism is more of a perspective than a method, this perspective was used to shape the way in which the research was designed and framed for this study. Feminist social research methods were adopted and this study embraced the idea of sensitive style of qualitative interviews which involves the participants in the production of knowledge (Ramazanoglu & Holland, 2011: 157). Feminist standpoint epistemology emphasizes the importance of women's diverse material realities and locating specific standpoints (Landman, 2006: 430). The understanding is such that when women speak from their experiences they produce knowledge that does not necessarily exist in male dominated discourses (Ramazanoglu & Holland, 2011: 76). The research methods used in this study were aligned with this feminist epistemology, understanding that knowledge is created and negotiated, with the participant playing an active and important role in this process.

Importantly, feminist research also values the personal experience of the researcher. My own experience as a qualified teacher, maths tutor, previous maths pupil and a female was used to better understand and place gender-sensitivity in a maths classroom. This was achieved through writing and reflecting on the three sets of field notes I took. These field notes were roughly written down throughout observations. They were then typed into separate MS Word documents and expanded upon *ex post* so as to be used with the transcripts in analysis. Whilst I have experience in schools and tutoring programs and am passionate about mathematics and

the role it plays in the lives of young females, I had to constantly be aware of my positionality whilst conducting research. As cautioned by Code (1995), only very rarely is it possible to understand exactly how it is for someone else, even if the individual is of your same gender, class or race (Doucet & Mauthner, 2006: 40). As shall be further discussed in the section on research constraints, beyond a shared gender, I was an outsider in this environment. Reflexivity was thus a central component of the data collection process. Like other feminist researchers I openly reflected on, acknowledged and documented my social positioning and what this meant for my role in co-creating knowledge with the participants.

3.2. Data Analysis

The transcripts from the interviews as well as the three field-notes were backed up and protected so that no other individual could access them. These documents were then coded using MS Word and by hand. While I have experience using the computer software NVivo for coding, I opted to do the coding by hand. In my experience I have found NVivo to be a bit mechanical. I wanted to engage with the transcripts in a more conscious and organic manner. As the data set was small, manual coding was a useful alternative to using NVivo. Adopting this approach to coding did not detract from the rigour of analysis. The coding was still done systematically after close reading of the transcripts, broadly using the approach to coding that Miles and Huberman proposed as outlined in Punch (2014). This approach, termed 'transcendental realism' has three components namely data reduction, data display and the drawing and verifying of conclusions (Punch, 2014: 171). It entails making use of both parent and child codes.

Upon reading and re-reading the transcripts the main themes that emerged from the collected data were: Gender and Mathematics, Gender Sensitivity, Gender Insensitivity and Critical Considerations. These were the first level codes that were more descriptive in nature (Punch, 2014: 174). These first level codes helped to reduce and summarize the data. Within each of these broader codes, second-level codes were established which further helped to reduce data. These second level codes provided a more meaningful understanding of the data and they were inherently more inferential than the more descriptive first level codes. A table of codes was made on MS Word with the definition of each code so as to assist with the coding process (See Addendum A). The first and second level codes were colour coordinated within this table and the transcripts and field notes were then coded accordingly by separating sentences and sections of each document into the relevant codes.

It should be noted that the process of coding was made simpler due to the fact that the key themes and codes that emerged from the data were based upon the same themes used for the semi-structured interviews (Punch, 2014: 173). The first level codes were therefore based on the themes established prior to the analysis. This coding process was one in which new codes were added, others were altered and discarded as the process continued. This more dynamic approach was so as to end up with a set of codes that best suited the data and the research question.

Additionally, memoing is an essential part of the approach put forward by Miles and Huberman (Punch, 2014: 177). These memos are more informal thoughts and considerations

that emerged as the analysis process occurred, which I wrote down on separate pieces of paper and post-it notes. The data was also visualized through the drawing of mind maps and lists (See Addendum B) which were created both on MS Word and by hand. Doing this manually as opposed to on a software program, assisted me in better comprehending and visualizing the information. The data was displayed and reduced in numerous ways on numerous platforms, with results and conclusions being drawn, clarified and verified throughout the process (Punch, 2014: 172).

The data was interpreted with constant consideration being given to the overarching research question, namely: *What are the indicators necessary to classify a NGO run mathematics tutoring program as gender sensitive?* Through analysing the data and more specifically analysing the relationship of gender and mathematics, the understandings of gender sensitivity and insensitivity as well as contradictions and critical considerations within this, three indicators of gender sensitivity of mathematics tutoring programs emerged (See Addendum C). These findings were then further interpreted, defined and expanded upon so as to provide a richer understanding of these indicators and thus a more meaningful response to the research question.

3.3. Research Constraints

The first research constraint to be mentioned is due to the fact that the focus of this study was narrow. As a result it did not look at the indicators of gender sensitivity within an NGO run tutoring program from a psychological or biological perspective. Rather only a sociological perspective was used. Additionally this study focused specifically on gender in relation to the subject of mathematics within one single case, that of BoxGirls. This study therefore did not extend to directly include other subjects, other NGOs or other factors that play a role in the education of young females including, but not limited to, family structures and economic factors. The timeframe of this study was also limited and as a result follow-up interviews could not be conducted and the pool of participants could not be extended beyond four individuals.

It is necessary to mention that English was not the first language of any of the participants. While all of the participants were able to converse in English and respond to the questions posed, having English as a second or even third language, at times prevented the respondents from being able to fully engage with what are very complex issues surrounding gender sensitivity. I myself am not able to converse in isiXhosa or German and thus was not able to conduct the interview in the home language of any of the participants. Issues surrounding language did not jeopardize the results of this study; it did however make the interview process at times more complex and interesting.

An additional constraint which is always a consideration when conducting research is that of the perceived relationship between the researcher and the participant. Whilst engaging with those involved in the NGO and conducting the interviews I needed to remain cognisant of my positionality. As a white, tertiary educated, middle class female it was important that I was aware of who I was within the context of Khayelithsa and BoxGirls specifically, and remain sensitive to that. Standing out as an outsider, due to my race and inability to speak isiXhosa,

in this context inevitably influenced the way in which individuals perceived me and influenced how they engaged with me. As Sampson (2004) notes however, there are benefits to being an outsider when undertaking research. One benefit is that it is easier to be objective and arguably see things through a clearer lens (Sampson, 2004: 387). Being an outsider to BoxGirls South Africa and to the community of Khayelitsha meant that I could undertake research in a more objective way, although it possibly limited my ability to understand certain things within this context in greater depth. Whilst I was an outsider, I entered this research process being familiar with the workings of tutoring programs. The limitations of being an outsider were therefore overcome to some degree, by my familiarity with education and tutoring environments.

Finally, an interview which is recorded by an outsider who is conducting the research for academic purposes creates a new and stressful environment for the participants. However I consciously attempted to make these interviews as non-hierarchical as possible, creating a space where there was a dialogue through which both myself as the researcher and respondent created knowledge together. This is aligned with the sensitivity and consideration that accompanies a feminist interview style.

3.4. Ethical Considerations

Ethical considerations promote social responsibility and acknowledge human rights and the importance of the safety of individuals who participate in the study (Resnik, 2015). Acknowledging the importance of ethical considerations, this study aimed to prevent social harm, respected participants and honoured confidentiality. This section shall scaffold the specific measures taken so as to ensure this study was ethical.

Fieldwork for this research was only conducted once UCT had granted permission, through the approval of the Research Ethics Application Form submitted by myself and my supervisor. Additionally consent was given by the UCT's Knowledge Co-Op and the project manager of BoxGirls South Africa via email correspondence and verbal communication over Skype, before conducting the research.

This research required being in an environment with not only those employed by the NGO BoxGirls, but also the grade five learners who participate in the tutoring sessions. Whilst I had not planned to engage with the learners directly or gather any information from them for the research, it was not possible to detach so entirely from the situation that I never made contact with them. When I attended the tutoring sessions the learners engaged with me, although at no point did I engage with the learners with the intention of interviewing them. The learners are all in grades 4 to 7 and therefore approximately of the ages 10 to 14. They are all minors. Their rights and safety were of great importance and were protected throughout this research process.

A further ethical consideration was that at no point did I observe a mathematics class taught within one of the schools associated with BoxGirls or any other school in the area. This was done in accordance with the Department of Basic Education's (DBE) commitment to safety in schools. The DBE has developed a National School Safety Framework as a tool for

Provincial and District Officials to ensure the safety of learners and staff within schools (Department of Basic Education, 2018). The privacy of schools and the protection of the learners and educators within them was honoured and adhered to throughout this study.

The interview process and the collection and analysis of data followed ethical guidelines put forward by the University of Cape Town and the University of Cape Town's Knowledge Co-op. All individuals that were interviewed were given the opportunity to accept or decline giving their informed consent prior to the commencement of interviews. Ethical considerations were clarified and confirmed with the respondents through a consent form, which the respondents were given to read and sign prior to any interview being conducted. This occurred in three of the interviews. However for the interview conducted over Skype verbal consent was given and then a signed consent form was emailed after the interview had been conducted. Throughout the interview respondents were afforded the space to stop the process if they no longer wanted to participate. Any and all information the NGO or specific individuals wished to remain confidential was honoured and not for the use of the submission of this study. Additionally, the names of all participants were altered when transcribing to ensure anonymity and the protection of the individuals involved.

As this study was not conducted in academic isolation but also for the use of the BoxGirls South Africa, special ethical considerations were given to protect the operations and procedures of the NGO and all those involved within it. The research was conducted in a manner so as not to disrupt the tutoring sessions and academic programmes as far as was possible. Additionally, the full transcripts of each interview have not been attached to this paper to protect those who participated from potential internal repercussions from statements made within the interview. Beyond this, post research, the Project Manager of the BoxGirls Program was informed of the progress of the research and sent a draft paper to afford her the opportunity to raise any concerns.

Throughout this research, from the start of fieldwork to the completion of this study, ethical considerations were treated with the utmost sensitivity.

