

Is there a ‘Boy Problem’ in Learning STEM Subjects and Pursuing a Related Career? Findings from Q Methodology Research

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Abstract

Through Q methodology, this study aimed to investigate whether a ‘boy problem’ exists among 49 Grade 9 and 10 schoolboys in Qatar’s public schools, particularly in relation to learning science, technology, engineering and mathematics (STEM) subjects and pursuing careers in these fields. The overall objective was to foreground the schoolboys’ own narratives regarding their academic performance and future career aspirations, as well as to uncover how they experience, understand and negotiate their social world both within and beyond the classroom. The analysis yielded four distinct factors, each reflecting a shared but differentiated perspective on STEM learning and future aspirations. These were labelled as follows: (1) There is no big problem, just a lot of little problems; (2) The problem is beyond the power of temptation; (3) The problem is complicated; and (4) Let’s get to the root of the problem. The findings suggest that the ‘boy problem’ cannot be reduced to a single explanatory factor, but rather emerges from the interaction between schooling practices, social expectations and individual perceptions. Accordingly, the discussion focused on three dominant discourses that frame boys’ educational experiences, namely: (1) failing schools, (2) poor boys and (3) boys will be boys.

Keywords: Boy Problem; Q Methodology; Qatar; STEM; Gender Disparities in Education

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هل يواجه الطلاب ما يُعرف بمصطلح «مشكلة الفتیان» في تعلم مواد العلوم والتكنولوجيا والهندسة والرياضيات (STEM) والتوجه نحو المهن ذات الصلة؟ نتائج بحث باستخدام منهجية كيو

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ملخص

باستخدام منهجية كيو (Q methodology)، هدفت هذه الدراسة إلى فحص ما إذا كان 49 طالبًا من طلاب الصفين التاسع والعاشر في المدارس الحكومية في قطر يواجهون ما يُعرف بمصطلح «مشكلة الفتیان»، لا سيما فيما يتعلق بتعلم مواد العلوم والتكنولوجيا والهندسة والرياضيات (STEM) والتوجه نحو المهن ذات الصلة. تمثل الهدف العام في إبراز سرديات الطلبة حول أدائهم الأكاديمي وتطلعاتهم المهنية المستقبلية، فضلًا عن الكشف عن كيفية عيشهم وفهمهم وتفاوضهم مع عالمهم الاجتماعي داخل الصف الدراسي وخارجه. أسفر التحليل عن أربعة عوامل، يعكس كل منها منظورًا متميزًا بشأن رغبة الطلاب في تعلم مجالات STEM والتوجه نحو العمل في مهن مرتبطة بها. وقد سُميت هذه العوامل على النحو الآتي: (1) لا توجد مشكلة كبيرة، بل مجموعة من المشكلات الصغيرة؛ (2) المشكلة تتجاوز محاولات الإقناع؛ (3) المشكلة معقدة؛ و(4) لنصل إلى جذور المشكلة. تشير النتائج إلى أن «مشكلة الفتیان» لا يمكن اختزالها في عامل تفسيري واحد، بل تنشأ من تفاعل الممارسات المدرسية والتوقعات الاجتماعية والتصورات الفردية. وبناء عليه، ركّز النقاش على ثلاثة خطابات مهيمنة توطر تجارب الفتیان التعليمية، وهي: (1) المدارس المُخفّقة، (2) الفتیان الضحايا، و(3) سيظل الفتیان فتیانًا.

الكلمات المفتاحية: مشكلة الفتیان، العلوم والتكنولوجيا والهندسة والرياضيات (STEM)، قطر، منهجية كيو، الفجوات التعليمية بين الجنسين

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Introduction

This study’s title, ‘Is there a “boy problem” in learning STEM subjects and pursuing a related career? Findings from Q methodology research’, requires an explanation. What is a ‘boy problem’ and why would one exist in learning science, technology, engineering and mathematics (STEM) given that ‘men outnumber women in several fields in STEM’ (Stewart-Williams & Halsey, 2021, p. 3)? How is Q methodology helpful in determining whether a ‘boy problem’ exists in learning STEM subjects?

To begin, the notion of the ‘boy problem’ emerged in the United States during the twentieth century, initially referring to immigrant boys who were frequently perceived as troublesome and consequently placed in reform schools (Author). Since then, the concept has evolved to describe a global issue of educational underachievement among male students. (UNESCO, 2022). For Bossavie and Kanninen (2018), in over 100 countries, male enrollment and completion rates in secondary and higher education are lower compared to those of females. Pinkett and Roberts (2019) noted that many schoolboys show a lack of interest in studying, struggle with mental health challenges, exhibit sexist attitudes, and have difficulty expressing their emotions, with disappointing academic results. According to Roberts (2021), recent projections suggest that a boy born in 2016 is 75% less likely to attend university than a girl born in the same year.

If ‘boys are in crisis’ globally, then why do men outnumber women in many STEM fields? An answer can be found in UNICEF’s report (2020): *Mapping Gender Equality in STEM from School to Work* (Alam & Tapia, 2020). The report showed that gender equality in STEM varies significantly between countries based on several factors. To illustrate, in many Western countries, at least as many secondary-level girls as boys achieve minimum proficiency levels in math and science. However, fewer girls than boys achieve similar minimum proficiency levels in most economically disadvantaged countries in Africa and Latin America. Conversely, empirical research shows that, in economically advantaged and non-Western countries, girls are more likely than boys to pursue STEM careers (Sellami et al., 2017). Explaining such disparities should shift the discussion from gender construction to ‘the broader question of what it is to experience being schooled as a boy [and a girl] in the new liberal educational environment’ (Whelen, 2011). Focusing on schoolboys, Epstein et al. (1998) contested the notion that all boys are underachieving academically. Rather, they posed critical questions about the identity of the boys who are struggling, such as: Which boys? At what stage of education? According to what criteria? By addressing these questions, they challenged the traditional discourse on the ‘boy problem,’ arguing that it is overly simplistic and leans more toward ‘quick fixes’ rather than thorough investigation and research. They connected the ‘boy problem’ to negative educational experiences, including insufficient support and negative relationships with teachers.

