Article

High School Students' Perceptions of the Role of Social Support in Cultivating Their Interests in and Aspirations to STEM Degrees and Careers—A Middle Eastern Case Study

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Abstract: This case study intends to comprehend students' perceptions of social support in cultivating their interests and aspirations for science, mathematics, engineering, and technology (STEM) degrees and careers. Survey-based quantitative research was employed, incorporating data from 1426 high school (grade 11th–12th) students in Qatar. The survey instrument encompassed four dimensions, i.e., (1) participants' demographics, (2) STEM interests, (3) STEM supports/barriers and (4) STEM career aspirations to understand students' perceptions. Spearman's Rho correlation test demonstrated a positive correlation between students' perceived social support (from family, teachers, and society) and their STEM interests ($p < 0.01$). Findings from the Mann-Whitney U test illustrated that females perceived enhanced social support (from teachers and society) in Qatar ($p < 0.05$). Even though teachers and society have been the stimulus to developing students' STEM interests, there is still room to implement a policy for the consequential influence in constructing students' STEM career aspirations. Thus, we believe these findings would urge policymakers to design tools that enable teachers and society to nurture, cultivate and sustain interest in STEM among the youth to meet Qatar's National Vision 2030.

Keywords: social supports; society; STEM interests; STEM educational and careers aspirations

1. Introduction

Science, mathematics, engineering, and technology (STEM) education have been identified as crucial catalysts for fostering key critical thinking skills for tackling the world's economic, environmental, health, social, and many other problems today [1,2]. Prominent among these are the skills of problem-solving, logical thinking, deduction, interpretation, reasoning, and self-introspection skills [3]. These skills are achievable by teaching STEM from a multidimensional and interdisciplinary perspective that can make STEM subjects more relevant to teachers and students, ensuring sustainable education in STEM [1,2]. Despite the great demand for qualified individuals with adequate STEM skills and knowledge, there has been a substantial decline in the number of students interested in STEM majors and careers [4]. Thus, many developed countries across the globe have raised concerns over the paucity of STEM-literate people, urging educators, educational institutions, researchers, and others to address this leaky STEM pipeline [5]. A systematic review by Kayan-Fadelmula et al., 2022 based on the research articles of Gulf Cooperation Council (GCC) states, has showcased the scarcity of STEM professionals in Qatar based on the indicators of enrollment in STEM-based education and careers [5].

Since around the late 20th century, Gulf Cooperation Council (GCC) countries have channeled significant investments in education reforms, making the education sector topping the list of policy agendas as a fundamental pillar of the country's socio-economic prosperity [6]. Qatar, for example, has taken bold steps to transition to a knowledge-based economy, thereby intensifying the need to build a highly skilled national capacity

capable of addressing modern society's challenges. Qatar has invested in information, communication & technology (ICT), education, innovation, and entrepreneurship. Despite successive educational reforms emphasizing the need to enhance student recruitment, persistence, and retention in STEM study programs, the scarcity of STEM professionals is in evidence [6,7].

The primary rationale behind this study is that Qatar's Ministry of Development Planning and Statistics report indicates that students graduating with a university degree in non-STEM disciplines in 2020–2021 outnumbered those graduating with STEM degrees [8]. Since this discrepancy in STEM and non-STEM graduates can have serious ramifications for the country's economic development, it is imperative to identify and comprehend the factors affecting STEM interests and career aspirations among the youth. The present study sought to explore whether different social support factors impact high school students' interests and career aspirations in STEM in Qatar and, by extension, other countries in the GCC and the broader Arab region. Because high school is a critical stage for nurturing STEM career interests [9], we drew on existing literature to design our survey of high school students' perceptions of the role of social support in promoting their STEM interests and career aspirations. Therefore, the paper's primary objective is to explore the high school students' perceptions of social support (from their families, teachers, and society) for cultivating their STEM interests. Also, to observe if there exists any relationship between students' perceived support from family, teachers, and society and their likelihood of choosing STEM careers. Conclusively, this article aims to enhance STEM literacy by comprehending the impact of social support, considering the intersection of STEM education and sustainable education.