Chapter 4: Findings and Discussion

This chapter shall expand upon the findings of this study. Before addressing gender sensitivity specifically, an understanding of tutoring programs and the relationship between gender and mathematics shall be explored so as to better position the discussion of gender sensitivity. The main findings discussed below suggest that the adoption of gender sensitive practices in mathematics tutoring programs can enhance the academic performance of young girls as well as improve their confidence and self-worth. These findings further suggest that it is possible to establish a list of indicators that point to gender-sensitive practices in mathematics tutoring programs. Three indicators of gender sensitivity emerge, namely indicators that pertain to: Environment, Education and Engagement.[1]

4.1. The Impact of Tutoring Programs on the Academic Performance of Young Girls

The respondents who mentioned the impact the BoxGirls Tutoring Program has on academic performance were all in agreement that at least to some degree, academic improvement is evident for the girls who participate.

> BoxGirls is a program where […] girls learn confidence, they gain confidence as far as subjects like English and maths are concerned […] you can see a difference between, let's say if I was teaching child from this year and then if she joined boxgirls […] when she gets in the program you can see improvement... [improvement in] the marks, the personality and the behaviour. (Respondent 4, 14/08/2018).

This excerpt in particular, is in agreement with the majority of literature on tutoring programs. For example the work of Cohen et al. (1982) who found that tutoring programmes have positive effects on the academic performance and attitudes of those who receive tutoring. Additionally Rothman and Henderson (2015), also state that tutoring programs have a positive impact on the academic performance of learners. However they expand upon this and present the argument that tutoring programs are more likely to yield positive results if they are aligned with the school curriculum (Rothman and Henderson, 2015: 2). As stated in the interviews and evident from the BoxGirls Website, Boxgirls is aligned with the CAPS curriculum followed in public schools in South Africa.

CAPS stands for Curriculum Assessment Policy Statement (Department of Basic Education, 2018). It is a comprehensive policy document for learning and teaching in South African schools. As stated by O'Donoghue (20130), CAPS emphasizes content knowledge and the structured pacing and sequencing of the curriculum. There are seven main principles within CAPS: social transformation, active and critical thinking, high knowledge and skills, progression, human rights, inclusivity and environmental and social justice, valuing indigenous knowledge systems and credibility, quality and efficiency (CAPS, 2011).

[1] It should be noted that minor changes were made to the quotes from transcripts presented in this chapter. These alterations were made so as to help with the flow of reading. The meaning and context of these quotes however were not altered in any way.

When discussing the structure of the BoxGirls tutoring program, a respondent noted that they make use of more than one curriculum although this is structured according to CAPS,

> One is for leadership and one is the homework club curriculum and this actually evolved through […] conversations we had with the teachers[...] this curriculum is based on the CAPS curriculum structure. (Respondent 3, 09/07/2018).

The findings from the interviews in conjunction with the BoxGirls website therefor echo what is said in the literature regarding the positive impact of tutoring programs and how this impact can be enhanced when aligned with the curriculum used in schools.

Before looking at the relationship between gender and mathematics in tutoring programs, it is necessary to note that the BoxGirls tutors are not trained teachers. The BoxGirls tutors are women from the community (Khayelitsha) who are trained by BoxGirls in their curriculum. They are paraprofessionals from the same community of the young girls they teach. There is evidence in the literature of this being not only common in tutoring programs but beneficial. Cohen et al (1982) comment on paraprofessionals tutoring, and note how this increases the availability of tutors. Additionally employing paraprofessionals from the community in which the tutoring program is run helps to establish a learning environment where the tutors are able to be sensitive to the lived realities of the young girls. The BoxGirls tutors, as shall be further noted, are able to establish relationships of trust and respect which creates a more gender sensitive learning environment.

4.2. The Relationship between Gender and Mathematics

This section is comprised of four subsections relating to gender and mathematics. Firstly the importance of mathematics for young girls is addressed before looking at whether girls learn and participate in mathematics differently in comparison to boys. Finally the academic performance of young girls in mathematics is explored. Overall, the relationship between gender and mathematics was understood slightly differently by all the participants.

4.2.1. Importance of Mathematics for young girls

All participants were in agreement that mathematics provides opportunities for young girls in terms of future education as well as careers. All four participants understood mathematics as providing the learners with an opportunity at working in areas that were, and largely still are, male dominated. One respondent clarified that this is dependent on females having the necessary subjects:

> Maths and English are the main courses, so it's a must that you have them. (Respondent 2, 27/06/2018).

This is in agreement with the literature on gender and mathematics which states that looking at this relationship is imperative as female participation in South Africa, in Science, Technology, and in particular in Mathematics, despite some improvements, from primary through to tertiary education and to the career level is still very low (Leder, 2015: 149). Shepherd (2017) and Leder (2015), emphasise the importance of mathematics for young girls, noting that if females continue to be underrepresented in mathematics professions, they

continue to have less access to higher paying job opportunities. By increasing the number of females in mathematics related professions such as engineering or business, wage disparities between genders begins to decrease. Mathematics is therefore understood as being of great importance as it plays a fundamental role in addressing gender inequality and wage disparities.

Prior to the impact of mathematics on future employment and income prospects however, one participant commented on the social empowerment mathematics gives to young girls in society, even at the age of ten or eleven years old.

The participant gave a concrete and everyday example of children going to a shop to purchase sweets.

> They know, okay there is this price and how much I have and if I minus that and also multiply this, it's […] like the mathematics that they learn at that stage. (Respondent 3, 09/07/2018).

Expanding on this the participant stated that the mathematics literacy young girls learn and basic operations like multiplication, addition, subtraction and division can assist young girls and women with things such as household calculations. Here mathematics at a primary school level is viewed as being essential for going through life. Based on the foundations learnt at this level, females can later learn financial literacy and be able to manage budgets as just one example.

Mathematics was understood by all participants as empowering young girls and women socially and economically. Overall this study found that there was consensus amongst participants and within the literature that mathematics is of importance for girls' current and future lives.

4.2.2. Girls and Boys Learning Mathematics Differently

The piece by Dowker et al (2012) frames discussions surrounding whether girls and boys learn mathematics differently in a clear and comprehensive manner. They find that it is not that boys and girls learn mathematics differently, but rather that gender stereotypes result in girls rating themselves lower than their male peers (Dowker et al, 2012: 2). Common gender stereotypes as noted by the participants of this study include the assumption that boys are better at mathematics while girls are better at languages. It is noted by Shepherd (2017) that if classrooms follow gender stereotypes like "Boys are better at mathematics", the gendered differentiated patterns serve to establish different learning expectations for boys and girls (Shepherd, 2017: 8).

When discussing whether boys and girls learn mathematics differently, participants focused their responses on who puts in more effort. Interestingly the two BoxGirls tutors held contrary views. The one participant stated that girls were lazier than boys and liked to play more, thus of the belief that boys put more effort into their mathematics. Whilst the other participant stated that:

> Boys […] like to play too much. […] girls are always […] more focused on school. (Respondent 2, 27/06/2018)

In line with the literature referenced above, one participant stated that girls and boys perhaps do learn differently as a result of the stereotypes placed upon them. However the participant further stated that while learners may be negatively influenced by these stereotypes, she was unaware of any statistic that suggested that boys and girls learn mathematics differently.

Rather the participant stated that:

> So I think that we actually learn the same, or differently as individuals, as everyone learns differently. (Respondent 3, 9/07/2018).

In agreement with the above statement the male participant, who has over twenty years of experience teaching both boys and girls, also made a case for each child learning differently as an individual.

It is beyond the scope of this study to look at potential biological and psychological differences between learning in boys and girls. Rather these findings suggest that while all learners learn differently as individuals, the gendered stereotypes and expectations placed upon learners can influence how females and males engage in learning.

4.2.3. Girls and Boys Participating Differently

Addressing the participation of young girls in mathematics classrooms, three out of four of the participants noted that their work was in a single-sex environment. As a result, they did not have experience in mixed sex classrooms. However the participant, who teaches both boys and girls, stated that he has found that girls participate more than boys in class. He explained that within his classroom girls speak more openly than the boys and that the girls actively participate in learning. When asked what was meant by this he said:

> You see in terms of homework and tasks given in class [the girls participate and work hard]. The girls write notes and answer questions […] girls are sharp in class (Respondent 4, 14/08/2018).

What was evident from observations conducted for the research and the field notes thereof is that the girls participate both willingly and enthusiastically in the BoxGirls tutoring program. Based on my first observation of a tutoring session I had written the following statement:

> They (the girls) are eager to learn as evident by their raised hands, serious working and assisting their peers. They all bring their own government issued school workbooks along to the lessons and take ownership of their work. (Fieldnote 1, 2/06/2018).

Whilst BoxGirls is a single-sex learning environment from the observations and discussions had with the tutors, the findings aligned with what was said by the male teacher, namely that girls actively participate in their learning of mathematics and that they take their studies seriously.

It should be noted that within BoxGirls there are 20-30 girls at each tutoring session. This learning environment therefore establishes a smaller teacher to pupil ratio than in an average government classroom where classes can have easily over 40-50 children. This smaller ratio, in addition to other factors such as the tutors being paraprofessionals from the community and it being a girls-only environment, influences how the girls participate in mathematics

lessons. What was apparent from observations and discussions with the participants was that BoxGirls South Africa creates a learning environment which promotes a willingness on behalf of the girls, to engage with the tutors as well as the learning material.

4.2.4. The academic performance of boys and girls

The literature mentioned above commented on how gendered differentiated patterns in classrooms serve to present different learning expectations for boys and girls within this learning space. This is particularly the case in subjects such as mathematics (Shepherd, 2017: 8). These gender stereotypes can negatively impact how girls participate in mathematics and thus negatively influence their academic performance.

While much of the literature points to the crippling role negative stereotypes have on the mathematics performance of female students through undermining their confidence (Shepherd, 2017), the findings of this study are not fully aligned with this. This study still accounts for the negative role played by gendered stereotypes and the implications this has upon the self-confidence of young girls. However this study did not find that the academic performance of girls in mathematics is substantially lower than that of their male peers.

Rather, one participant stated that within South Africa the academic performance of boys and girls in mathematics was equal. Three of the four participants understood girls and boys performing fairly equally. However one of the participants stated the inverse of findings in the literature, putting forward the notion that girls in fact outperform the boys in all subjects, including mathematics.

Giving a practical illustration of this the participant stated that:

> [The school] has an awards ceremony that we do each and every year and in grade 7, we have a shield. The shield goes to the top learners in grade 7. So in five years now, there has only been one boy who got the shield […] So, in my experience I know the top achiever in grade 7, is almost always a girl. (Respondent 4, 14/08/2018).