Consequently, researchers should attempt to understand the schoolboy’s educational and social experiences—that is, their realities. This should include their life satisfaction, attitudes and motivations towards education, levels of anxiety towards schoolwork, career aspirations, and parental and teacher relationship quality. Such investigation should be performed through research methods that respond to what John Law’s (2004) *After Method* sought to achieve in the social sciences: ‘I hope that we [as

researchers] can learn to live in a way that is less dependent on the automatic. To live more in and through slow method, or vulnerable method, or quiet method. Multiple method. Modest method. Uncertain method. Diverse method' (p. 11). Law (2004) called for 'a more generous and inclusive approach to method' in the social sciences—an approach that captures the multiple, vague and ephemeral realities in which we live.

Q methodology responds to Law's call by enabling researchers to access the multiple realities that surround us. Reality, as William James (1842–1910) observed, simply means 'relation to our emotional and active life' (as cited in Seigfried, 1990, p. 191) — in other words, our subjectivity. Subjectivity refers to 'the things that we say—silently to ourselves as in reveries or publicly to others as in conversation—from our own vantage point, and excluding that which is objective' (Brown, 2019, p. 565). In this regard, Q methodology offers both a philosophical and conceptual framework which, together with its technical and analytical procedures, forms a basis for the scientific investigation of subjectivity (Brown, 2019).

To this end, this study employs Q methodology to examine whether a 'boy problem' exists among a group of Grade 9 and 10 schoolboys in Qatar's public schools, particularly in relation to learning STEM subjects and pursuing STEM-related careers. The overall aim is to understand how the social world is experienced and understood by these schoolboys.

In the following, we first review 'the failing boys' debate before we situate the debate in the Qatari context. Next, we introduce Q methodology as our chosen approach for investigation. Finally, we present and discuss the findings and conclude with final thoughts.

The failing boys debate

In recent decades, boys' academic performance has become a significant topic in international educational research and government reports (e.g., Haywood & Ghaill, 2013; World Bank, 2021). This 'moral panic' (Epstein et al., 1998) over boys' underachievement is not a novelty, as it dates to the second half of the 17th century (Cohen, 1998). In the British context, 'the first systematic and public assessment of boys' and girls' performance in 1868 [showed] that girls outperformed boys in reading, spelling, geography and history' (Cohen, 1998, p. 26). Epstein et al. (1998) explained that, historically, teaching methods, texts studied or teachers were to blame if boys were not performing as expected. Conversely, boys' success was 'attributed to their innate brilliance, intellect or natural potential' (Epstein et al., 1998, p. 4). Nevertheless, contemporary research on boys' underachievement provides a plethora of different explanations. The most prevalent ones are highlighted below.

In several educational spaces (mainly Western), boys' underachievement has been seen as a result of an alleged war launched against them by feminists who have shifted the focus from the problems boys are facing in school to issues of equality in girls' schooling (Hoff-Sommers, 2015). Being considered 'the winners of late modernity' (Haywood & Ghaill, 2013), young women's and girls' academic gains are arguably made at the expense of boys. Hoff-Sommers (2015) asserts that 'the recent advances of girls and young women in school, sports, and vocational opportunities are cause for deep satisfaction'

(p. 1). However, she adds the caveat that such satisfaction blinds many 'to the larger and growing cohort of poorly educated young men in our midst, boys who are going to be lost in our knowledge-based economy' (p. 1). Hoff-Sommers further indicates that as the changes to schooling promoted by feminist organisations (e.g. the American Association of University Women) are implemented, schooling has become 'more feelings centred, risk averse, [and] competition-free, and moves further and further from the characteristic sensibilities of boys' (p. 2).

Looking at schooling from a different angle, Drudy et al. (2017) noted a tendency among policymakers and other social commentators to link boys' academic performance issues in schools to the feminisation of the teaching profession, referring to the fact that women comprise a significant majority of the teaching workforce globally (UNESCO, 2011). Although there is no empirical evidence that the feminisation of teaching correlates with boys' underachievement (Drudy et al., 2017), the predominantly female teaching workforce in schools continues to be seen as a possible culprit in whatever educational disadvantages boys are encountering in their schooling (Grant, 2014), especially in the absence of male role models (McGrath et al., 2020).

Others have contended that the most significant issues that boys encounter in schools are not artifacts of feminism or the feminisation of teaching but rather a consequence of inadequate schooling. Both Smith (2003) and Ridge et al. (2017) discussed how assessment, curriculum, teaching methods, teachers and classrooms are often failing schoolboys. According to Martino (2005), the aforementioned educational elements preclude schoolboys from developing the broader set of skills that are required for coping and surviving in a changing world. Discussing the research he conducted in Australian, South African and Canadian contexts, Martino (2005) pointed to 'a lack of focus in many schools on encouraging boys to develop a broader definition of what it means to be male' (p. 1). In particular, schoolboys are frequently discouraged to value expressivity, emotional literacy and nurturing capacities. Furthermore, education programs promoting supposedly 'boy friendly' approaches that involve structured activities and competitive tasks stress a certain stereotypical version of masculinity that fails to account for the diversity that exists among schoolboys as human beings (Martino, 2005).

Other research into schoolboy's underachievement has focused on a range of socioeconomic factors that may or may not contribute to academic success, such as family's and peers' influence, background, ethnicity, class and personality (Haywood & Ghail, 2013). In this regard, calls have been made to examine the 'boy problem' as not simply a matter of gender. Grant (2014) stressed that 'reducing the issue to biological differences between male and female students obscures other significant factors and serves to reinforce peer cultures of masculinity that may ultimately disadvantage boys in schools and society' (p. 2).

To conclude, at the centre of the 'boys are in crisis' global debate are the following questions: Is the school curriculum too girl-friendly? Is the predominantly female teaching workforce disadvantaging boys simply by being women? Are schools failing to balance the competitive focus viewed as fundamental to boys' 'natural' learning style and the emphasis on expressiveness and emotional literacy, which are increasingly seen as essential skills in today's changing world? Are boys struggling academically due to

specific socioeconomic factors? To find answers, it has been argued that there is a need for a critical yet constructive diagnosis of the ‘boy problem’ across different educational contexts (Haywood & Ghail, 2013). We argue that such a diagnosis must focus on the schoolboys’ own narratives.

