

Research Article

Mathematics and Gender Stereotypes in One Jewish and One Druze Grade 5 Classroom in Israel

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We report findings from qualitative case studies of two grade 5 classrooms in Israel, one Jewish and one Druze. The aim was to identify classroom factors contributing to the differences in the gendered patterns of mathematics outcomes for Jewish and Arab Israeli students. Marked differences were found in the teachers' gender-related interactions with students, and their beliefs and expectations of boys' and girls' mathematical capabilities. The Jewish teacher held conventional gender-stereotyped beliefs of male mathematical superiority. The Druze teacher believed that girls required affirmative action to overcome implied gender biases in favour of males in the Druze community. The findings support earlier research and theoretical perspectives on gender-related issues in the mathematics classroom. In particular, when teachers hold gender-biased beliefs and expectations, students' classroom experiences and mathematics learning outcomes are impacted along gender lines.

1. Introduction

Since Fennema [1] first drew attention to girls' disadvantage in mathematics, there has been ongoing research interest in the field. The recent TIMSS (Trends in International Mathematics and Science Study) 2007 data continue to reveal gender differences at grades 4 and 8 in participating nations [2]. Israel only participated in TIMSS 2007 at the grade 8 level, and was one of 25 (out of 29) countries with no statistically significant gender differences in achievement, although the girls' mean score was slightly higher [2]. When the performance of Israeli Jewish and Israeli Arab students were compared [3], the Jewish students (mean = 484) had outperformed the Arab students (mean = 408). While there was no gender difference in the Jewish students' mean scores, a significant difference favouring girls was found among the Arab students.

In trying to understand which classroom-based factors might contribute to the differences in the gendered patterns of mathematics outcomes for Israeli Jewish and Arab

students, a qualitative study of two grade 5 classrooms, one Jewish and one Druze (an Arab subgroup) was conducted. Earlier theoretical models explaining gender differences, see Leder [4], a framework developed by Avrahami-Ainat [5], and previous research in the field informed the research design.

1.1. The Israeli Education System. In Israel, the educational systems for Jews and Arabs are separated, yet both are run by the Ministry of Education [6, 7]. The school system includes "six years of primary education (Grades 1–6), three years of middle school (Grades 7–9), and three years of high school (Grades 10–12)" [7, page 28]. The curriculum is the same for all schools. In middle school, mathematics and English are generally grouped by ability. To complete high school and qualify for university entry, students must pass standardised external examinations, and mathematics is compulsory. The importance of succeeding in school mathematics in Israel cannot be underestimated. Mathematics is a critical filter, and students' future options appear to narrow from an early stage of schooling.

1.2. Jewish and Arab Students' Mathematics Participation and Performance, and Attitudes towards Mathematics. Recent data on Israeli students' mathematics participation and performance, and their attitudes towards mathematics are presented below.

1.2.1. Performance and Participation Data. Birenbaum and Nasser [7] claimed that in Israel "small but pervasive gender discrepancies in mathematics achievement in favour of boys have been documented over the years, at all levels of education starting from the elementary school level" (page 28). In the 2006 national testing of grade 5 students, Jewish students scored higher than Arab students and, in all subjects tested, gender differences were reported to be small [8]. In the Jewish sector, boys outperformed girls in mathematics, yet in the Arab sector girls scored much higher than boys, a pattern consistent with Israel's grade 8 TIMSS 2007 results.

At the secondary level, Israeli Jewish students appear to follow gender-stereotyped patterns widely reported in English-speaking western nations, with more males than females studying the most challenging mathematics courses offered [9].

1.2.2. Attitudes towards Mathematics. Although performance differences favoured Jewish students in Israel's 2006 and 2009 TIMSS data and in national mathematics testing, Birenbaum and Nasser [7] concluded that "Arab students exhibited a more positive attitude to mathematics (than Jewish students), and Arab girls exhibited an even more achievement-enhancing pattern than Arab boys" (page 37). Arab females have also been found to have high levels of perceived mathematics achievement and self-confidence in mathematics, and higher levels of self-efficacy and less anxiety than Arab males [9, 10]. Nasser and Birenbaum [10] speculated that Arab girls' desire "to demonstrate their capabilities, which they believe to be underestimated by their family or by their community" (page 294) might explain the findings. Compared to Israeli Arab students' views on the gendering of mathematics, Jewish students' views were more consistent with the traditional stereotype of mathematics as a male domain [11]. It was also found that Jewish males and females held similar views while there were many gender differences among the Arab students.