1.1. Review of Literature and Conceptual Framework

STEM-related learning and career orientation implicate a complex phenomenon that involves myriad underlying influences, such as personal (age, gender, grade, nationality, etc.), motivational (self-efficacy, performance, interests, confidence, expectation, etc.), and environmental (school-related factors such as teachers' support, pedagogical approach, support from parents/peers/society, etc.) [10]. Previous literature reveals that support from the family, peers, teachers, and society plays a pivotal role in shaping students' STEM interests and STEM career trajectories [11,12]. The overall impact of parents, peers, teachers, and school-related factors has been found to enhance students' academic outcomes [13,14] and, specifically, affect their achievement in math and science [15,16]. Support and encouragement from the family are depicted as significant moderators affecting children's science interests, especially regarding the interactions between parents and their children [17,18].

Similarly, support from teachers is another crucial determinant of STEM interests and aspirations among young adolescents. Support and guidance from teachers are regarded as critical factors that promote students' STEM learning and STEM interests. Many studies have shown the potential influence teachers can have in shaping students' STEM interests [19,20]. The quality of the teacher is reported to be strongly correlated to the student's achievement [21,22], which is measured by students' outlook toward teacher-adopted instructional practices [23,24], and teacher-mediated encouragement [25]. Likewise, support from society and its impact on cultivating STEM interests and aspirations of students is an area that remains largely underexplored. Indeed, the Middle East is a region where social norms and cultural values affect various aspects of education and career choices. In this study, we intended to comprehend societal support in molding students' attitudes and aspirations in Qatar [26–29].

Insights into high school students' perceptions of social support in the context of Qatar are somewhat limited, calling for close attention to this area. Therefore, the current study sought to fill this gap in the literature by conducting a quantitative survey of STEM-related interests and career aspirations -based on the views and opinions of public and private high school students in Qatar. The STEM interest has been described in this article via the variables of performance and confidence in STEM. The conceptual model of this

study is based on the previous literature that intended to illustrate the impact of social support on secondary students' STEM interests and career aspirations [8,11–13]. Based on the aforementioned literature, the perception of students' STEM interests and careers has been studied by investigating the dimensions of (1) participants' demographics, (2) STEM interests, (3) STEM supports/barriers, and (4) STEM career aspirations.

1.2. Theoretical Framework

Most of the studies exploring the influence of social support on students' STEM interests and aspirations have drawn on the Social Cognitive Career Theory (SCCT; Lent et al., 1994, 2000) [30,31] and Eccles' Expectancy Value Theory (EVT; Eccles et al., 1983) [32]. SCCT ascribes career aspirations to an assortment of factors, including individual (personal factors), environmental (social factors), and motivational factors (behavioral factors). Using SCCT as a theoretical model, this study hypothesizes that social agents such as parents, teachers, and society tend to influence students' STEM interests and career aspirations [14]. The second model, Eccles' Expectancy Value Model, postulates that parents' beliefs affect children's motivation and performance [33]. Aligned with the goals of our study, both the SCCT and the EVT provided a framework guiding this study's research questions.

RQ 1: Do high school students perceive their families, teachers, and society as support or a barrier to cultivating their STEM interests?
RQ 2: What is the correlation between students' perceived support from family, teachers, and society and their interest in STEM (if any)?
RQ 3: How do students' perceived support from family, teachers, and society influence their likelihood of choosing STEM careers?