Perceptions of the relationship between gender and mathematics therefore seem to be dependent upon the individual's experiences of this dynamic and their exposure to mixed gender classrooms. What is apparent from these findings however, is that the relationship between gender and academic performance in mathematics is not as linear as the literature seems to suggest.

4.3. Gender Sensitivity

Gender sensitivity is not necessarily a straight forward concept to understand, nor is it concept that individuals inherently know and are able to describe on instinct. Rather the respondents had to take time to think about what gender sensitivity meant. In all cases the respondents drew on their own experiences to try and explain it.

Some key pieces of literature on gender sensitivity that this study made use of includes the works by Subrahmanian (2005) and Wood and Lenze (1991). Having touched on the importance of mathematics for young girls earlier, it is evident that there is a need to discuss,

comprehend and incorporate the role gender sensitivity can play in a mathematics environment.

4.3.1. Understanding gender sensitivity

The literature that looks at gender sensitivity in education makes reference to the role played by educators in adopting teaching methods that are less harmful to young girls (Shepherd, 2017: 36). As stated by Subrahmanian (2005), gender inequalities are often institutionalized in norms and the attitudes of society. However educators can work so as to overcome gender inequalities and address gender stereotypes.

Gender sensitivity in education is understood as being aware of the workings of gender stereotypes and teaching in a way that supports the facilitation of knowledge of those within the learning environment (Wood & Lenze, 1991). The findings of this study were aligned with the literature as gender sensitivity was broadly understood by all the respondents as involving inclusivity and being aware of the challenges and stereotypes young girls face. The participants commented that gender sensitivity plays an important role in assisting mathematics tutors in creating safe learning environments. Safe learning environments established through an awareness of gender stereotypes are ones in which girls are not afraid to engage and participate with the learning material as well as with the tutor or teacher.

One respondent provided a comprehensive definition of gender sensitivity and explained it accordingly:

> Gender sensitivity is about being inclusive or creating an inclusive space where everyone, no matter how they define their own role in society, has the same chance of learning and of developing their skills. (Respondent 3, 9/07/2018).

It is necessary to note that both the literature and the respondents made reference to gender sensitivity in education being multifaceted. Wood and Lenze (1991) for example highlight how gender-sensitive teaching incorporates language, the classroom style and the manner in which teachers engage with learners. The way in which educators engage with learners and the language they use is of importance when working towards gender sensitivity. For example attention needs to be paid to using language that does not further perpetuate gender stereotypes but that validates each learner is important. Additionally the classroom style is of relevance. A less hierarchical learning environment, where the autonomy and voices of the learners is respected is integral for any environment that aims to be sensitive to gender. A learning environment that encourages group work and the learners taking ownership of their work and knowledge is also of great importance.

Paying attention to gender-sensitivity in a mathematics tutoring program involves navigating this learning space in such a way that does not only favour a male way of thinking and learning but is inclusive. Gender sensitivity is a constant work in progress rather than an end result. Educators need to work at establishing an inclusive environment where young girls can participate and feel safe to do so. The male participant also emphasized that gender sensitivity and working towards it is a challenge which requires continous reflection.

4.3.2. Examples of gender sensitivity

The overarching theme was that any gender sensitive practice was one that respected the girls and one that established a safe and inclusive learning environment. For example one respondent stated that gender sensitive teaching in a mathematics tutoring program would be aware of key issues such as:

> How do you talk to the girls to show them your respect? And how do you create an atmosphere where everyone feels safe to speak up and to ask questions? (Respondent 3, 09/07/2018).

An understanding of gender sensitivity becomes more concrete when explaining examples thereof. The respondents put forward a variety of suggestions of what they consider to be gender sensitive practices.

Aligned with the quote made by Respondent 3 above, another respondent, in emphasizing the importance of a safe learning environment, commented on the importance of mutual respect. A mathematics tutoring program that values mutual respect creates a space that is less hierarchical and one where the girls can engage in negotiation. The structure of BoxGirls aims to do this and the tutors encourage group work and create an environment where the girls take ownership of their learning. This is in accordance with the argument made by Wood and Lenze (1991) addressed earlier when referring to the role classroom style can play in establishing a more gender sensitive environment. Therefore a core theme that runs across the learning environment and the way in which tutors engage with pupils is the need for respect.

As an example of how a less hierarchical learning environment could be achieved in a mathematics tutoring program, one respondent stated that the tutors in BoxGirls work so as to ensure high levels of openness and respect:

> It is important to make sure the girls know you and who you are. […] Even if I am older than them, I have to respect them. (Respondent 1, 27/ 06/2018).

This respondent mentioned that being from the community assists in establishing trust relationships between her and the girls of BoxGirls. From the findings of this study it seems that the girls were more willing to trust the tutors as they know the tutors understand their lived realities and respect them. The tutors actively work so as to respect the girls and make sure that they feel safe and supported whilst learning mathematics at BoxGirls. This is all achieved within a less hierarchical learning environment.

In my field notes I commented on the fact that within the learning environment the learners had themselves, with the facilitators established the rules for the running of the tutoring program. These rules included:

> Do not talk when other person is talking.
> Do not bully others.
> You must be nice to yourself. (Fieldnote 3, 27/06/2018).

I marvelled at the great deal of effort that was put into establishing the rules and expectations for the program. What I found most interesting was that,

> The rules were not just written and dictated to the girls by the tutors, rather they established the rules that all of them, including the tutors would follow. Again, just like the sessions I had observed before, there was no hierarchical system in place, rather a flatter system where the tutors and the pupils are equal. (Fieldnote 3, 27/06/2018).

Yet a further example of gender sensitivity in a non-hierarchical environment put forward by one of the tutors was that students should feel confident and supported enough to be able to voice their feelings. The respondent stated that if a tutor had done something that offended a learner, the learner should be able to address that issue and feel enough agency to do so.

> If ever I'm wrong or have upset you, just raise your hand and say it. Say "I didn't like what you said" and then I'll apologize and we can work to move forward. (Respondent 2, 27/ 06/ 2018).

Gender sensitivity was understood as working so as to establish less-hierarchical environments where girls could use their voices. The ability to use their voice was further understood as being a vital life skill that the girls would carry with.

A gender-sensitive environment, as suggested by the participants, mandates self-reflection. This is in accordance with the literature (Subrahmanian, 2015) which states that there is a need for constant self-reflection by tutors and teachers. Additionally Wood and Lenze (1991) explain that self-reflection helps individual educators register their own behaviour and improve upon that so as to be more sensitive to gender. Through self-reflecting it is understood that educators are able to uncover their own biases. For example educators can reflect on whether the language they used to explain a mathematical concept to the girls was sensitive to gender or reinforced gender stereotypes (Wood & Lenze, 1991: 19). Examples used by the educators should move beyond gendered-stereotypes. Non-gender sensitive mathematics examples teachers may use shall be discussed in the following section.

Being sensitive to gender also involves establishing a safe learning environment where group work is encouraged. As noted by Forgasz et al (2010) this style of learning has been found to work better for girls. Overall the examples of gender sensitive practices put forward by respondents adhere to the argument made by Subrahmanian (2015). Namely, educators play a fundamental role in establishing a gender sensitive environment as they develop gender sensitive practices at a micro level. These educators need to monitor and reflect on the learning experience of all the learners in their class, so as to best work towards adopting more gender sensitive approaches.

The final example of gender sensitivity put forward in these findings relates to the classroom dynamics. This example is not directly related to mathematics, but furthers an understanding of what gender sensitivity means within a learning environment.

As commented upon by a participant:

> Gender sensitivity is about, for example cleaning the classroom. This is for everyone […] both boys and girls, clean and sweep the class. I do not say "No boys wait outside, the girls will sweep the class." Both boys and girls do the same thing. (Respondent 4, 14/08/208).

Here it was emphasized that being sensitive to gender does not mean the different treatment of boys and girls within a classroom. Rather it involves moving beyond gender stereotypes and gendered roles. It is not just the girls who should clean the classroom; rather all those who are in the classroom take responsibility in fulfilling this role. The importance of gender sensitivity shall now be discussed, drawing on the examples provided above.

4.3.3. Importance of gender sensitivity

Gender sensitivity was understood by the respondents as playing a crucial role in moving beyond gender stereotypes and exclusion in a mathematics learning environment. A clarification was made by a respondent however. The respondent noted that gender stereotypes impact both girls and boys.

> There are challenges for girls participating in maths because it is seen as a male subject, where boys perform better. However this can also impact boys who may hide the fact that they may be struggling with maths because they are supposed to be good at it. (Respondent 3, 09/07/2018).

For the benefit of both boys and girls in mathematics learning environment, educators need to impart and facilitate knowledge in an inclusive gender sensitive manner. Being sensitive to gender is especially important in a subject such as mathematics in which there are various stereotypes about it being a male-dominated subject. Furthermore as mentioned earlier, it remains that women are underrepresented in STEM degrees and professions. Addressing gender stereotypes in mathematics and teaching mathematics in a way that empowers each individual within the learning environment is therefore of great importance. It can begin to address the gender disparities in mathematics.

There is therefore immense value in adopting gender sensitivity when teaching mathematics. This requires reflection on behalf of the educators. Additionally, as noted by Wood and Lenze (1991), being sensitive to gender is context specific. To best facilitate knowledge and learning that is gender sensitive tutors need to reflect on what gender sensitivity means within their specific context, subject and lesson.

In highlighting the importance of gender sensitivity it is therefore also necessary to highlight the importance of the role played by the educator. Teachers and tutors have the ability to teach beyond gender stereotypes. Through reflection and a commitment to empowering their learners, educators can establish safe learning spaces that are less hierarchical and encourage gender sensitive learning that respects and values the agency of young girls in their mathematics classrooms.

4.4. Gender Insensitivity

Having discussed gender sensitivity in some detail it is beneficial to also incorporate a discussion of gender insensitivity. Wood and Lenze (1991) correctly highlight that gender

insensitivity can be present in the subject content, curricula, learning environment and the way in which educators engage with learners. Participants in this study echoed these beliefs and one participant pointed to the fact that in mathematics classes, the examples used by teacher as part of the subject content are often gender insensitive.

> If teachers are using examples, or if they're explaining things and taking it only out of the life and world of a specific gender at the expense of another that is insensitive to gender […] Being insensitive to gender would mean that the girls only count with I don't know, Barbies or unicorns and the boys count with cars. (Respondent 3, 09/07/2018).