The boy problem in the Qatari context

In the Qatari context, the ‘boy problem’ discussion began a decade ago. AlMisnad (2012) explored the gender gap in education in Qatar, particularly in higher education. While discussions of gender gaps in most societies often suggest female disadvantage and male dominance, AlMisnad (2012) identified the Qatari context as a place in which this is not the case. She maintained that ‘despite advances in educational attainment, and the more recent quantitative and qualitative improvement to the entire educational system, the Qatari education system has been suffering from a phenomenon that can be called the missing boys’ (p. 3). She observed that approximately 67% of Qatar’s higher education graduates are women, with men being almost absent from post-secondary education, despite 19.6% of the country’s government spending being allocated to education. It has been argued that, since launching Qatar’s educational reform in 2002, the education system has suffered a reverse gender achievement gap that warrants closer examination (Ridge et al., 2017).

Justifying the lower participation rates of Qatari men in secondary and higher education, AlMisnad (2012) claimed that Qatari schoolboys tend to underperform compared to girls and are three times more likely to drop out by the end of their preparatory education level. She suggested that the root of the problem could be schoolboys’ low verbal and reading skills and called on researchers to consider this issue an important area of study. Qatari schoolboys’ performance on international assessments reveals a significant gender gap favouring girls. On the 2016 PISA, boys in Qatar scored lower than girls in mathematics, science and reading, with an average gap of 53 points (Ridge et al., 2017). Additionally, girls scored an average of 20 points higher than boys on Qatar’s National School Certificate (Ridge, 2014). According to Lee (2016), these results reflect how Qatari schoolboys value education less than girls.

It has also been suggested that Qatari men tend to prefer employment in the public sector, which is the largest employer of Qatari nationals. The public sector is viewed as less competitive, more secure, financially comfortable and more prestigious, and it typically does not require a post-secondary degree (AlMisnad, 2012). In specific, as Lee (2016) noticed, the military sector is seen as a high-paying public employer that provides readily available jobs, which do not require young Qatari men to have attained high levels of educational achievement. Consequently, Qatari schoolboys’ lack of motivation towards education is due to the strong pull from the labour market (GSDP, 2012). Still, Ridge (2014) found that Qatari schoolboys had further disregard for education as a result of discouraging school experiences.

Methodology

To investigate whether a ‘boy problem’ exists among a group of Grade 9 and 10 schoolboys in Qatar’s public schools—particularly in relation to learning STEM subjects and pursuing related careers—

this study employs Q methodology (hereafter Q). Størksen et al. (2011) wrote, ‘Q methodology has not been very commonly applied within educational research, but its application within this field seems to be appropriate and increasing’ (p. 810). Q methodology is a research technique developed by William Stephenson, who was an assistant to Charles Spearman, considered a pioneer of factor analysis at the University College of London in 1935. Q methodology’s philosophical and conceptual framework, combined with its technical procedures, enables researchers to uncover subjective (or first-person) viewpoints within a group of individuals (Watts & Stenner, 2012). Q is considered a qualiquantological method (Stenner & Rogers, 2004), involving a quantitative and qualitative dimension. The quantitative aspect of Q involves using factor analytic techniques, while the qualitative aspect is ‘grounded in its ability to emphasize the *how* and *why* people think the way they do’ (Brown, 2004, p. 1).

A Q study involves five main stages (Brown, 1980). The *first* stage involves defining a *concourse*, which refers to ‘the flow of communicability surrounding any given topic’ (Størksen et al., 2011, p. 811) and contains an infinite number of possible opinions that individuals might have toward an issue or topic. The *second* stage requires developing a *Q-sample*, which is a collection of statements (each called a *Q-item*) that captures the complexity of the concourse but is limited in number (Størksen et al., 2011). The *third* stage entails defining the *P-set*, that is, the study’s participants. Størksen et al. (2011) argued, ‘Since Q studies are primarily inductive, the number of participants in the P-set is usually limited compared to quantitative studies’ (p. 811). The central principle in selecting participants for a Q study is their relevance to the topic being investigated (Watts & Stenner, 2012). In the *fourth* stage, the selected participants are instructed to sort the Q-sample items, each written on a separate card, by arranging them on a distribution grid according to their own subjective standpoint (i.e., by doing a sorting activity). The *final* step involves analysing and interpreting the results through specialised software (e.g., PQMethod software). Details of the current study follow.

The Institutional Review Board (IRB) at Qatar University approved this study under the reference number QU-IRB 1808-EA/23. Informed consent was obtained from all students participating in this study. Additionally, consent was obtained from the parents of students under 18, ensuring adherence to ethical standards for minors.

Research design

Stephenson (1986) emphasised both the ‘informational’ and the ‘conversational’ qualities of a concourse. Accordingly, we draw on various sources to develop the study’s concourse. We first conducted item sampling via an extensive review of newspaper articles, policy documents, social media posts and the literature that exists on the issue under investigation. This item sampling established the ‘informational’ aspect of the concourse. Next, we performed two focus group sessions, attempting to establish the ‘conversational’ aspect of the concourse. The first focus group session was with subject experts (i.e., STEM education faculty and schoolteachers), while the second session was with a group of grade 9 and 10 Qatari schoolboys. The questions that we asked in these focus groups can be found in Table 1 below.

Table 1: Focus group session questions

Subject experts focus group (N= 5)	Schoolboys focus group (N=5)
1. What are the main elements of STEM education?	1. Describe your schooling experience.
2. What qualities do schoolboys need for learning STEM subjects and pursuing a related career?	2. Describe your relationship with your STEM teachers.
3. What skills do schoolboys need to develop for learning STEM subjects and pursuing a related career?	3. Describe your participation and engagement in your STEM classes.
4. How can students engage in STEM learning?	4. Describe your experience with STEM curriculum (i.e., textbooks, homework, and assessment).
5. Describe your own experience in teaching STEM for schoolboys.	5. What role does your family play in your education?
6. Is there anything else you would like to mention regarding learning STEM subjects and pursuing a related career among Qatari schoolboys?	6. What role do your friends play in your education?
	7. Describe your extracurricular activities in relation to learning STEM subjects.
	8. Describe your future career plans.
	9. Is there anything else you would like to mention regarding your schooling experience?