1.3. The Druze in Israel. One of the teachers in the present study was Druze and taught in a Druze school. The Druze form a minority group within Israel and within the Israeli Arab community. They speak Arabic as mother tongue and are considered a traditional and closed social and religious community. The Druze seek to preserve their own distinctive culture and heritage but are also integrated into Israeli public life in many ways. While they serve in the Israeli army and speak Hebrew in addition to Arabic, they are largely endogamic, living for the most part in their own communities and maintaining their own elementary and high schools [12, 13]. Indeed, as Almog [14] noted, the Druze requested to be removed from the Arab Education system, and "[I]n 1977, the Ministry of Education removed the Druze and Circassian sectors from the jurisdiction of

the Department of Arab Education and Culture..." (n.p.). In 1992, the Druze schools "were integrated into the Haifa and Northern Israel districts, and the department moved to the Ministry of Education in Haifa in 1992" [14, n.p.]. As at December 2009, there were about 125,000 Druze living in Israel. They live in 18 villages in northern Israel [15]. The Druze comprise around 1.7% of Israel's population of 7.4 million, and represent 8% of the Israeli Arab population [16].

Khattab [12] reported that Israeli Arab students, like ethnic minorities elsewhere, have high educational aspirations. This is explained to a large degree by high parental educational expectations and involvement in their children's education, perceived as a primary avenue for upward social mobility. How the Druze minority differ from the Muslim Arab sector can be inferred from findings reported by Eilam [17] who compared Jewish, Arab (Christian and Muslim), and Druze teacher trainees on an individualism-collectivism continuum with respect to their cultural background. The general finding was that the Druze were differentiated from the Muslim Arabs and were situated on this continuum, together with the Christian Arabs, between the Muslim and the Jewish respondents, that is, closer to the Western individualist continuum than the Israeli Muslim Arabs. In general, Israeli Arabs succeed in instilling in their children high aspirations for educational achievement. In addition to this, the Druze draw advantage from their own social and cultural capital which perhaps provides a context for the initiative of the single Druze teacher reported in the present study.

Druze culture and religion severely limit women's roles. There has, however, been a "silent" revolution over the last twenty years. The position of women has been transformed through higher education, and the graduates have impacted on the next generation [15, 18, 19]. Higher education for Druze women gained momentum during 1991–1996 [20]. Initially, they experienced difficulty realizing their higher education goals because of cultural restrictions on their movements outside the villages, as well as other gender-related expectations, and translation into occupational prestige was even more difficult. Today, however, the Druze encourage their talented girls to participate in prestigious studies in order to advance the Druze community/sector economically and socially. As a consequence there are currently more Druze women than men in higher education [15, 18]. The following claim by Weiner-Levy [18] is of particular relevance to the present study.

Women who completed their university studies and work as teachers serve as role models for girls. Their respected status in the community also affects parents' willingness to allow their daughters to pursue higher education. Participants were active in shaping their students' futures. (page 227)

2. The Study

2.1. Research Aims. While allowing the cultural and ethnic diversity of the Israeli Jewish and Arab subpopulations

to be maintained, students' learning outcomes from the two populations differ. Gender differences in mathematics outcomes are found in both groups. In the Jewish sector, boys appear to be the advantaged group; in the Arab sector, it seems to be the girls. The main aim of the present study was to identify classroom-based factors that might contribute to these gendered patterns, and to try to understand the dissimilarities. Since ability grouping for mathematics can begin as early as grade 7 in Israel, grade 5 was selected as the focus. In many countries, primary teachers are generalists, but this is not necessarily true in Israel, and one primary teacher from each of the Jewish and Arab sectors who only taught mathematics participated. Pertinent literature on gender issues and mathematics learning, as well as the theoretical dimensions that informed the research design are discussed next.

2.2. Previous Research and Theoretical Perspectives on Gender and Mathematics Learning. Since the mid 1970s, gender differences—usually favouring males—in achievement and in participation rates in mathematics have been the impetus for research aimed at uncovering the contributing factors. Over the years, there have been many extensive literature reviews in the field (e.g., [4, 21–23]). Despite definitive evidence, Li [22] concluded that teachers appeared to “have different beliefs about male and female students” (page 72), stereotype mathematics as a male domain, “overrate male students' mathematics capability, have higher expectations for male students, and more positive attitudes about male students” (page 72). Teachers have also been found to interact more often with males on mathematics-related issues and disciplinary matters, direct more high cognitively demanding mathematical questions to boys, and allow them more time to answer questions [4].

Classroom dynamics have been recognised in Israel as important contributors to gender differences. Classroom misbehaviour is more common among boys, yet teachers are reported to respond to boys by emphasising the need to try harder while girls are told to be “cute” and stop talking [5]. Avrahami-Ainat [5] believed that gender gaps resulted from socialisation, with parents and the Israeli educational system being the main influences. Teachers' attitudes towards boys and girls and those in the cultural milieu of both groups outside school can differ. Mittelberg and Lev-Ari [9] maintained that teachers had a strong influence on students' confidence, self-esteem, and future study directions. Ben Artzi [24] believed that teachers' expectations strongly affect learning outcomes. The ways teachers can serve as socialisers, as identified by Avrahami-Ainat [5], framed the design of the present study.