This excerpt highlights the use of gendered stereotypes often presented to learners in mathematics classrooms. It illustrates that often individuals are boxed into categories as a result of their gender and told what to engage with. In mathematics, gender neutral concepts are then used in examples presented to the learners by the educators or as part of the curricula, which further perpetuate stereotypes and categories based upon gender. This is problematic as it can be used to legitimize exclusivity and stereotypes within a mathematics classroom.

In addition to the explanation above, the same participant also put forward the only attempted definition of gender insensitivity namely:

> If you're insensitive to gender then you would show gender stereotypes. (Respondent 3, 09/07/2018).

Again this definition is linked to gender stereotypes. Educators who are gender insensitive perpetuate these stereotypes rather than aiming to remedy them. Whilst no other participant attempted a definition of gender insensitivity, two other participants also made reference to the negative implications of gender stereotypes in a learning environment.

One participant commented on gender stereotypes beyond the content of mathematics and within the learning environment. The participant expressed her concern about classrooms where teachers tell boys not to play roughly as they are stronger than girls and can easily overpower them. Here the focus was on gender stereotypes that can perpetuate a belief that girls are always weaker than their male peers. This will have implications for how girls perceive themselves and can negatively impact upon their engagement with learning material within this space.

The literature provides further examples of gender insensitivity. Roop (1989) for example, puts forward the illustration of boys being permitted to interrupt or overrule girls in class discussions as one case of gender insensitivity (Roop, 1989: 90). Despite being a girls only environment BoxGirls still works to establish an environment where there is respect and individuals do not interrupt or overrule each other. Evidence of this is one of the rules written down by the learners and tutors of BoxGirls:

> Do not talk when another person is talking. (Fieldnote 3, 27/06/2018)

As discussed when looking at the implications gender stereotypes and insensitivity can have in a learning environment, the literature highlights that gender insensitivity decreases the confidence and levels of participation of young girls within the mathematics classroom

(Roop, 1989: 91). BoxGirls however aim to not only improve the confidence and self-worth of the young girls but establish a space with high levels of participation and group work. BoxGirls should therefore be understood as working so as to combat gender insensitivity within their tutoring program.

In line with the literature and discussing the potential dangers of gender insensitivity, the only male participant pointed out how gender insensitivity and stereotypes can function beyond the confines of a classroom. He commented on the reality that within greater society gender insensitivity exists. This can negatively impact upon the lives of girls. He mentioned how within a South African context, in the school he works at, girls sometimes miss school because so as to help out at home. However, boys within the same family will not be expected to fill this role and will attend school uninterrupted. This very real scenario highlights how gender insensitivity exists in various spaces and needs to be acknowledged and addressed.

Briefly discussing gender insensitivity and the implications thereof has highlighted the importance of working towards gender sensitivity. Furthermore it has highlighted that both gender sensitivity and gender insensitivity relate to gender stereotypes. The former aims to move beyond these stereotypes, the latter reinforces and legitimizes them.

4.5. Critical Considerations

In light of the above findings and discussion there are some critical considerations that need to be addressed. There are two critical considerations of particular relevance to this study, namely whether single-sex learning environments are beneficial and whether the BoxGirls Tutoring program can be understood as being gender sensitive.

4.5.1. Single-Sex Learning Environments

Jackson (2002) and Forgasz et al (2010) suggest that a girls-only learning environment has positive implications for the girls. The literature notes that within a girls only environment the atmosphere is calm and supportive. It is further suggested that as a result of this environment, girls seem more willing to engage in discussions around the subject of learning than they would within mixed classes (Jackson, 2002: 38). While there isn't necessarily an extensive body of literature that comments on the impact of single-sex learning environments, most literature on the matter seems to acknowledge that programs for girls, be they after-school programs like BoxGirls South Africa, or in school activities can improve girls' confidence, interest and enthusiasm towards mathematics (Forgasz et al, 2010: 66). There is however still debate amongst scholars and educators as to the full implications of single-sex education.

All four of the participants stated that single-sex learning environments are at least to some degree, beneficial for the young girls learning mathematics. Single-sex learning environments were understood as creating a space where young girls can talk freely about their academic work as well as more personal issues.

One of the tutors emphasized that a single-sex classroom can greatly influence the confidence of the young girls:

> There are girls who when they first come to our program were too shy. As tutors we never forced them to speak. Now they speak for themselves. (Respondent 2, 27/06/2018).

These girls may not have felt as safe or confident within a mixed-sex environment. Through the environment created by BoxGirls and the care of their tutors these girls gain confidence and self-worth. Feeling confident enough to speak up in a learning environment is only one facet of a larger reality. Girls who begin to feel confident not only speak up more in class, they believe in themselves and their work and they speak up beyond the walls of a learning environment as well.

In addition to single sex learning environments helping to improve the confidence of young girls it was noted by participants that these environments present tutors with the opportunity to establish a space in which the girls feel safe. Within this safe space, girls see each other as sisters within a community. The girls trust each other and their tutors. There is mutual respect.

In further agreement with the literature was the interesting statement made by one participant, namely that a single-sex learning environment would be beneficial for a girls-only environment but not for a boys-only environment.

> I think boys are […] mischievous, so it's fine when they are mixed with girls. A class where it is boys only […] that would be too hard. (Respondent 4, 14/08/2018).

It was further mentioned by the respondent that:

> So it think […] if girls are in a class alone they can focus a little bit better. When boys are mixed with girls, they are […] mischievous and then they make the class […] naughty and can disturb those girls you see. (Respondent 4, 14/08/2018).

Overall the respondents felt that a single sex learning environment for girls could be more conducive to the learning of mathematics. It is necessary to note however that one of the tutors stated that a girls-only program could benefit from having sessions that involve young boys as well. She spoke about how:

> In some sessions we talk about certain issues that we've felt boys should be there for. This would allow the boys to give their opinion and answer for themselves. (Respondent 2, 27/06/2018).

Here the focus was more upon the different perspective boys could add to discussions which could be of value in promoting an inclusive learning environment. Aligned with this comment, another participant also mentioned that the safe space created within a girls-only learning environment is not necessarily impossible to create in an environment with both boys and girls. Here she explained that an inclusive environment is more about the atmosphere established surrounding the learning, rather than being dependent on being a single-sex learning environment.

Importantly a single-sex learning environment is not automatically gender sensitive. Single-sex environments can functions so as to further perpetuate gender stereotypes. Consideration therefore needs to be made as to whether BoxGirls, a single-sex tutoring program, can be understood as being sensitive to gender.

4.5.2. BoxGirls as Gender Sensitive

Statements made by the four participants and the BoxGirls website provide evidence that the main aim of BoxGirls is to help young girls improve their self-esteem, instilling in them the belief that they are strong (BoxGirls, n.d). This aim alone seems to serve as evidence of BoxGirls being gender sensitive. However this section further discusses key findings from the interviews and field notes that provide evidence of BoxGirls working within a single-sex environment that is sensitive to gender.

BoxGirls works to create a safe space that moves beyond gendered stereotypes. Those involved with BoxGirls are aware and sensitive to the fact that gender stereotypes can be perpetuated even in a girls-only environment. Excerpts from the field-notes taken throughout observation provide insight as to how BoxGirls intentionally works so as to be gender sensitive. With specific reference to the learning environment of the BoxGirls tutoring program and how learners engaged with their tutors and peers I noted that:

> The relationship between the tutors and the girls seems to be non-hierarchical and the tutors do not stand in the front and dictate to the learners. Rather it is a more flat structure where the tutors and the girls blend into one as the tutors help the individual groups engaging with the learners as their equals and being honest if a maths problem is complicated even for them […] Overall the tutoring session was very different to anything I have seen before. The girls are kind to their peers and themselves as they learn, learning is done as a group and at each groups own pace with assistance being provided as needed. (Fieldnote 1, 02/06/2018).

The tutors of BoxGirls consciously work so as to engage with learners in a manner that aims at being gender-sensitive, as defined earlier in this chapter. This excerpt provides just one example of the gender sensitive nature of BoxGirls, by commenting on the fact that girls work in groups and are given autonomy over their learning and experiences. Furthermore, the space created by BoxGirls, as I observed it, was one in which learners felt safe and willing to participate. One activity I observed illustrated the levels of trust and security established in the BoxGirls Tutoring program:

> Each girl had a paper heart that they had written something on. One by one they stood up and spoke to everyone saying what they had put on their heart. They stood in front of everyone and said what it is they were stressed about. For example one of the learners said she was stressed about her school report, another learner said that she was stressed about a fight she had with her sister. They would say what they are stressed about in English to the group. After talking to the group about what they were stressed about the group snapped their fingers, in an act of support for the girl speaking and the one who spoke would scrunch up the paper heart and sit down. It was a very powerful thing to be a part of and I was amazed at the maturity and support the girls showed. It's not easy to speak about what you worried about in front of people and they felt safe enough to do so. (Fieldnote 3, 27/06/2018).

This is a powerful example of what is possible when a safe environment is created. The young girls felt confident enough to speak about very personal issues. Not only were they

supported by the tutors but by their peers as well. At the risk of repeating what is said in the field note, it should be emphasized again that in this activity, each girl was given the opportunity to share; each girl was listened to and each girl was affirmed. BoxGirls has created a space where the academic and personal voices of young girls are encouraged and acknowledged. This speaks volumes to the respectful way in which tutors have engaged with the girls in the past that allowed the girls to share so openly in this less-hierarchical learning environment.

The following excerpt from the interviews highlights how BoxGirls also works at creating an opportunity for girls to participate in stereotypically male dominated areas, such as boxing and mathematics. In doing so BoxGirls focuses on establishing an environment that is not highly competitive.

> BoxGirls combine[s] things that are competitive with things that are not competitive. […] We don't just do non-competitive but we also don't just do competitive. (Respondent 3, 09/07/2018).

The BoxGirls tutoring program creates a space for young girls where they know that it is acceptable to make mistakes. The learning environment is not purely competitive. The literature, particularly noted by Forgasz et al (2010), also highlight that a highly competitive environment has not been found to be conducive for girls to learn in. BoxGirls finds a balance between competitive and non-competitive environments and successfully establishes a safe learning environment where girls are able to participate and learn from their tutors, peers and themselves.