The item sampling and the focus group sessions resulted in 91 research statements that were culled to a Q-sample that is ‘small enough for practical purposes and sufficiently diverse to approximate the diversity of the concourse’ (Brown et al., 2019, p. 3). As advised by Lo Bianco (2015), the culling process involved examining each statement independently and removing repetitious and marginal statements. This resulted in 30 research statements that were inductively categorised into three main categories (see Table 2), piloted with two schoolboys to ensure their comprehensibility and to identify unforeseen problems, reformulated with the help of an Arabic proofreader, and labelled with an identifying number to facilitate data recording. At this point, the Q-sample was finalised (see Appendix 1).

Table 2: Q-statement categories

Schoolboys’ personal context	Schoolboys’ educational context	Schoolboys’ social context
Their skills, interests, orientations, motivation, and plans	Curriculum, teaching methods, educational goals, assessment and relationship with teachers	The extent to which society offers schoolboys opportunities to acquire the mindset and skills valued in STEM learning, as well as the influence of parents and peers.
Q-items 1, 2, 3, 4, 6, 8, 9, 10, 11, 13, 14 and 30	Q-items 7, 15, 16, 17, 18, 19, 20, 21, 22 and 24	Q-items 5, 12, 23, 25, 26, 27, 28 and 29

We then contacted Qatar's Ministry of Education and Higher Education for facilitating the recruitment of schoolboys who might be interested in participating in this study. With the help and guidance of the schools' principals and STEM teachers, a group of 49 schoolboys in grades 9 and 10 was recruited and invited to participate in the Q-sorting activities. These schoolboys were provided with explanatory information about the research, a consent form, and a parental consent form, as they were under the age of 18.

Upon receiving signed consent forms, the schoolboys were asked to read the cards on which the Q-statements were printed and pile them into three groups (i.e., I agree, I do not agree, or I am neutral) based on this condition of instruction: *These are a collection of statements that describe some perspectives on and attitudes towards learning STEM subjects and pursuing a related career among Qatari schoolboys. With which statements do you agree, with which do you disagree, and about which do you feel neutral?* Next, the schoolboys were instructed to reread each pile (e.g., the agree pile) and make finer distinctions among the statements by sorting them into an 11-point forced quasi-normal distribution grid (see Figure 1). Upon the completion of the Q-sorting activity, the participating schoolboys were asked to explain their choices for the +5 and -5 rankings. These explanations were then transcribed for further analysis.

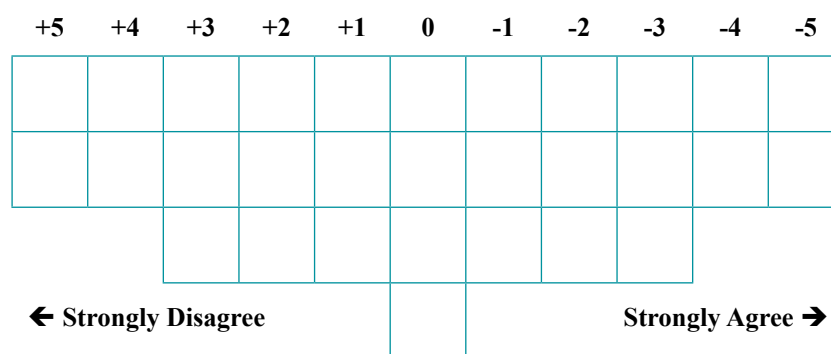


Figure 1: Grid

Next, the Q-sorts (i.e., the ways the schoolboys sorted the Q-items) were analysed using the PQMethod software (Schmolck, 2014). The software enabled factor extraction, provided rotation methods, and offered various statistical measures. After completing the data entry, we calculated the intercorrelations among the Q-sorts, which were then factor-analyzed using centroid factor analysis followed by varimax rotation to capture the maximum amount of opinion variance (Watts & Stenner, 2012). After eliminating factors with insufficient statistical strength, a four-factor solution was selected (i.e., F-1, F-2, F-3 and F-4), explaining 40% of the explained variance, with 47 of the schoolboys loading on one of these factors, while 2 schoolboys were null cases. Brown's equation (1980) was used to calculate the significance of each Q-sort at the $p < 0.01$ level: $2.58 \times (1 \div \sqrt{\text{no. of items in Q-sample}})$. In this study, factor loadings of at least ± 0.47 were considered significant at the $p < 0.01$ level.

Each emerging factor represents a distinct social perspective shared by a group of schoolboys regarding the issue under investigation. Such a shared social perspective was manifested as a factor array, that is, a single Q-sort configuration that represents the perspective of participants who loaded on a specific factor (Watts & Stenner, 2012) (see Figures 2, 3, 4 and 5). Table 3 provides a summary of all

the emerging factors, including the opinion variance and significant loadings, while the Q-sort values for individual items are detailed in Appendix 1.

Table 3: Opinion variance and significant loadings for the emerging factors

Factor	F-1	F-2	F-3	F-4	Null cases	Total
Number of loadings	19 schoolboys	7 schoolboys	11 schoolboys	10 schoolboys	2 schoolboys	49 schoolboys
% Explained variance	14%	9%	10%	7%	-	