2.3. Research Approach. The research approach was essentially qualitative and involved two case studies. Some quantitative data were also gathered.

According to Thomas [25], “a case study is an in depth analysis of a single entity” (page 81); the entity in the present study was the grade 5 mathematics classroom. Stake [26] distinguished between intrinsic and instrumental case studies. The goal of an intrinsic case study “is to understand

the case itself” [26, page 77]; in contrast, in instrumental case studies,” the case serves to help us understand phenomena or relationships within it [26, page 77]. In the present study, two instrumental case studies enabled the pursuit of a deeper understanding of the impact of teachers' attitudes and beliefs about boys and girls on their students' gendered behaviors. Whether there were differences by ethnicity were also of interest. One case study involved an Israeli school in the Jewish sector of education; the other was in a Druze school.

The following classroom-based factors, identified by Avrahami-Ainat [5] and Forgasz and Leder [27] as dimensions associated with perpetuating the gender stereotyping of mathematics as a male domain, were the focus of attention in the data gathering and analyses:

- (i) frequency and nature of student-teacher interactions;
- (ii) gender stereotypes evident in teaching resources;
- (iii) teachers' beliefs about girls' and boys' mathematics learning and gender stereotypes;
- (iv) teachers' classroom behaviours towards girls and boys.

2.4. The Sample. A group of primary principals from Jewish and Druze schools were approached and asked if one grade 5 teacher from their schools could be invited to participate in the study. It was made clear that participation needed to be voluntary. Positive responses were received from eight Jewish and five Druze teachers. Only one teacher from each sector was required, so participants were randomly chosen. Neither of the teachers selected was known to the researchers. Both were female and each taught in a coeducational, nonreligious primary school in northern Israel. The teachers had been informed of the purpose of the study when they were invited to participate.

2.5. Teachers' Backgrounds. The Jewish teacher was aged 40. She had completed a Bachelor of Education (no specialization) but had not commenced teaching immediately after graduating. She had 10 years of teaching experience, only taught mathematics, and was the teacher in charge of mathematics, a position she had held for seven years.

The Druze teacher described herself as a “modern” Druze woman. She was 28, had a Bachelor of Education (specializing in mathematics) and seven years of teaching experience. She was in charge of mathematics at her school and only taught mathematics.

2.6. Data Gathering Instruments and Analyses. The data gathering instruments included videotaped classroom observations and semistructured interviews with the teachers.

2.6.1. Lesson Observations. Timetables were obtained and classroom visit times identified. Visiting schedules were randomised and the teachers agreed not to be informed when visits would occur. This was deliberately planned in order to gather data from lessons that were typical of these teachers, that is, not from lessons that were specially prepared for the researchers' visits.

Eight 45 minute lessons were videotaped in each classroom. Due to the nonsequential lesson visits, various mathematics content areas were covered. The classroom-based researcher also served as the video-camera operator. The videotapes were watched closely and frequency counts made of

- (i) student-initiated interactions with the teacher and whether the initiator was a boy or a girl;
- (ii) teacher-initiated interactions with students—questions, comments while working and disciplinary comments—and whether these were with a boy or a girl.

All lesson segments involving student-teacher interactions were transcribed. The teaching materials used during lessons, including examples on the board and the questions and problems students were asked to solve, were examined for gender stereotypes.

2.6.2. Interviews. Semistructured interviews were conducted with the teachers after the classroom observations were complete. They were asked to provide personal background information. Then, the same opening prompt was used with both: “Tell me about your professional background and concerns.” What was said determined the direction of the questions that followed; however, the interviewer had particular issues to pursue based on the classroom observations. Of particular interest were

- (i) their views on whether boys and girls learnt mathematics differently;
- (ii) whether they believed mathematics was more important for boys’ or girls’ futures;
- (iii) whether they felt they treated and interacted with boys and girls differently in the classroom;
- (iv) whether there was any evidence of gender stereotyping in the ways they interacted with students and in the teaching resources used.

The interviews were audiotaped and transcribed. Selected transcript excerpts are used in this article to highlight representative examples of interactions and behaviours consistent with the constructs and issues of interest in the study, and that provide strong support for the conclusions drawn.