Almost all participants stated categorically that they believed that BoxGirls was gender-sensitive. One participant added that BoxGirls could perhaps further improve upon gender sensitivity by working with boys as well as. This, the participant felt, could remove some of the stigma surrounding the assumption that boys are dangerous. It was noted by another participant, as mentioned earlier in this chapter, that it is most likely possible to create a safe and inclusive space for both boys and girls in a mathematics tutoring program. Due to the scope of this study however further attention could not be paid to adequately address a discussion on an inclusive and gender sensitive environment for a mixed classroom. This is perhaps an area for future study to expand upon the findings of this research and incorporate a look at gender sensitive environments in learning spaces for all genders.

4.6. Moving beyond the findings

The findings have not only helped to better define gender sensitivity through examples, but has also moved beyond this to incorporate a discussion surrounding the importance of gender sensitivity within mathematics tutoring programs.

The adoption of gender-sensitive practices, as evident through the Mathematics Tutoring program of BoxGirls, can improve the academic performance of young girls. Beyond positively impacting the academic performance of young girls however, gender sensitive practices also enhance the confidence and self-worth of young girls. It is therefore of relevance to attempt to establish a list of gender-sensitive indicators that can be used to help frame a mathematics tutoring program and promote tutoring that is sensitive to gender.

Through the process of coding, analysing and discussing the findings three indicators of gender sensitivity emerged. Using the BoxGirls mathematics tutoring program as the foundation for the establishment of these indicators, this study puts forward the Three E's: Environment, Education and Engagement (The Three E's). These shall be discussed in greater detail in the chapter that follows.

While the Three E's were established by looking at the single case study of BoxGirls South Africa, they are framed broadly so that they can be used in the discussion of any tutoring program. Using the Three E's will help with an assessment of whether tutoring programs are adopting practices that are aligned with a more gender sensitive approach.

Chapter 5: Indicators of Gender Sensitivity: The Three E's

This study has argued for the importance of increasing gender sensitivity in historically male-dominated subjects such as mathematics. Increasing gender sensitivity in mathematics tutoring programs as well as in classrooms, as a result of the application of gender sensitive indicators, can better facilitate the possibilities of girls achieving in mathematics.

From the findings and discussion of gender sensitivity in BoxGirls South Africa above, three indicators emerged as sub-categories of gender sensitivity in tutoring programs (See Addendum C). The three broad indicators put forward by this study, relate to the structure of the tutoring program, the style of learning that takes place and the engagement between the pupils and the tutors as well as among the pupils. These indicators have been labelled as The Three E's, namely that of Environment, Education and Engagement. What follows is a brief outline of each of these indicators of gender sensitivity.

5.1. Environment

The first indicator to be discussed is Environment. This indicator refers specifically to the whether the learning environment is safe, less-hierarchical and inclusive. This study found environment to be an essential consideration when working towards gender sensitivity. Overall an environment that is gender sensitive is one where there is mutual respect between tutors and learners within a less hierarchical learning environment. From the observations, I found BoxGirls South Africa to be working within a less-hierarchical environment as commented on in the field note below,

> The relationship between the tutors and the girls seems to be non-hierarchical and the tutors do not stand in the front and dictate to the learners. Rather it is a more flat structure where the tutors and the girls blend into one as the tutors help the individual groups engaging with the learners as their equals and being honest if a maths problem is complicated even for them. (Fieldnote 1, 02/06/2018).

Moreover a gender sensitive environment is inclusive. Within the BoxGirls tutoring program for example,

> Everyone no matter how they define their own role in society […] has the same chance of learning and developing their skills. (Respondent 3, 09/07/2018).

This interview excerpt points to the environment established by BoxGirls as being an inclusive one. In addition to establishing an inclusive environment, a gender sensitive tutoring program aims at establishing a safe space. The learning environment can be understood as safe if learners feel confident enough to participate and engage with the learning material and the tutors. This is established through creating meaningful relationships of trust between the tutors and the learners and by the tutoring program adopting a less competitive approach to learning (Forgasz et al, 2010). In a gender sensitive environment learners do not fear making mistakes. They are not afraid to participate because they feel supported and respected in a less hierarchical and less competitive environment.

Tutors and those involved with a program should use this indicator to continuously reflect on the environment they are creating. This study has found the BoxGirls tutoring program to be a useful example of a safe, non-competitive, less-hierarchical learning environment.

Therefore when applying this indicator to the BoxGirls Mathematics tutoring program, it is apparent that the environment established by this program is gender sensitive.

5.2. Education

The second indicator this study presents is that of the style of learning and education that takes place within the tutoring program. This indicator can be used to reflect on whether the curriculum and teaching encourages a less mechanical and gender stereotyped style of learning.

Firstly, a more gender sensitive style of education is one that moves beyond only competitive individual activities. Rather a gender sensitive tutoring program will adopt a form of education that encourages inquiry-based learning, co-operative groups and a more non-competitive environment.

As noted in the findings above,

> The girls are kind to their peers and themselves as they learn, learning is done as a group and at each groups own pace with assistance being provided as needed. (Fieldnote 1, 02/06/2018).

This excerpt points to evidence of the BoxGirls tutoring program adopting a less mechanical approach to education. The promotion of group work and the ability of girls in BoxGirls to learn from their peers as well as their tutors, highlights that BoxGirls works at promoting a more gender sensitive style of learning.

Secondly, beyond the style of education it is important that attention be paid to the mathematics content and curriculum. Here moving beyond gender stereotypes is essential for a tutoring program to be understood as being gender sensitive.

As stated by a participant,

> If you're insensitive to gender then you would show gender stereotypes. (Respondent 3, 09/07/2018).

Tutoring programs that adopt a gender sensitive approach to education will present learners with examples that go beyond gendered stereotypes. As a simple illustration of this point, this will mean that girls are not expected to count with dolls while boys count with cars. A more gender sensitive tutoring program will therefore provide the learners with examples that validate their day to day lives but do not perpetuate categorization of interests based upon gender.

BoxGirls aims to go beyond gender stereotypes. Their tutoring program validates the lived realities of the young girls who live in Khayelitsha. The tutors, who are from Khayelithsa, present examples to the learners that acknowledge their experiences. When applying the Education indicator to the BoxGirls Mathematics tutoring program, it is apparent that the education style and subject content used by this program is gender sensitive. The BoxGirls tutoring program actively works so as to deconstruct gender stereotypes.

Those involved in tutoring programs can reflect upon this indicator and the approach to education adopted by BoxGirls so as to address the gender sensitivity of the education content and style of their program. BoxGirls is a helpful example of what gender sensitive education can looks like in a mathematics tutoring program.

5.3. Engagement

The final indicator this study presents is that of Engagement. Engagement is understood in the context of tutoring programs as being multifaceted, meaning both participation and communication.

Firstly as it refers to participation, a gender sensitive tutoring program is concerned with establishing an environment in which the learners are willing to participate. This includes learners being willing to attempt an answer to a problem, helping peers with work and broadly engaging with the learning material. This study found that the learners are willing to participate in the BoxGirls tutoring sessions. As mentioned in of the field notes,

> The most important observation although a broad one, was that these girls were all happy. They come to the tutoring session by choice and are happy to be a part of it. They are eager to learn as evident by their raised hands, serious working and assisting their peers. They all bring their own government issues school workbooks along to the lessons and take ownership of their work. (Fieldnote 1, 02/06/2018)

BoxGirls should therefore be understood as successfully establishing a tutoring program that encourages the participation of the learners. Beyond this however BoxGirls also focuses on the importance of gender sensitive communication between the tutors and the learners.

A more gender sensitive approach is one in which the tutors communicate with the learners in a respectful manner. Here the communication must account for the learners' agency. One way to begin to address this indicator is to reflect upon how individual tutors are communicating with learners. For example, as commented on by one of the respondents of this study, it is important to reflect on,

> How to talk to the girls to show them your respect? And how do you create an atmosphere where everyone feels safe to speak up and to ask questions? (Respondent 3, 09/07/2018).

Communication in a gender sensitive approach to engagement, comprehends the importance of mutual respect. The girls should communicate with each other and the tutors in a respectful manner. So too however, should the tutors engage with the young learners in a way that respects and encourages them.

> Even if I am older than them, I have to respect them. (Respondent 1, 27/06/2018).

In all the sessions I observed and from the statements made in the interviews, such as the one above, the BoxGirls tutors seem to be working so as engage with the learners in a respectful manner.

This gender sensitive indicator of engagement, looking specifically at the importance of participation and communication, can be used so as to assist those within tutoring programs in reflecting on the type of engagement present within their programs. When applying this

indicator of engagement to the BoxGirls Mathematics tutoring program, it is evident that the engagement within this program aims at being gender sensitive.

5.4. The Relationship between the Three E's

The Three E's mentioned above should not be applied in isolation. There is an inherent overlap between them and they influence and in turn are influenced by each other. Used together the Three E's establish a proposed foundation for looking at gender sensitive practices within mathematics tutoring programs

This study understands the relationship between the Three E's to be circular and multi-directional (as depicted in the diagram below).