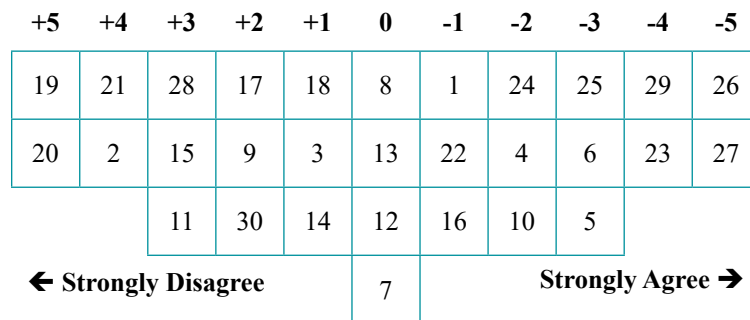


Figure 2: Factor array for F-1

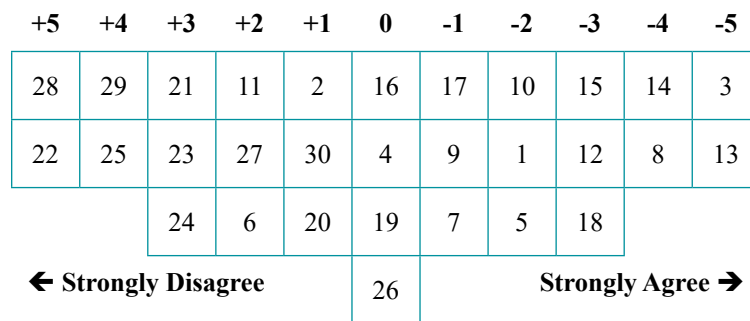


Figure 3: Factor array for F-2

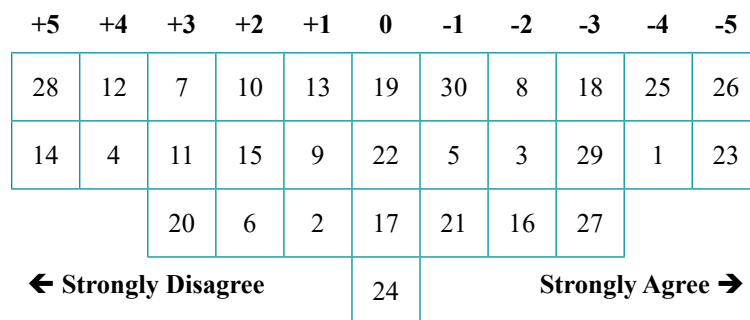


Figure 4: Factor array for F-3

	+5	+4	+3	+2	+1	0	-1	-2	-3	-4	-5
2	21	8	20	3	13	9	14	17	1	16	
4	22	11	6	18	7	10	15	26	5	27	
		25	23	29	12	19	24	28			
					30						
	← Strongly Disagree						Strongly Agree →				

Figure 5: Factor array for F-4

Data analysis

In the following lines, we provide a qualitative discussion of the emerging factors (F-1, F-2, F-3 and F-4), with each representing a distinct yet shared perspective regarding learning STEM subjects and pursuing a related career among a group of schoolboys. This qualitative discussion is structured as follows:

- For each emerging factor, we provide labels that represent the schoolboys' overall sentence (Stenner & Rogers, 2004).
- For each emerging factor, we include the Q-items' factor rankings between brackets. To illustrate, for F-1, (Q-item 20: +5) indicates that Q-item 20 was ranked as most agreed by the merged average of all schoolboys who loaded on this factor.
- For each emerging factor, we include comments made by the schoolboys during the sorting activities to offer a more comprehensive narrative and deeper insight into their perspectives. These comments were translated from Arabic to English and paraphrased.

F-1: There is no big problem, just a lot of little problems

A total of nineteen schoolboys loaded on F-1, representing 14% of the explained opinion variance. These schoolboys clearly see themselves as persistent, hardworking, innovative, and creative (Q-item 2: +4 & Q-item 11: +3). The result of which is that these schoolboys constantly receive high marks on science, mathematics, and technology exams (Q-item 19: +5).

Schoolboys who loaded on this factor have good relationships with their STEM teachers (Q-item 20: +5), who see them as diligent and exemplary students (Q-item 21: +4). Part of the confidence these schoolboys feel regarding learning STEM in school is derived from the fact that they study these subjects in a language that they can easily understand (Q-item 15: +3), and they receive encouragement from their parents (Q-item 28: +3). These schoolboys describe their parents as engaging individuals who encourage their children to ask STEM-related questions and thus drive conversation at home, provide them with opportunities to explore their ever-changing world, and hope that their children will pursue STEM-related careers. Thus, schoolboys loaded on this factor consider enrolling in university in the near future and choosing a scientific major (Q-item 30: +2).

However, what is lacking in these schoolboys cannot be accounted for. Schoolboys who loaded on this factor do not enjoy going to school (Q-item 1: -1). In particular, they do not have a passion for science experiments (Q-item 4: -2) or scientific modelling (Q-item 6: -3). In addition, they seem to be uninterested in participating in scientific competitions (Q-item 5: -3) and extracurricular activities (Q-item 25: -3). Above all, these schoolboys do not have confidence in their ability to explain the steps involved in solving mathematical or scientific problems (Q-item 10: -2). Outside of school, these schoolboys emphatically denied knowing about or engaging with local youth science centres (Q-item 26: -5; Q-item 27: -5). Perhaps, this is because their friends have no interest in learning about science, mathematics or technology (Q-item 23: -4) and social media have failed to spark any interest in scientific or technological inquiry on the part of these schoolboys (Q-item 29: -4). In sum, schoolboys who loaded on this factor can be seen as being burdened by teachers' and parents' encouragement and expectations that they learn STEM majors and pursue a related career despite being ill-equipped to meet these expectations and perhaps uninterested (Q-item 13: 0).

F-2: The problem is beyond the power of temptation

A total of seven schoolboys loaded on F-2, accounting for 9% of the explained opinion variance. For these schoolboys, the four primary agents of socialisation (i.e., family, schools, peers, and social media) are attempting to foster an organic attachment to STEM-related majors and careers. First, their parents are staunch supporters of both learning and pursuing a career in STEM (Q-item 28: +5). Second, their teachers see them as diligent and exemplary students (Q-item 21: +3), engaging them in diverse projects and activities that encourage passion for and curiosity about STEM via utilising the school's interactive and well-equipped laboratory (Q-item 24: +3), as well as providing them with constant and unconditional support (Q-item 22: +5). Perhaps this is what drives these schoolboys to perceive themselves as innovative and creative (Q-item 11: +2), energising them to participate in challenging extra-curricular activities (Q-item 25: +4). Third, the social media influencers these schoolboys follow on TikTok, Instagram and Snapchat empower them to explore science and technology by making it more accessible and fun (Q-item 29: +4). For example, during the COVID-19 pandemic, these schoolboys were able to better understand the biological characteristics of the virus, assess risks and have informed discussions with their friends and family. Finally, their friends have an interest in and passion for studying STEM-related subjects with them (Q-item 23: +3).