2.6.3. Student Achievement Data. At the end of the academic year, the teachers provided the researchers with their students’ classroom-based test grades. The teachers’ tests were different, but were consistent with the grade 5 national curriculum. Both claimed that their tests were balanced with multiple-choice and open-ended questions. *T*-tests (*T*-tests can be conducted with small sample sizes (see StatSoft Electronic Statistics Textbook—<http://www.statsoft.com/textbook/basic-statistics/>)) were conducted to explore for gender differences in the results of these classroom-based tests. The achievement data were also compared to published Israeli national performance data for grade 5 students.

TABLE 1: Frequencies of interactions by student gender in the Jewish teacher’s classroom.

	Boys (<i>N</i> = 13)	Girls (<i>N</i> = 9)
Student-initiated	63	35
Teacher-initiated	82	41
Questions	35	17
Comments while working	30	23
Discipline-related	17	1

3. Results and Discussion

Information about the grade 5 classrooms and the results from lesson observations and interviews are presented for each teacher in turn.

3.1. The Jewish Teacher’s Classroom. There were 22 children (13 boys; 9 girls) in the grade 5 class. Although the students were sitting at desks clustered in groups, no group work was observed. The teaching approach was fairly traditional and teacher centred. The teacher used whole class settings, showed examples on the blackboard, asked questions, required exercises from a textbook to be completed, and called on students to come out to the blackboard to demonstrate their answers. As the students worked, the teacher walked around the room watching what they did and responding to requests for help. The teacher encouraged girls, but not boys, to help one another.

3.1.1. Student-Teacher Interactions. A summary of the frequencies of student-initiated and teacher-initiated interactions derived from the videotapes of the eight observed lessons is shown in Table 1.

The data in Table 1 reveal that the teacher interacted with boys approximately twice as often as with girls—both student-initiated and teacher-initiated interactions. Even though there were more boys than girls in the class (ratio 1.4 : 1), the interaction rates were still in favour of boys.

Classroom observations revealed that when the teacher asked questions, she often selected a boy even when more girls offered to answer. The teacher frequently accompanied her comments to girls with feminine endearments such as “sweetie,” a behaviour not paralleled with boys.

Clear differences were observed in the quality and focus of the interactions with girls and boys and the covert messages conveyed. The following two scenarios are representative of the differences noted when boys and girls were reprimanded.

Jack and Ron began speaking to each other loudly. The teacher turns to them, “Have you finished working?” She approaches closer, puts her hands on her hips, and says loudly, “So, why are you talking to each other without permission? Ron, please go to the board and answer the question. I spoke to your mother last week and she promised me that you are now focussed on your work. What happened today?”

Ron quickly goes to the board and completes the problem successfully. (Lesson 1)

The teacher says, “What’s going on here? Are you ready to calm down immediately? Who threw Susan’s pencil case?” Jack shouts out “Lyn did it.” The teacher says to Jack “Stop laughing immediately or I’ll send you to the principal’s office to calm down” (she does not do so). She turns to Lyn “And as for you, madam, quickly pick up the things you threw from the pencil case and put them back in. And, it should be clear to you that if your mother does not call me at home tonight, you are not to come into my classroom tomorrow.” (Lesson 5)

As illustrated by these examples, while disciplinary reprimands for boys resulted in cognitive demands and classroom participation, for girls they resulted in punitive actions.

The teacher appeared to hold different expectations for girls’ and boys’ mathematics success that were manifest in her language use. The following illustrates how she spoke to boys.

(To a boy, lesson 3): You understand the work (scowling at him). I believe in you. So, get up and go to the blackboard and solve the exercise.

In contrast, girls were encouraged, rather than expected, to succeed, for example:

(To a girl, lesson 6): Would you like to go to the blackboard and try to solve the problem?

Even when a girl was successful, there were often accompanying comments highlighting her femininity, for example,

(To a girl, lesson 1): Sweetie, you see, you have succeeded!

At interview, the teacher was asked if she spoke differently to girls and boys. She claimed she did not:

No, of course not, how can you say that? If a student gives a good answer, I give positive affirmation without any reference to whether it’s a boy or a girl. The reinforcement is dependent on how good the answer is. Let me explain. If the student answers a simple question, you do not expect me to get all excited in my praise. But if a boy or a girl answers a challenging question that demonstrates original thinking then I provide them with praise in a special way, to encourage them to continue. But this has no connection to whether it’s a boy or a girl. All are equal with me.

Earlier in the interview the teacher had been asked if there were students who had greater difficulty learning mathematics. Her reply seemed to clarify her classroom behaviours. She believed that boys were genetically superior to girls for mathematics and, because they did well, she challenged and advanced them mathematically:

Of course, the girls generally understand the material much more slowly than boys, therefore I have to explain it to them a number of times. But it’s genetic. It’s known from research that the part of the brain that is responsible for spatial perceptions/abilities is less developed in girls. Many times I hear phenomenal insights from boys. They grasp the material so quickly. You (the researcher) were in the class. You saw how wonderfully they compete with each other—who will solve the problem first. And so, I progress them in the material.