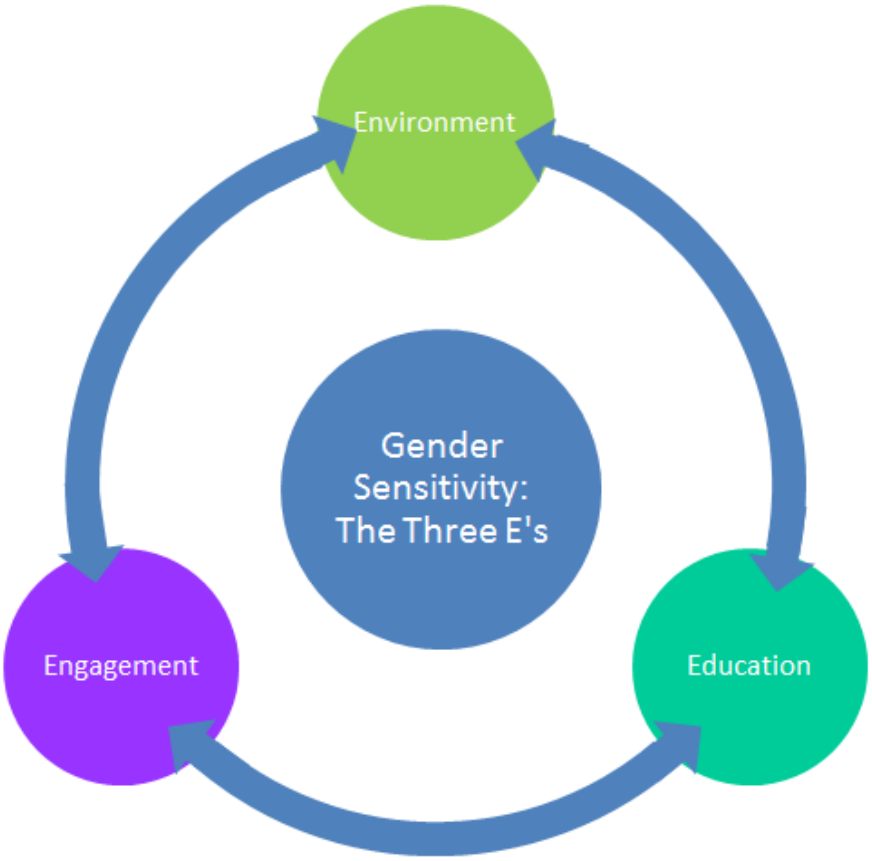


Image 2: Diagrammatic representation of the Relationship between the Three E's

Within this diagram the arrows from each indicator go both ways. This is used to show that each indicator is influenced by the other two indicators and influences them in return. For example if we look at the Environment indicator. The learning environment will influence the levels of engagement (as depicted by the arrow from Environment going to the left). If the learning environment is less gender sensitive and more hierarchical it will not encourage learner participation and will influence how tutors engage with learners. Engagement will also reciprocally influence the learning environment (as depicted by the arrow from Engagement going to Environment). Additionally the learning environment will be influenced by the type of education and learning deemed desirable within the tutoring program (as depicted by the arrow from Education going to Environment). If education is

seen as needing to be more mechanical this will influence the environment. If the learning environment is more hierarchical it will in turn influence the more mechanical style of education in a tutoring program. The relationship between each of the indicators is therefore multidirectional.

To adequately account for the circular relationship between these indicators of gender sensitivity, tutoring programs should apply all three indicators together. Applying only one of the indicators at a time will not adequately reflect whether a tutoring program is working towards being gender sensitive.

It is necessary to clarify that these indicators are not hierarchical. There is no indicator that is more important than another. Furthermore there is no numerical value attached to any of them. These indicators are qualitative and do not aim to quantify gender sensitivity or enable an individual to rank a tutoring program based upon a degree of gender sensitivity. Additionally, this study does not propose that the Three E's function as a once-off checklist. They therefore do not function so as to achieve a final classification of a tutoring program as being gender sensitive. Rather these indicators should be used with an understanding that gender sensitivity in tutoring programs is a work in progress.

Furthermore, when applying the Three E's, consideration needs to be given to the specific context. In this study consideration was given to the context in which BoxGirls South Africa is situated, namely in the informal settlement of Khayelitsha in post-apartheid South Africa. Only through situating this tutoring program was this study able to adequately reflect on the gender sensitive practices of BoxGirls and apply these indicators. The same degree of consideration given to context evident in this study should be given when applying these indicators to any tutoring program.

If context is given the necessary consideration and these indicators are applied together with the understanding that they are multidirectional, these indicators can be used as an aid to reflect upon individual tutoring programs. The Three E's not only provide a tool to establish whether tutoring programs can be understood as being sensitive to gender, but by requiring reflection into the education, environment and engagement of a program, they also function so as to encourage tutoring programs to be more aware of gender sensitivity. The Three E's account for the importance of the female voices in the more historically male-dominated degrees and fields of mathematics.

Chapter 6: Conclusion

6.1. Conclusion

This qualitative empirical study has presented gender sensitivity as a response to the continued underrepresentation of women in STEM degrees and professions in South Africa. The focus was specifically on primary school mathematics as the basic concepts, skills and thinking strategies taught at this level, are essential for the successful continuation of mathematics at a secondary and tertiary school level.

Gender sensitivity in mathematics tutoring programs was defined as being an awareness of the challenges and stereotypes young girls face when participating in mathematics (Wood & Lenze, 1991). To frame the discussion of gender sensitivity and the need to address gender stereotypes, this study looked at a single case, the BoxGirls Mathematics Tutoring program, run in South Africa.

The examples of practices that can be understood as gender sensitive put forward by this study echoed the findings in the literature of Subrahmanian (2005), Wood and Lenze (1991) and Forgasz et al (2010). In this study however the emphasis was placed on the type of learning encouraged within the learning space, the way in which tutors and teachers engaged with learners and the environment established. From this, three broad indicators of gender sensitivity emerged, the three E's namely: Environment, Education and Engagement. These indicators were presented as a useful tool to understanding and assessing gender sensitivity in mathematics tutoring programs.

The Three E's play an integral role in reflecting on and encouraging more gender sensitivity in tutoring programs. While they help to frame necessary discussions around the importance of gender sensitivity in tutoring programs, addressing context is of importance. It is for this reason; this study took time to establish the national, regional and tutoring program specific context before applying the Three E's to the BoxGirls program. This study found BoxGirls South Africa to be gender sensitive when assessing their program according to the Three E's. BoxGirls South Africa therefore serves as a helpful example to other tutoring programs. Their program illustrates how gender sensitivity can be used to address the challenges and stereotypes young girls face when participating in mathematics.

As these indicators inherently require the reflection of the education, environment and engagement present in a program, they function so as to encourage tutoring programs to be more aware of gender sensitivity. The continued underrepresentation of females in STEM degrees and professions highlights the need to address gender sensitivity in education. The findings of this study are therefore not only of relevance to BoxGirls. Rather they are of relevance to any tutoring program. Future research into the workings of gender sensitivity in mathematics tutoring programs should aim to extend beyond this study and incorporate a consideration of gender sensitivity in a mixed-sex tutoring program.

Finally, it was stated by Michelle Obama at the Summit of the Mandela Washington Fellowship for Young Africa Leaders in 2014 that: "No country can ever truly flourish if it stifles the potential of its women and deprives itself of the contributions of half of its

citizens." (Obama, 2014). This quote remains relevant for various nations, including South Africa. The South African education system and more specific to this study, the teaching of mathematics, seem to be stifling the potential of young girls. This deprives STEM professions of the contributions that can be made by females.

By addressing gender stereotypes at a primary school level and encouraging the achievement of girls in mathematics at all education levels, South Africa will be able to begin to include the voices of females within the more historically male-dominated areas of the economy and society. Essentially, through using the Three E's to encourage increased gender sensitivity in mathematics tutoring programs, we begin to consciously work towards providing young females with the best chance they can have in preparing for their future. Gender sensitivity empowers young girls and their communities; furthermore it helps pave the way for young girls to achieve their full potential.

Reference List

Babbie, E. & Mouton, J. (2001). Part 3:10 Qualitative Studies. *The practice of social research*. Cape Town: Oxford University Press, pp. 269-311.

Baker, D. P., Akiba, M., LeTendre, G. K. & Wiseman, A.W. (2001). Worldwide Shadow Education: Outside-School Learning, Institutional Quality of Schooling, and Cross-National Mathematics Achievement. In: *Educational Evaluation and Policy Analysis*, Vol. 23, No. 1. Sage Publications, pp. 1-17. Accessed online on 14 April 2018. Available at: http://journals.sagepub.com.ezproxy.uct.ac.za/doi/pdf/10.3102/01623737023001001.

BoxGirls South Africa. (2015). *BoxGirls South Africa: Annual Report 2015.* Accessed online on 8 March 2018. Available at: http://www.boxgirls.org.za/wp-content/uploads/2016/06/Annual-Report_Boxgirls-South-Africa_final.pdf

BoxGirls South Africa. (n.d). *BoxGirls South Africa: Our Aims.* Accessed online on 8 March 2018. Available at: http://www.boxgirls.org.za/en/about-us/our-aim-girls-education/.

BoxGirls South Africa. (n.d). *BoxGirls South Africa: Our Story.* Accessed online on 8 March 2018. Available at: http://www.boxgirls.org.za/en/about-us/

Branson, N., Garlick, J., Lam, D., Leibbrandt, M. (2012). Education and Inequality: The South African Case. *A Southern Africa Labour and Development Research Unit Working Paper Number 75*. Cape Town: SALDRU, University of Cape Town. pp. 2-23.

Cohen, P.A., Kulik, J. A. & Kulik, C.C. (1982). Educational Outcomes of Tutoring: A meta-Analysis of Findings. In: *American Educational Research Journal*, Vol. 19, No. 2. United States of America: American Educational Research Association, pp. 237- 248. Accessed online on 14 April 2018. Available at: http://www.jstor.org.ezproxy.uct.ac.za/stable/pdf/1162567.pdf.

Crossman, K. (2013). The Effects of an Afterschool Program on Elementary Students' Reading Comprehension, Doctor of Education in Educational Leadership, California State University, Sacramento. Accessed on 15 April 2018, Available at: https://csus-dspace.calstate.edu/bitstream/handle/10211.9/2032/Kathy.pdf?sequence=2.

DeJaeghere, J., & Pellowski Wiger. (2013). Gender Discourse in an NGO education project: Openings for transformation toward gender equality in Bangladesh. In: *International Journal of Educational Development*, Vol. 33, No. 6. Elsevier. pp. 557-565. Accessed online on 13 May 2018. Available at: https://ac-els-cdn-com.ezproxy.uct.ac.za/S0738059313000333/1-s2.0-S0738059313000333-

main.pdf?_tid=cd59b254-2a52-4292-bceb-e16e4083d579&acdnat=1526251726_a355f99812fc97b214778648a92119be.

Department of Basic Education. (2018). *Curriculum Assessment Policy Statements (CAPS).* Accessed online 24 October 2018. Available at: https://www.education.gov.za/Curriculum/CurriculumAssessmentPolicyStatements(CAPS)/tabid/420/Default.aspx.

Department of Basic Education. (2011). *National Curriculum and Assessment Policy Statement (NCS), Mathematics, Intermediate Phase Grades 4-6.*South Africa: Department of Basic Education: 1-265.

Department of Basic Education. (2018). *Safety in Schools.* Accessed online 24 October 2018. Available at: https://www.education.gov.za/Programmes/SafetyinSchools.aspx.