Still, something does not feel right for these schoolboys. First, these boys emphatically denied being passionate or curious about learning STEM-related subjects (Q-item 3: -5; Q-item 13: -5). For them, understanding science, mathematics, and technology does not necessarily boost their confidence in their ability to win the race of life (Q-item 14: -4), nor do they see these subjects as important for their lives and society overall (Q-item 12: -3). These schoolboys do not enjoy searching for scientific information (Q-item 8: -4), nor do they have confidence in their ability to explain the steps involved in solving mathematical or scientific problems (Q-item 10: -2). In school, part of the problem is that these schoolboys study science, mathematics, and technology in a language that they cannot easily understand (Q-item 15: -3), and exams are often difficult for them (Q-item 18: -3). Although these schoolboys study STEM-related topics in their mother tongue (i.e., Arabic), there is an emphasis on Modern Standard

Arabic, commonly called Al-fushu, which they do not use in their daily lives, preferring more colloquial language. In addition, the schoolboys complained about the curriculum overload—that is, the excessive amount of content they are expected to learn in a limited amount of time, including many STEM terms, phrases, equations, and acronyms. Perhaps this, among other factors, drives these schoolboys to report that they do not enjoy going to school (Q-item 1: -2).

F-3: The problem is complicated

A total of eleven schoolboys loaded on F-3, accounting for 10% of the explained opinion variance. These schoolboys acknowledge what is *necessary* to do in school in relation to studying STEM subjects. However, they avoid doing what they view as *unnecessary* to achieve in this regard. What is *necessary*, in their view, is being engaged in the classroom (Q-item 7: +3); having a good relationship with teachers (Q-item 20: +3); being innovative and creative (Q-item 11: +3); engaging in science experiments (Q-item 4: +4) and scientific modelling (Q-item 6: +2); and being able to explain the steps involved in solving mathematical or scientific problems (Q-item 10: +2). After all, the parents of these schoolboys strongly encourage them to study STEM-related issues (Q-item 28: +5), which they believe are important for their lives and society overall (Q-item 12: +4). Ultimately, understanding science, mathematics and technology gives these schoolboys confidence (Q-item 14: +5), especially given the fact that these subjects are taught in a language that they can easily understand (Q-item 15: +2).

However, what is *unnecessary*, in these schoolboys' view, is knowing about or engaging with youth science centres after finishing the school day (Q-item 26: -5; Q-item 27: -3); participating in extra-curricular activities (Q-item 25: -4); having friends to study STEM-related subjects with (Q-item 23: -5) or resorting to social media to spark an interest in science, mathematics and technology (Q-item 29: -3). Schoolboys here are uninterested in building a deep understanding of STEM subjects through research (Q-item 8: -2). Strengthening this passive attitude toward any scientific activities outside the school, these schoolboys are consumed by and burdened with difficult STEM exams (Q-item 18: -3) and complicated textbooks (Q-item 16: -2), which makes them fail miserably to enjoy attending school (Q-item 1: -4) and avoid choosing scientific majors for their approaching tertiary education (Q-item 30: -1).

In short, for schoolboys who loaded on this factor, doing what is required in school is not easy, but it is possible. However, doing something beyond what is necessary is complicated, especially given that these schoolboys are not passionate about learning STEM subjects (Q-item 3: -2).

F-4: Let's get to the 'root of the problem'

A total of ten schoolboys loaded on F-4, accounting for 7% of the explained opinion variance. These schoolboys plainly see themselves as persistent, hardworking, innovative and creative individuals (Q-item 2: +5; Q-item 11: +3). Such perceptions are aligned with how their teachers view them, that is, as diligent and exemplary students (Q-item 21: +4). They love performing science experiments (Q-item 4: +5) and engaging in research-based scientific endeavours (Q-item 8: +3) and challenging extra-curricular activities (Q-item 25: +3). They enjoy scientific modelling (Q-item 6: +2) and share this

passion with their friends (Q-item 23: +2). They also have good relationships with their STEM teachers (Q-item 20: +2), to whom they resort for help when faced with difficulties in school (Q-item 22: +4).

However, schoolboys who loaded on this factor struggle considerably with reading their STEM textbooks and find them complicated (Q-item 16: -5). This is mainly because these textbooks are written using a difficult language that these schoolboys cannot easily understand (Q-item 15: -2). In terms of the classroom, these schoolboys complained about how they study STEM subjects (Q-item 17: -3). Such methods are based on ‘expository science’. That is, schoolboys learn scientific facts, concepts and theories, including the relationships between them, through direct instruction on the part of the teacher. Sometimes, their teachers incorporate hands-on experimentation. Still, relative to inquiry-based methods, expository science tilts toward content mastery. Consequently, these schoolboys seldom experience using the school’s laboratory to conduct scientific experiments (Q-item 24: -2), which renders them unprepared and unwilling to participate in the scientific competitions held inside and outside their schools (Q-item 5: -4). Perhaps, this, among other factors, prevents these schoolboys from enjoying school (Q-item 1: -4). Moreover, in contrast to their counterparts who loaded on F-1, F-2 or F-3, schoolboys who loaded on this factor do not receive encouragement from their parents to learn about STEM subjects and pursue a related career (Q-item 28: -3). As a result, they have no curiosity about mathematics, science and technology (Q-item 13: 0); no desire to choose a scientific major upon graduation from high school (Q-item 30: 0) and an obvious lack of knowledge about and engagement with youth science centres (Q-item 27: -5; Q-item 26: -3).

Discussion: The schoolboys’ own story

The following section discusses whether a ‘boy problem’ exists among these schoolboys, centring on the three main discourses that fail boys in education according to Epstein et al. (1998), namely: (1) *failing schools*, (2) *poor boys* and (3) *boys will be boys*. The failing schools discourse holds that the school is responsible for boys’ educational failures, while the poor boys perspective positions them as the victims, blaming ‘female [teachers] for boys’ apparent underperformance’ (Francis, 2000, p. 10). The boys will be boys discourse perceives underachievement as a matter of ‘boyiness’.

Failing schools

The ‘I enjoy going to school’ statement received a reverse consensus (or a consensus against) by all emerging factors (Q-item 1: -1, -2, -4, -4). The question then becomes: in what ways does the school fail these boys? Among educators, policymakers and researchers, school failure is often simplistically understood based on its low performance and exclusively defined by its students’ poor exam results. Nevertheless, precious little has been written about what a failing school means for schoolboys and how educators and policymakers can respond to such perceived failure.