Consistent with this view, the teacher reacted differently when girls and boys were stuck, had not completed what was required, or were reluctant to show what they had done. The following transcript segment illustrates how she did not probe or push girls to respond, sometimes leaving them without closure, or turned to boys to provide correct responses.

Rose: (Working from a worksheet) “Not yet, I haven’t finished”.

Teacher: “So, what are you waiting for? We are all waiting for you”. The teacher continues by drawing everyone’s attention to the work on the board. “I am moving to the next stage”. (Lesson 1)

Teacher: “Susan, would you like to come to the board to solve the next exercise”.

Susan: Shrugging her shoulders, “No”.

Teacher: “Jack, come to the board”. (Lesson 2)

With boys, she focused on them completing the mathematical task and was prepared to offer assistance. The teacher’s differential reactions to boys and girls were explained in her answer to a question on how she encouraged students to progress mathematically:

Sometimes I see that a (male) student catches on to a subject quickly and answers brilliantly. So I raise the (cognitive) level of the question and allow the boys to deal with it. They succeed. It’s a challenge for me, you see, what grades they get in class. They only need to be challenged by the material. I have been teaching for many years and the grades they achieve in the Maytzav (national) test are always higher than the girls’. Every time I see anew that maths is simply their domain.

In a follow-up question, she was asked whether the boys getting better grades than girls affected her relationships with the boys. Defensively, she replied:

I relate to all the boys and the girls equally, I do not put up with any favouritism. I give them the same participation time in the classroom.

Everyone does the same exercises. The girls have a problem finding solutions by themselves. All the time they ask each other for help when I give assignments. So I allow them to move seats and this helps their thinking. Discussion always raises levels.

3.1.2. Classroom Materials. The teacher made up examples on the blackboard and asked students to complete exercises from the textbook that reinforced traditional gender stereotypes. The following is an example used on the board:

Olivia and Michelle are seamstresses. Olivia sews 1/3 of a shirt in a day. Michelle sews 2/3 of a shirt in a day. If they sew together, will they succeed in producing only one shirt in a day? (Lesson 2)

The textbook used was published in 2006. For the eight observed lessons, there was a 4:1 ratio in favour of males mentioned in the questions students had to complete or in the illustrations on textbook pages. Women were usually described or illustrated in traditional domestic roles, while men were portrayed as property owners, merchants, and leaders. When a man's profession was mentioned, it invariably required higher education.

When asked about her use of gender stereotyped materials, the teacher said she believed that what she used represented reality and not gender stereotyped. She reiterated her belief in genetic differences:

The materials that I use in lessons such as the book or on the blackboard actually represent reality. What actually are these gender stereotypes that you mention? If there is a word problem about a girl who buys a doll and a boy who buys a plane, doesn't this reflect what children actually do in reality? I do not think it is possible to change things that are genetic. Boys have their characteristics and girls have theirs. If I were to write on the board a word problem about a girl who bought a plane and a boy who bought a doll, the children would laugh, it sounds like a joke. Apart from that, the inspectors check these books and if it were authorized by them to use for teaching, from my point of view it's OK as it is.

In response to a follow-up question, she maintained it would be wrong to omit pages in the textbook as parents might complain. She also claimed confidence in the textbook because it was sanctioned by the Ministry of Education.

3.1.3. Mathematics Achievements. The students' end-of-year test grades were as follows:

$$\begin{aligned} \text{Boys (13): } \bar{x} &= 76.0; \text{ sd} = 7.3, \\ \text{Girls (9): } \bar{x} &= 75.0; \text{ sd} = 22.1. \end{aligned} \quad (1)$$

A Levene's test revealed that the variances (standard deviations) were significantly different, but the *t*-test result

TABLE 2: Frequencies of interactions by student gender in the Druze teacher's classroom.

	Boys (<i>N</i> = 14)	Girls (<i>N</i> = 8)
Student-initiated	25	40
Teacher-initiated	64	90
Questions	31	48
Comments while working	30	41
Discipline-related	3	1

revealed that the mean scores were not ($t = .131$, $df = 9.22$, $P > .05$). These classroom-based results were consistent with the small, nonsignificant gender difference in favour of males in the grade 5 national data in for the Jewish sector in Israel [7]: Boys: $\bar{x} = 73.4$, Girls: $\bar{x} = 71.8$. Interestingly, the teachers' belief in the mathematical superiority of boys did not appear to be supported by her classroom test results.