De Wet, J. P. & Erasmus, Z. (2005). Towards Rigour in Qualitative Analysis. *Qualitative Research Journal*. Vol. 5, no. 1: pp. 27-39.

Doris, A., O'Neill, D. & Sweetman, O. (2012). Gender, Single-Sex Schooling and Maths Achievement. In: *Discussion Paper Series*. pp. 2-30. Accessed online on 13 May 2018. Available at: http://ftp.iza.org/dp6917.pdf.

Doucet, A., & Mauthner, N. S. (2006). Feminist methodologies and epistemology. In D. L. Peck, & B. C. D. (Eds.), *The Handbook of 21st Century Sociology.* Thousand Oaks, CA: Sage Publications. pp. 36-42. Accessed online on 23 May 2018. Available at: https://s3.amazonaws.com/academia.edu.documents/33507623/Doucet_Mauthner_Feminist_Methods_2006.pdf?AWSAccessKeyId=AKIAIWOWYYGZ2Y53UL3A&Expires=1527444788&Signature=nJQp1c2Yu2yleo94QzNw2fxm1PE%3D&response-content-disposition=inline%3B%20filename%3DDoucet_Mauthner_Feminist_Methods_2006.pdf.

Dowker, A., Bennet, K. & Smith, L. (2012). Attitudes to Mathematics in Primary School Children. In: *Child Development Research*, Vol. 2012. Hindawi Publishing Corporation. pp. 1-9. Accessed online on 13 May 2018. Available at: https://www.hindawi.com/journals/cdr/2012/124939/

Fieldnote 1 on Gender Sensitive NGO Run Tutoring Programs. 2 June 2018. BoxGirls SA Offices: Khayelitsha Cape Town.

Fieldnote 2 on Gender Sensitive NGO Run Tutoring Programs. 9 June 2018. BoxGirls SA Offices: Khayelitsha Cape Town.

Fieldnote 3 on Gender Sensitive NGO Run Tutoring Programs. 27 June 2018. BoxGirls SA Offices: Khayelitsha Cape Town.

Fiske, E.B. & Ladd, H.F. (2005) Education and Apartheid in *Elusive Equity: Education Reform in Post-Apartheid South Africa.* Pretoria: HSRC: 40-60.

Fleisch, B. (2008). 'Poverty and Performance' in Fleisch, B., *Primary Education in Crisis: Why South African School Children Underachieve in reading and mathematics*. Cape Town: Juta, pp. 51-75.

Forgasz, H. J., Becker, J. R., Lee, K.-H., & Steinthorsdottir, O. B. (Eds.). (2010). *International perspectives on gender and mathematics education*. Charlotte, NC: Information Age Publishing.

Jackson, C. (2002). Can Single-Sex Classes in Co-Educational Schools Enhance the Learning Experiences of Girls and/or Boys? An Exploration of Pupils' Perceptions. In: *British Educational Research Journal*, Vol. 28. No.1. Wiley on behalf of BERA. pp. 37-48. Accessed online on 13 May 2018. Available at: http://www.jstor.org.ezproxy.uct.ac.za/stable/pdf/1501861.pdf?refreqid=excelsior:d41b6fc0b108bca499b67190f97ca620.

Landman, M. (2006). Getting Quality in Qualitative Research: A Short Introduction to Feminist Methodology and Methods. In: *Proceedings of the Nutrition Society*, Vol. 65, No. 4. Cambridge University Press, pp. 429-433. Accessed online on 23 May 2018. Available at: https://www.cambridge.org/core/services/aop-cambridge-core/content/view/3E3C3A28370EDC81A77A8E4BF466C59B/S0029665106005180a.pdf/getting_quality_in_qualitative_research_a_short_introduction_to_feminist_methodology_and_methods.pdf.

Leder, G. C. (2015). *Gender and Mathematics Education Revisited.* The Proceedings of the 12th International Congress on Mathematical Education. pp. 145-170. Accessed online on 13 May 2018. Available at: https://link.springer.com/content/pdf/10.1007%2F978-3-319-12688-3_12.pdf.

Letsebe, K. (2018). *Woman remain underrepresented in the ICT field*. IT Web: Johannesburg South Africa. Accessed 30 October 2018. Available at: https://www.itweb.co.za/content/G98YdMLxaPAMX2PD.

Malema, M. (2017). *How South Africa ranks in the Global Gender Gap Report.* Business Report. Accessed online 30 October 2018. Available at: https://www.iol.co.za/business-report/how-south-africa-ranks-in-the-global-gender-gap-report-11823950.

Millennium Development Goals Monitor. (2016). *Millennium Development Goals: Promote Gender Equality and Empower Women*. Accessed online on 25 September 2018. Available at: http://www.mdgmonitor.org/millennium-development-goals/.

Munoz, M.A., Ross, S. M. & Neergaard, L. L. (2009). Supplemental Educational Services as a Component of No Child Left Behind: A Mixed-Method Analysis of Its Impact on Student Achievement. In: *Planning and Changing*, Vol. 40, No. 3. ERIC, pp. 135-159. Accessed online on 15 April 2018. Available at: https://search-proquest-

com.ezproxy.uct.ac.za/docview/909493253/fulltextPDF/2CCA7ED4003F453APQ/1?accountid=14500.

Obama, M. (2014). *Remarks by the First Lady at the Summit of the Mandela Washington Fellowship for Young African Leaders*. 30 July 2014. Washington, D.C. Accessed online 2 November 2018. Available at: https://obamawhitehouse.archives.gov/the-press-office/2014/07/30/remarks-first-lady-summit-mandela-washington-fellowship-young-african-le.

O'Donoghue, R. (2013). *Framing Active Teaching and Learning in CAPS*. Fundisa for Change Programme. Environmental Learning Research Centre, Rhodes University Grahamstown, and GIZ Expert Net: pp. 2-24.

Park, H., Behrman, J. R. & Choi, J. (2012). Causal Effects of Single-Sex Schools on Students' STEM (Science, Technology, Engineering and Math) Outcomes by Gender and Parental SES. In: PIER Working Paper No. 12-038. SSRN. pp. 1-26. Accessed online on 13 May 2018. Available at: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2153812.

Punch, K. (2014). Collecting Qualitative Data, Chapter 8. *Introduction to Social Research: Quantitative and Qualitative Approaches*, 3rd Edition, London: Sage Publications, pp. 143-166.

Ramazanoglu, C. & Holland, J. (2002). Choices and Decisions: Doing A Feminist Research Project. In: *Feminist Methodology: Challenges and Choices*. Sage Publications: London. pp. 145-164. Accessed online on 23 May 2018. Available at: http://methods.sagepub.com.ezproxy.uct.ac.za/book/feminist-methodology.

Ramazanoglu, C. & Holland, J. (2002). From Truth/ Reality to Knowledge/ Power: taking a Feminist Standpoint. In: *Feminist Methodology: Challenges and Choices*. Sage Publications: London. pp. 60-79. Accessed online on 23 May 2018. Available at: http://methods.sagepub.com.ezproxy.uct.ac.za/book/feminist-methodology.

Ramazanoglu, C. & Holland, J. (2002). Introduction. In: *Feminist Methodology: Challenges and Choices*. Sage Publications: London. pp. 2-20. Accessed online on 23 May 2018. Available at: http://methods.sagepub.com.ezproxy.uct.ac.za/book/feminist-methodology.

Reinharz, S (1992). Conclusion. In: Reinharz, S. (ed.) *Feminist Methods in Social Research*. Oxford: Oxford University Press: pp. 240-269. Accessed online on 13 May 2018. Available at: https://www.brandeis.edu/sociology/pdfs/faculty-articles/reinharz-methods.pdf.

Resnik, D. B. (2015). *What is Ethics in Research and Why is it Important?* National Institute of Environmental Health Sciences. Accessed online 24 October 2018. Available at: https://www.niehs.nih.gov/research/resources/bioethics/whatis/index.cfm.

Respondent 1. (2018). *Interview conducted on Gender sensitive NGO run tutoring programs*. 27 June 2018, BoxGirls South Africa Offices: Khayelitsha Cape Town.

Respondent 2. (2018). *Interview conducted on Gender sensitive NGO run tutoring programs*. 27 June 2018, BoxGirls South Africa Offices: Khayelitsha Cape Town.

Respondent 3. (2018). *Interview conducted on Gender sensitive NGO run tutoring programs*. 9 July 2018, Interview conducted over Skype: Johannesburg.

Respondent 4. (2018). *Interview conducted on Gender sensitive NGO run tutoring programs*. 14 August 2018, Vuzamanzi Primary School: Khayelitsha Site B, Cape Town.

Ritter, G.W., Barnett, J.H., Denny, G. S. & Albin, G. R. (2009). The Effectiveness of Volunteer Tutoring Programs for Elementary and Middle School Students: A meta-analysis. In: *Review of Educational Research*, Vol. 79, No. 1. Sage Publications. pp. 3-38. Accessed online on 14 April 2018. Available at: http://journals.sagepub.com.ezproxy.uct.ac.za/doi/pdf/10.3102/0034654308325690.

Roop, L. J. (1989). Research in the Classroom: The English Teacher as Midwife: Gender Sensitivity in Teaching Methods. In: *The English Journal*, Vol. 78, No. 6. National Council of Teachers of English. pp. 90-91. Accessed online on 18 May 2018. Available at: https://search-proquest-com.ezproxy.uct.ac.za/docview/237281260?OpenUrlRefId=info:xri/sid:primo&accountid=14500.

Rothman, T. & Henderson, M. (2011). Do School-Based Tutoring Programs Significantly Improve Student Performance on Standardized Tests? In: *research in Middle Level Education Online*, Vol. 34, No. 6. Routledge: Taylor and Francis Group. pp. 1-10. Accessed online on 14 April 2018. Available at: https://www.tandfonline.com/doi/pdf/10.1080/19404476.2011.11462079?needAccess=true.

Sampson, H. (2004). Navigating the waves: the usefulness of a pilot in qualitative research. *Qualitative Research, 4(3):* 383-402.