Based on the results of this study, a failing school is a place where schoolboys cannot read their textbooks easily (Q-item 16: -1, 0, -2, -5) nor study in a language they can *all* easily understand (Q-item 15: +3, -3, +2, -2). A failing school is where *some* students complain about difficult exams (Q-item 18: +1, -3, -3, +1) and *most* of them do not receive satisfactory marks (Q-item 19: +5, 0, 0, -1). Most of the

time, joy is not invited into the classroom in a failing school (Q-item 17: +2, -1, 0, -3), depriving *most* schoolboys of meaningful interaction and involvement (Q-item 7: 0, -1, +3, 0) that could otherwise cultivate a genuine passion for science, mathematics and technology (Q-item 3: +1, -5, -2, +1) and leads to a loss of curiosity (Q-item 13: 0, -5, +1, 0). At a failing school, peer learning is not always the norm (Q-item 23: -4, +3, -5, +2), facilities are not effectively utilised (Q-item 24: -2, +3, 0, -2) and bridges with other educational organisations are broken (or perhaps burned) (Q-item 26: -5, 0, -5, -3 & Q-item 27: -5, +2, -3, -5), leading to what John Dewey (1900) referred to as a 'waste in education'.

In short, the main explanation for the dissatisfaction that schoolboys feel towards their schools in this study is the curricula and assessments. Schools can be a daunting place when they choose to teach the curriculum, not the students. Schools, in Qatar and perhaps elsewhere, often prioritize teaching packaged curricula over creating learning experiences that are specifically tailored to meet the diverse needs of students in the classroom. In such cases, it is not surprising that schoolboys grow frustrated and anxious.

According to UNESCO (2020), there is a growing emphasis on the need for curriculum change that reflects the seven macro-competences in STEM education. These are 'lifelong learning, self-agency, using diverse tools and resources, interacting with others, interacting with the world, trans-disciplinarity, and multi-literacies' (p. 6). The related advice to policymakers, therefore, must emphasise the need for curriculum change and educational policies that enforce literacy interventions, hands-on learning approaches and effective assessment. Above all, there is a need to implement data management systems and supplementary intervention programs that identify boys at risk and help put them on a path to success.

The related advice to STEM teachers should emphasise the use of substantive knowledge and disciplinary knowledge in meaningful settings. Substantive knowledge requires activating schoolboys' prior knowledge to make sense of a particular scientific content, while disciplinary knowledge necessitates that schoolboys know *how to*, as opposed to *know what*.

Poor boys

In the Western context, which enforces mixed-gender education (or co-education), schoolboys' underperformance is argued to be the result of 'woman peril'. Specifically, 'the fear that there were too many women teachers and that they were creating a feminised environment in the schools in which boys could not prosper' (Drudy et al., 2017, p. 24). In such situations, as previously discussed, the central concern has been that a lack of 'male role models' (Eurydice, 2018) negatively impacts schoolboys' performance and overall wellbeing (McGrath et al., 2020). Additionally, schoolboys' underperformance in the Western context is associated with the 'lads' culture heavily presented by the media (Haywood & Ghaill, 2013). Being a 'lad' means being a 'cool' person who is not necessarily doing well in school but rather smoking, drinking and using drugs. It has been argued that 'lad' culture emerged as the result of boys exploring their modern masculinity, while 'hav[ing] lost control of their lives because of attacks by assertive women, particularly feminists' (Epstein et al., 1998, p. 6). However, in the Qatari context, as well as in other conservative non-Western contexts that adopt single-sex education, there is a different story, yet with similar results.

To varying degrees, Q-item 20, which articulates that the schoolboys who participated in this study have a good relationship with their teachers, received positive scores in all emerging factors (+5, +1, +3, +2). The teachers also seemed to have positive opinions about *most* of these schoolboys (Q-item 21: +4, +3, -1, +4). One can argue that these teachers provide the needed ‘male role models’ for their students. However, reality is complicated. Statistics show that Qatari male teachers represent 2.5% of the total Qatari teachers working in elementary schools and less than 1% of the teaching workforce in Qatar (Qatari and non-Qatari teachers) (MOEHE, 2020). In Qatar, there is a low number of Qatari male teachers, as the teaching profession is viewed as an unattractive career option (Author; Macleod & Abou-El-Kheir, 2017). Although Qatari schoolboys are exposed to male teachers, these teachers come from different nationalities and with various cultures, worldviews, and dialects (Author). While it is important that schoolboys encounter role models who come from different backgrounds than their own, it is also important that they are inspired by someone just like *them* (Author). Additionally, it has been argued that Qatari young men and boys find their calling in military careers, which are seen as masculine, prestigious, and attainable; that is, they require less academic effort and a lower high school GPA (Author). In short, schoolboys in Qatar are intensively exposed to a prevalent military masculine culture, which is amplified by the absence of ‘cultural male role models’ in schools.

Boys will be boys

One of the findings that we found perplexing was that the schoolboys who participated in this study unanimously gave positive scores to Q-item 2 (+4, +1, +1, +5) and Q-item 11 (+3, +2, +3, +3), both of which articulate the self-perception of being persistent, hardworking, innovative and creative. In addition to discussing the matter with the schoolboys, we consulted with their teachers and with academics and researchers to better understand why the schoolboys perceived themselves in this way, considering that, in some cases, their STEM teachers insisted otherwise.

Our simple explanation agrees with Reilly et al.’s (2022) argument that men tend to overestimate their own intelligence and qualities. Our more complex explanation is that the schoolboys experience ‘cognitive dissonance’. The term cognitive dissonance was proposed by Festinger (1957) in the mid-twentieth century and has become an influential concept in social psychology, from which ‘much has been learned about the determinants of attitudes and beliefs [and] the internalization of values’ (Harmon-Jones & Mills, 2019, p. 3). Cognitive dissonance occurs when an individual holds two related, but contradictory, thoughts. To illustrate, a schoolboy who perceives himself as persistent, hardworking, innovative and creative might aspire for higher goals, such as attending university; this is consonance. If that same schoolboy has no desire to attend university to study a major consistent with his self-perception of being persistent, hardworking, innovative and creative, then his thoughts contradict each other; this is dissonance. Although the schoolboys who participated in this study indicated their belief that they were hardworking, creative, innovative and persistent, the statement ‘I aspire to enrol in university soon and to choose a scientific major’ received either reluctant scores, uncertain scores, or negative scores (Q-item 30: +2, +1, -1, 0). It should be noted that it is not the idea of enrolling in a scientific major per se that was rejected by most of these schoolboys, but rather the idea of enrolling in university.