3.1.4. Summary. There was a higher incidence of teacher interactions with boys than with girls in the Jewish teacher's classroom. More critically, the attention received by the boys was focused on the mathematics and potentially enhancing their mathematical development. The attention received by the girls was less cognitively demanding and often accompanied by gender stereotyped and lower expectations of their performance and behaviour.

A striking dissonance was revealed between what was observed in the classroom and what the teacher claimed was taking place. The teacher's stated beliefs and observed behaviours were clearly gender stereotyped. Yet, she denied that this had consequences on students' achievement. Rather she chose to explain her differential behaviours favouring boys by attribution to sex-based biological differences. Her beliefs were also reflected in her uncritical explanations for gender-biased classroom materials. Her expectation that the boys would excel mathematically over the girls was not supported by classroom test results.

3.2. The Druze Teacher's Classroom. There were 22 students (14 boys; 8 girls) in the Druze teacher's class. The students sat at desks arranged in clusters, but no group work was observed. The lessons were very teacher centred. Students worked quietly and were not allowed to assist each other. No competitive behaviour was observed among the boys.

3.2.1. Student-Teacher Interactions. A summary of the frequencies of student-initiated and teacher-initiated interactions is shown in Table 2.

The data in Table 2 reveal that the teacher interacted with girls far more frequently than with boys, approximately a 3:1 ratio. Considering that there were fewer girls than boys in the class, this ratio underestimates the relative interaction rates; girls were disproportionately favoured. Endearments did not accompany comments addressed to male or female students.

There were very few disciplinary interactions. The teacher was "strict" and did not tolerate students calling out answers. They were expected to raise their hands and

wait to be asked. Yet, there were subtle differences in how she disciplined boys and girls who called out, encouraging girls and reprimanding boys, as illustrated in the following representative examples:

Scowling at Adam, “Do not play with the pencil case. The answer is correct, but (turning to Hannah), we do not call out in this class, do we Hannah!” (Lesson 3)

Jasmine calls out, “It’s an acute-angled triangle.” The teacher responds, “Well done, Jasmine, and if one angle is straight . . .” (Lesson 2)

The Druze teacher clearly conveyed confidence in the girls’ abilities to succeed, often confronting and challenging any insecurity they might exhibit. With boys, she was either neutral or only rewarded and praised their efforts. Often she turned to girls to provide the correct solution to a problem that a boy could not answer correctly. Typical examples include:

Excellent, Jasmine. Why were you frightened to answer? See, you know the material well” (Lesson 2)

“Very good, very good, Joseph. I see that lately you are trying very hard”. Joseph smiles (in embarrassment). (Lesson 6)

“No worries, Harry, it’s OK to make a mistake. We’ll fix it together.”

The teacher approaches Sally and quietly says to her, “Come on, correct what Harry did on the board”.

Sally goes to the board, erases Harry’s answer and writes: “A right-angled triangle.”

Teacher: “Correct, Sally, explain why it’s a right-angled triangle”.

Sally points at the right-angled triangle and provides an explanation. (Lesson 2)

The teacher’s deliberate efforts towards girls stemmed from her personal experiences, consistent with Weiner-Levy’s [18, 19] descriptions for Druze women. When asked if girls and boys differed in their understanding of mathematics, her reply revealed a strong belief in the influence of Druze culture on students’ learning and life outcomes:

There is no difference between them from the biological standpoint. I grew up in a very conservative home. I and my sister had to help in all the housework and I was forbidden to go outside in the afternoon; my brothers were allowed to and they did not have to help with the housework. So when I finished the cleaning and helping my mother and my grandmother—they

were the homemakers—I would sit and spend many hours studying, including maths, so that when I grew I would not need to sit at home like my mother. I wanted to get ahead in life and understood that it was only through studies that I would succeed. I am the first in the household who went out to study and succeeded. Once there were not many female teachers, like today. The teachers were all male. I have attained high status. I am educated and because of that I want to help my female students to understand that their futures will only be achieved through their success in studies.

When asked if she related differently to the girls in her class because of her personal experiences, she replied:

This is not just my life story but it’s true for all the girls in the Druze sector. Only in recent years have girls got out of the house and got into higher education. I know that I relate differently to girls in the classroom not only through words but also through deeds. I have to, it’s my vocation to help them to succeed and expand their horizons so that they will have a good profession when they grow up and they will not be economically dependent on their husbands.

She was then asked specifically if her support aided girls’ success. She expressed little doubt that there was a strong effect on the girls, as well as secondary effects on parents:

Of course, I have no doubt. If you reinforce a student, and always say that she is capable, then she can only succeed. In the tests, I see that girls do very well, even better than boys. The girls invest much (effort) in class and at home. Then their parents see that they are spend time on homework and expect to see high grades; the girls do not disappoint. They do their homework well and get additional support from their parents when they achieve high grades.