Sharma, P., Verma, G. & Arur, A. (2013). Negotiating Meanings of Gender Justice: Critical Reflections on Dialogs and Debates in a non-governmental organization (NGO). In: *International Journal of Educational Development*, Vol. 33, No. 6. Elsevier. pp. 576-586. Accessed online on 13 May 2018. Available at: https://ac-els-cdn-com.ezproxy.uct.ac.za/S073805931300045X/1-s2.0-S073805931300045X-

main.pdf?_tid=8f3adc8a-4473-4421-8abc-a013eebb7dce&acdnat=1526251043_6bf51790d3c8160fd273a4e8007a4d21.

Shepherd, D. L. (2017). Gender, Self-Concept and Mathematics and Science Performance of South African Grade 9 Students. In: *Stellenbosch Economic Working Papers: WP11/2017*. pp. 1-42. Accessed online on 13 May 2018. Available at: https://scholar.google.co.za/scholar?hl=en&as_sdt=0%2C5&q=Gender%2C+Self-Concept+and+Mathematics+and+Science+Performance+of+South+African+Grade+9+Students.++&btnG=.

SII: Schools Improvement Initiative. (n.d). SII: Schools Improvement Initiative: *Where we Work*, University of Cape Town, accessed on 10 April 2018, http://www.sii.uct.ac.za/sii/about/wherewework.

Soudien, C. (2007). The "A" Factor: Coming to terms with the Question of Legacy in South African Education. *DeJaeghere et alal Development.* Vol. 17, No. 2: 182-193.

South African Institute of Race Relations. (2016). *Report Finds Deep Racial and Social Inequalities in Matric Results*. Press Release. IRR, pp. 1. Accessed online on 13 May 2018. Available at: https://irr.org.za/reports-and-publications/media-releases/report-finds-deep-racial-and-social-inequalities-in-matric-results/view.

Statistics South Africa. (2015). *Millennium Development Goals Country Report 2015.* Statistics South Africa: Pretoria, pp. 1-65. Accessed online on 25 September 2018. Available at: http://www.statssa.gov.za/MDG/MDG_Country%20Report_Final30Sep2015.pdf.

Strategic Development Information and GIS Department (SDI & GIS) and the City of Cape Town. (2011). *2011 Census Suburb Khayelitsha.* Accessed online 1 November 2018. Available at: http://resource.capetown.gov.za/documentcentre/Documents/Maps%20and%20statistics/2011_Census_CT_Suburb_Khayelitsha_Profile.pdf.

Subrahmanian, R. (2005). Gender Equality in Education: Definitions and Measurements. In: *International Journal of Educational Development*, Vol. 25, No. 4. Elsevier. pp. 359-407. Accessed online on 18 May 2018. Available at: https://www-sciencedirect-com.ezproxy.uct.ac.za/science/article/pii/S0738059305000349.

University of Cape Town. (2018). *UCT Knowledge Co-Op.* Accessed online 28 March 2018. Available at: http://www.knowledgeco-op.uct.ac.za/kco/about.

Wood, J. T. & Lenze, L.F. (1991). Strategies to enhance gender sensitivity in communication education. In: *Communication Education*, Vol. 40, No. 1. Taylor & Francis. pp. 16-21. Accessed online on 18 May 2018. Available at: http://web.a.ebscohost.com.ezproxy.uct.ac.za/ehost/pdfviewer/pdfviewer?vid=3&sid=a320c2f4-5107-4bca-beae-c3349b89c34c%40sessionmgr4009.

Yeo, A. et al. (2014) In-depth interviews, Chapter 7 in In Ritchie, J., Lewis, J., McNaughton Nicholls, C. & Ormston, R. (eds) *Qualitative Research Practice: A Guide for Social Science Students and Researchers*, 2nd Edition. London: Sage Publications, pp. 178-209.

Yin, R. K. (1994). Introduction. In Yin, R.K. (ed.) *Case Study Research: Design and Methods*. Second Ed. London: Sage Publications. pp. 1-52. Accessed online on 13 May 2018. Available at: http://www.madeira-edu.pt/LinkClick.aspx?fileticket=Fgm4GJWVTRs%3D&tabid=3004.

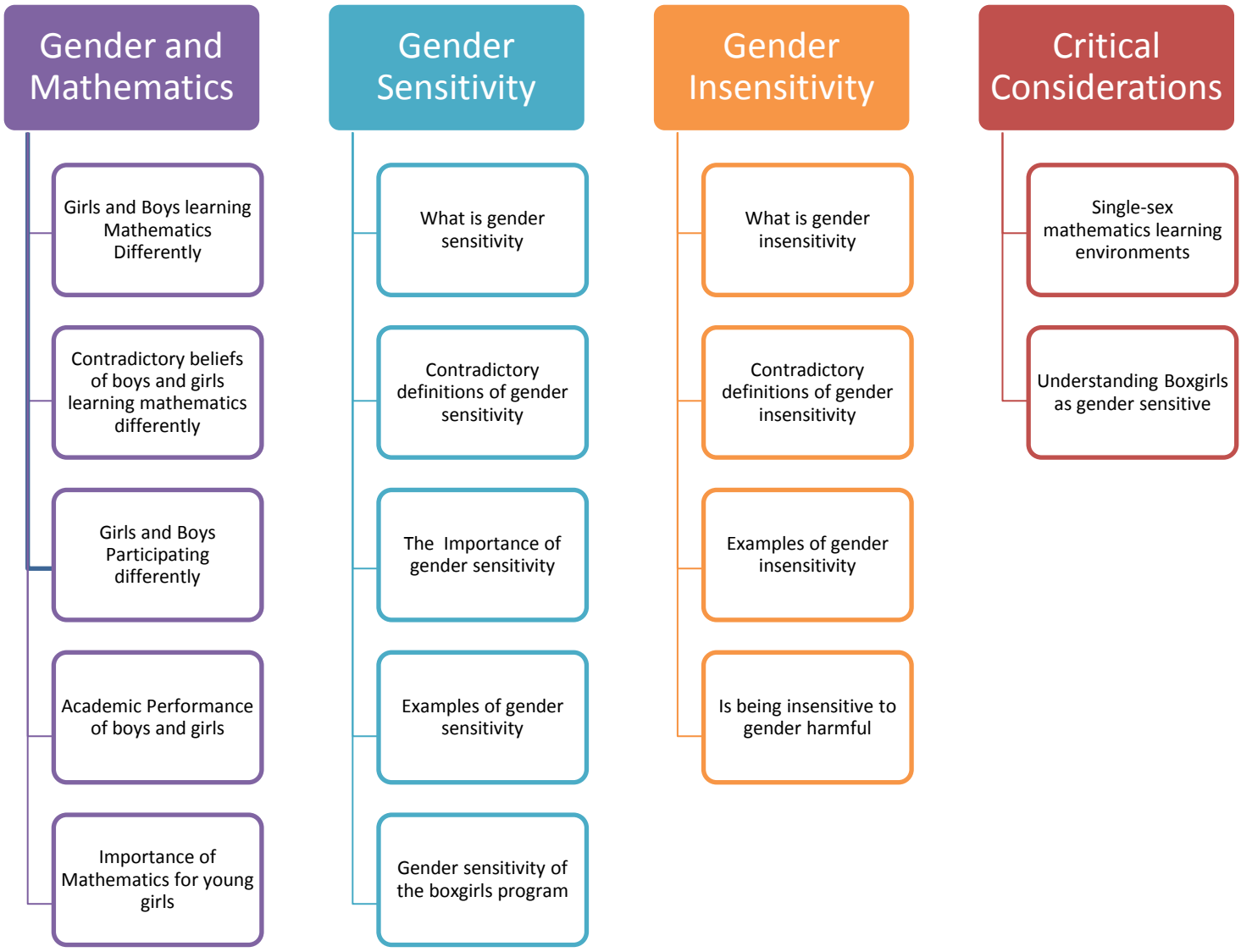
Appendices

Addendum A: Definitions of Codes

CODE NAME	Description	Colour
PARENT CODE: Gender and Mathematics	Discussions surrounding the perceived relationship between gender and mathematics	
CHILD CODES		
Girls and Boys Learning Mathematics Differently	Discussions around opinions and understandings as to whether girls and boys learn mathematics in different ways	
Contradictions about boys and girls learning maths differently	Differing views on what whether girls and boys learn maths differently and how they participate	
Girls and Boys participating differently	Discussions around opinions and understandings as to whether girls and boys participate more or less than each other , or in different ways	
The academic Performance of Girls and Boys	Discussions into the academic performance of boys and girls (including marks but also including understanding of concepts)	
The Importance of Mathematics for young girls	Whether mathematics is see as important for the further education and future employment prospects of young girls	
The value of single-sex mathematics learning environments	Discussions into the value of a girls-only or boys-only mathematics learning environment	
PARENT CODE: Gender Sensitivity	Discussions surrounding issues of gender sensitivities, complexities within this and gender sensitive practices	
CHILD CODES		
What is Gender Sensitivity	Any attempt at defining gender sensitivity or explaining what it is	
Contradictory definitions of gender sensitivity	Differing views of what gender sensitivity means	
The Importance of gender	Discussions surrounding why being sensitive to gender	

sensitivity	is valuable and important, including why it is important for current learners but also what it means for them in the long run	
Examples of gender sensitivity	Mention of practices that the participant classifies as being sensitive to gender (within the classroom and outside of the classroom)	
Gender sensitivity of the BoxGirls Tutoring Program	How the participant would classify the BoxGirls Tutoring program (as either sensitive to gender or insensitive to gender)	
PARENT CODE: Gender Insensitivity	Discussions surrounding issues of gender insensitivities, complexities within this and gender insensitive practices	
CHILD CODES		
What is gender insensitivity	Attempts at defining gender insensitivity	
Contradictions regarding the definition of gender insensitivity	Differing views on what gender insensitivity means	
Examples of gender insensitivity	Mention of practices that the participant classifies as being insensitive to gender (within the classroom and outside of the classroom)	
Is being insensitive to gender is harmful	Discussions around whether being insensitive to gender is harmful or not, why it is harmful for current learners and also the implications it can have	
PARENT CODE: Critical Considerations	Contradictions that are apparent when looking at the entirety of resources	
CHILD CODES		
Opinions of single-sex mathematics learning environments	Differing views on whether single-sex classrooms are beneficial for girls learning mathematics	
Views as to whether BoxGirls can be considered gender sensitive	Differing views as to how to classify BoxGirls as being gender sensitive or not	

Addendum B: Diagrammatic Representation of the final list of codes



Addendum C: Diagram of the Three E's of gender sensitivity