According to Harmon-Jones and Mills (2019), dissonance between two contradictory thoughts—or between thoughts and behaviours—creates discomfort. To deal with such discomfort, Festinger (1957) proposed that individuals would take steps to try to resolve the inconsistency by either changing their behaviour or by changing their beliefs so that they are consistent. Festinger (1957) also observed that individuals may engage a defense mechanism, such as *avoidance*, which involves ignoring the dissonance, and thus continue holding the contradictory thoughts. This last concept resonates more with the 'boy problem' literature; Epstein et al. (1998) argued that schoolboys do not see a problem with achievement, but working to achieve is something they often do not do. Similarly, Roberts (2021) argued that boys fell behind girls globally because they lack resilience, avoid challenging tasks, and are more likely to overestimate their ability, while putting in less effort.

Conclusion

We conclude this study by arguing that the 'boy problem' in Qatar and elsewhere is not simply a reflection of issues in local schooling. Rather, the problem is often indicative of broader social, cultural and economic issues. In the Qatari context, these issues have little to do with the influence of feminists, the feminisation of teaching or specific socioeconomic factors, such as race, class or ethnicity, especially that the Qatari population are said to be homogeneous most of its history. The challenges that schoolboys face in Qatar are different and unique.

Qatari schoolboys are not failing in school. Rather, they are simply failing to recognise the benefits of education. In particular, they do not recognise the advantages of learning STEM subjects and pursuing a related career for themselves and their society. Their schools are unable to effectively bridge the divide between these schoolboys and education; instead, they are widening the gap by adopting a 'one-size-fits-all' educational model that negatively influences schoolboys' motivation (Ridge et al., 2017). Society also seems to enable these young men to 'chill out,' as they will always manage to obtain relatively high-paying jobs that do not require equivalent levels of education (Author), plaguing them with an 'aspirations failure' (Ray, 2006). Consequently, in the absence of effective and thorough policies and initiatives to address the aforementioned issues, the 'boys in crisis' debate will continue for some time in Qatar.

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Appendix 1: Q-sort values for items

Q-item	F-1	F-2	F-3	F-4
1. I enjoy going to school.	-1	-2	-4	-4
2. I am persistent and hardworking.	+4	+1	+1	+5
3. I am passionate about learning science, mathematics, and technology.	+1	-5	-2	+1
4. I like to do science experiments.	-2	0	+4	+5
5. I participate in scientific competitions that are held inside and outside my school.	-3	-2	-1	-4
6. I like scientific modelling, which allows me to communicate my ideas, understand processes and make predictions.	-3	+2	+2	+2
7. In the classroom, I always ask questions and engage in finding answers.	0	-1	+3	0
8. I like searching for mathematical and scientific information.	0	-4	-2	+3
9. I am good at solving mathematical problems and calculations.	+2	-1	+1	-1
10. I am good at explaining the steps of solving mathematical or scientific problems.	-2	-2	+2	-1
11. I am innovative and creative.	+3	+2	+3	+3
12. Science, mathematics and technology are important to my life and my community.	0	-3	+4	0
13. I have curiosity towards learning mathematics, science and technology.	0	-5	+1	0
14. Understanding science, mathematics and technology gives me confidence in myself and my abilities.	+1	-4	+5	-2
15. I study science, mathematics and technology in a language that I can easily understand.	+3	-3	+2	-2
16. I can read science, mathematics and technology textbooks, and I don't find them complicated.	-1	0	-2	-5
17. I enjoy science, mathematics and technology classes. They are fun and include a lot of activities.	+2	-1	0	-3
18. Science, mathematics and technology exams are often easy for me.	+1	-3	-3	+1
19. I get high marks on science, mathematics and technology exams.	+5	0	0	-1
20. I have a good relationship with my teachers of mathematics, science and technology.	+5	+1	+3	+2
21. The teachers see me as a diligent and exemplary student.	+4	3	-1	+4
22. I resort to asking teachers for help when I am having difficulty with any subject in school.	-1	+5	0	+4
23. My friends love to study science, mathematics, and technology with me.	-4	+3	-5	+2

Q-item	F-1	F-2	F-3	F-4
24. In my school, there is a large laboratory for conducting scientific experiments. I enjoy going there.	-2	+3	0	-2
25. I like participating in challenging extra-curricular activities.	-3	+4	-4	+3
26. I often visit scientific centres after finishing the school day, such as centres for teaching mathematics or technology.	-5	0	-5	-3
27. I know places such as the Qatari Scientific Club and Qatar University's Center for Young Scientists.	-5	+2	-3	-5
28. My parents encourage me to study science, mathematics and technology.	+3	+5	+5	-3
29. Social media arouses my interest in science, mathematics and technology.	-4	+4	-3	+1
30. I aspire to enrol in university soon and to choose a scientific major such as chemistry, physics, biology, computer science, mathematics or engineering.	+2	+1	-1	0

Final declarations:

- The author/s declare that they got the required voluntary human participants' consent to participate in the study as well as the necessary institutional approvals.
- The datasets generated and/or analyzed during the current study are available from the corresponding author upon reasonable request.
- The author is the Editor-in-Chief of the Journal of Educational Sciences, Qatar University as of this issue. The author was not involved in the editorial handling or peer-review of this manuscript, as the appointment took effect with this issue, which is the first issue published under their editorship.

تصريحات ختامية:

- يصرح المؤلف/ المؤلفون بالحصول على موافقة الأشخاص المتطوعين للمشاركة في الدراسة وعلى الموافقات المؤسسية اللازمة.
- تتوفر البيانات الناتجة و/ أو المحللة المتصلة بهذه الدراسة من المؤلف المراسل عند الطلب.
- يتولى الباحث الأول في هذا البحث منصب رئيس تحرير مجلة العلوم التربوية بجامعة قطر اعتباراً من هذا العدد. لكنه لم يشارك في عملية تحرير هذه المخطوطة أو تحكيمها أو مراجعة الأقران بشأنها؛ حيث بدأ تعيينه مع هذا العدد، وهو أول عدد يُنشر تحت إشرافه.