Probed further, the teacher highlighted a cultural taboo that barred women from physical contact with boys. While the boys missed out on physical contact associated with positive feedback, support, and encouragement, she was also aware that she reacted more positively with girls:

I also support the boys, but the girls I give even more attention. Also I cannot touch the boys when they provide good answers as it’s not acceptable in our tradition. But the girls, I touch as well as adding a good word and smile. That gives them [girls] strength to continue, and I see the results in their grades. The girls get better grades than the boys, they understand that maths is not difficult, it is within their grasp, and their future is related to the extent of their investment in their studies.

3.2.2. *Classroom Materials*. Classroom observations revealed that the Druze teacher carefully avoided materials portraying gender stereotypes. The textbook used was published in 1996 and was generally devoid of images of people; the teacher avoided all pages with people in them. A focus on abstract mathematical examples, totally lacking human involvement—gender-based or not—was evident. At interview, she confirmed that this was deliberate. Asked if she intentionally omitted pages from the textbook, she replied:

I do not like giving students material without checking it first. Sometimes there are worksheets that I take off the Internet or find in the textbooks where girls are drawn with dresses and handkerchiefs on their heads, and always in the kitchen. I do not want the girls to think this is the only way women should look; today we are a little more modern. Today I am wearing pants, and I do not have my head covered. I decide which textbook pages I give them to do and which I do not. I am not obliged to teach all the pages in the book. In the classroom, I also attempt to present the “new” (modern) woman, so that children from religious homes will be exposed to the model of the new educated Druze woman.

3.2.3. *Mathematics Achievements*. Students’ end-of year class test results were:

$$\begin{aligned} \text{Boys (14): } \bar{x} &= 55.3; \text{ sd} = 5.7, \\ \text{Girls (8): } \bar{x} &= 72.9; \text{ sd} = 3.9. \end{aligned} \quad (2)$$

A Levene’s test revealed that the variances (standard deviations) were significantly different. The t -test result indicated that the girls’ mean score was also significantly higher than the boys’ ($t = -.254$, $df = 19.92$, $P < .05$). This gender difference in favour of girls was consistent with the pattern in the grade 5 national data for the Arab sector in Israel by gender [7]: Boys: $\bar{x} = 65.1$, Girls: $\bar{x} = 72.0$. Interestingly, the gender difference in the classroom test scores appeared considerably higher than for Arab students across Israel. This may simply be an artefact of the small class size. However, the data may be indicative of what can happen when a teacher clearly favours one gender over the other, that is, they provide evidence of the influence a teacher can have (see [28]). Clearly, however, more research on the influence of teachers holding gender-stereotyped beliefs is needed.

3.2.4. *Summary*. The Druze teacher interacted far more frequently with the girls than the boys in her class. When doing so, she offered demonstrative support and encouragement to the girls, instilling them with confidence to a greater degree than she did the boys. Endearments were not used and cultural proscriptions required her to refrain from any physical contact with boys.

Out of an articulated and deep commitment to changing girls and her community, and with relatively newfound support within the wider Druze community (as discussed

earlier), the teacher unashamedly adopted affirmative actions in favour of the girls. Her behaviour stemmed from her own experiences and her generation of female peers. She would not accept the past historical role designated for women in the Druze community, nor would she tolerate limiting her female students’ opportunities by the gender stereotyped expectations of the recent past. Her campaign to promote girls’ interest and performance in mathematics was also manifest in the classroom materials she used; she carefully screened students from gender-stereotyped descriptions and images. The students’ test results reflected her expectations. Not only did the girls outperform the boys, but the difference in the classroom scores seemed more pronounced than found for the Arab sector of education in Israel.

3.3. *Comparing the Classrooms of the Jewish and Druze Teachers*. There were some similarities in the grade 5 classrooms of the two teachers. Both could be described as traditionally teacher-centred classrooms [29], where explanations of mathematical concepts or ideas and examples demonstrated on the board are followed by children being set exercises to complete from a textbook, worksheet, or from the blackboard. Despite the tables being arranged in clusters in both classrooms, neither teacher engaged students in cooperative learning activities. While the Jewish teacher tended to send students to the board to demonstrate their solutions to questions more frequently than the Druze teacher, both used whole class settings to ask questions and select students to respond.

The differences in the two classrooms were marked with respect to gender-related interactions with students, and the teachers’ beliefs and expectations of boys’ and girls’ mathematical capabilities. The Jewish teacher held conventional gender-stereotyped beliefs of male mathematical superiority, claiming that the differences were biologically based. The Druze teacher believed that girls required affirmative action to address the implied biases in favour of males in the Druze culture. While the Jewish teacher claimed she was equitable in her treatment of boys and girls, classroom observations revealed far more interactions with boys, and the language she used clearly implied her higher expectations of males. The Druze teacher openly acknowledged that she favoured girls, while not actively discouraging boys. Classroom observations revealed that she interacted more often with girls and clearly encouraged them while also attempting to build their confidence. The Jewish teacher saw no conflict in adopting gender-biased classroom materials, believing that they reflected the realities of the world. The Druze teacher deliberately avoided using examples that might convey and reinforce male or female stereotypes. The mathematics achievements of the students in the Jewish teacher’s classroom were consistent with Israeli national testing data at the grade 5 level (ie., no gender differences), but were inconsistent with her declared expectation that the boys would outperform the girls. In the Druze classroom, the girls scored higher than the boys, consistent with the teacher’s goals, and possibly to a greater extent than in Israeli national data.

4. Final Words

The findings from the two grade 5 classrooms appear to support earlier research and theoretical perspectives on gender-related issues in the mathematics classroom (e.g., [5, 23, 27]). That is, when boys and girls are treated differently, and teachers hold gender-biased beliefs and expectations, students' mathematics learning outcomes appear to be impacted along gender lines. The Jewish teacher's beliefs and behaviours were consistent with the commonly held stereotype of mathematics as a male domain; she interacted more frequently with boys than with girls and held higher expectations of the boys, believing that their mathematical superiority over girls was genetically determined. The Druze teacher was proactive in challenging this traditional stereotype, believing more generally that for girls to break free of traditional cultural expectations within the Druze community in Israel, they needed to be well-educated, and that mathematics was the golden pass to achieving that. In Israel, mathematics remains a key determinant of future educational opportunities; without successfully completing mathematics in grade 12, it is not possible to pursue tertiary studies.

The strategy of the Druze teacher reported here can be situated within a broader context of Israeli Arab primary school education. In a large quantitative study of the classroom climate of grade 4–6 mathematics classrooms in Arab schools in Israel, Zedan [30] measured *Gender inequality and tension* among one of five factors related to classroom climate. The extent of *Gender inequality and tension* was found to be very low, “refuting the widespread belief of discrimination in favour of boys and suggesting equal teacher treatment for boys and girls” [30, page 81] in these schools. Zedan [30] proposed that “this attitude towards girls in a conservative Arab society is embedded in the fact that girls do not constitute a threat to boys in the job market in professions that require a scientific education” (page 83). As the vast majority of teachers in elementary Arab schools are female, Zedan [30] further claimed that it was “likely that female teachers might treat girls more positively and support them both in their studies and morally” (page 84). Although Druze schools were not focussed on in Zedan's [30] study, the classroom climate findings on *Gender inequality and tension* are consistent with, and support, the attitudes of the Druze teacher in the present study and her behaviours towards the girls in her class.

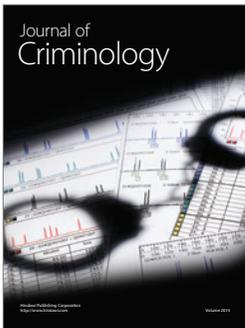
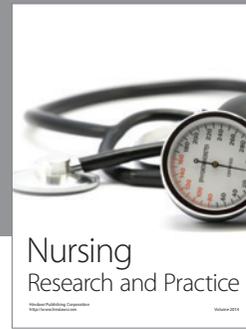
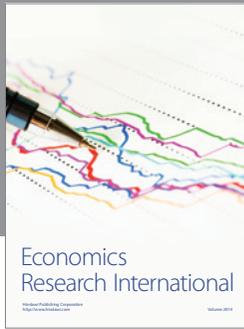
It is recognised that only two grade 5 classrooms were involved in the present study. However, the instrumental case study approach adopted did provide support for the interpretation that teachers' beliefs and behaviours, as well as cultural factors, may be contributing factors influencing students' learning outcomes. On a larger scale, the Israeli data on mathematics achievements presented earlier in the article indicate that gender inequities exist in both sectors of education. Should the Druze teacher reflect contemporary teaching practices in the Druze sector, it would be expected that females' achievements and participation rates in higher level mathematics courses will increase over time. Should the Jewish teacher reflect practices in that sector, no change over time would be anticipated.

It is recommended that further research be conducted on the effects on students of teachers who challenge cultural norms and expectations, as did the Druze teacher. The immediate and longer-term impacts of such practices should also be monitored. Continued scrutiny and identifying ways to challenge and change gender-stereotyped beliefs and classrooms practices such as those exhibited by the Jewish teacher in this study are also warranted. More knowledge in these areas is needed if the cycle of gender stereotyping and culturally biased expectations is to be broken, and for all children to be offered the opportunities to meet their potential.

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