2. Materials and Methods

This study adopted a quantitative research approach to investigate the likely influence of social support in fostering high school students' interests in and aspirations for STEM degrees and, eventually, a career in STEM fields. Data was collected via a survey instrument to gain insights into the STEM interests, STEM-related supports and/or barriers, and career aspirations of 11th and 12th-grade students in Qatar. Wherein the survey instrument encompassed four dimensions, i.e., (1) participants' demographics, (2) STEM interests, (3) STEM supports/barriers, and (4) STEM career aspirations. The study specifically sought to explore the role of social support, especially from family, teachers, and other members of society, in shaping high school students' STEM interests and career aspirations, as perceived by high school students in the context of Qatar.

2.1. Study Participants

The inclusion criteria of the survey participants involved the high school students of grades 11th and 12th of government and private schools in Qatar. Participants opting for STEM and non-STEM subjects in their higher secondary were included, which was further sorted according to the scope of the study. A high representativeness of the sample has been assured by including data from schools of all major cities in Qatar. Upon obtaining approval from the Qatar University Institutional Review Board (QU-IRB), school board superintendents and teachers were first contacted to make the necessary arrangements regarding the survey administration. Official letters requesting access to their respective schools for the researchers to gather students' data in their schools. A total of 1426 high school students from Qatar participated in the study. Figure 1 demonstrates the percentage of students in government and private schools crossed per grade, gender, and nationality. It is also evident that a wide disparity in nationality has been observed due to expatriates accounting for 85% of Qatar's population (Figure 1). Given the exploratory nature of the current study, a non-probability uncontrolled convenient sampling method was employed. The sampling process was completed when the sample and/or time saturation were attained. Table 1 shows the demographic distribution of students who participated in the survey by gender, nationality, type of school, and parental profession.
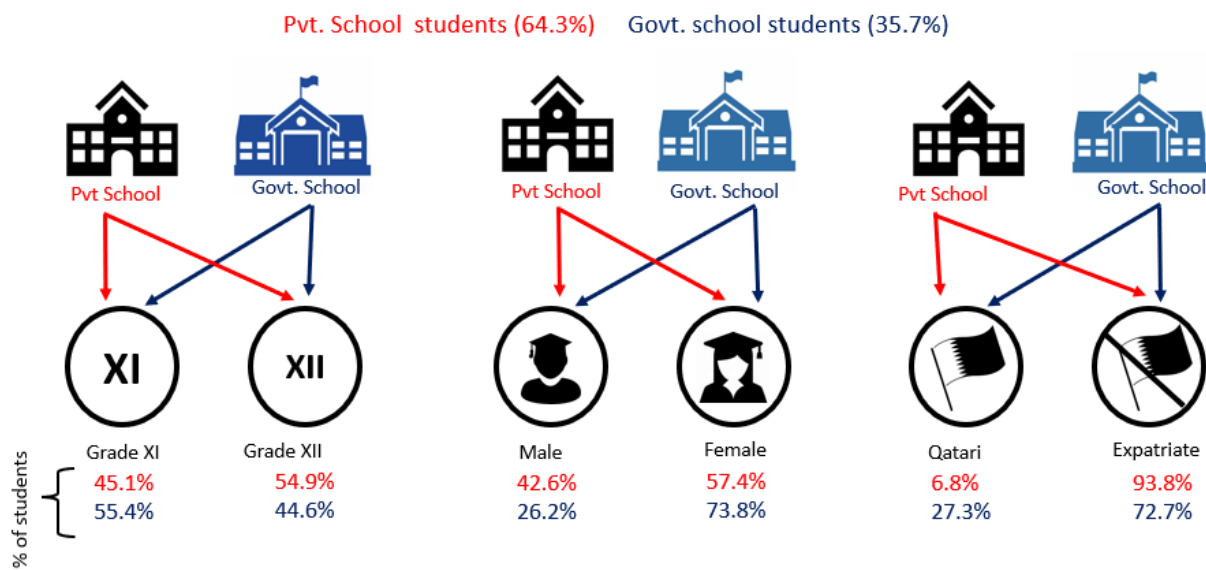
Figure 1. Percentage of student responses from government and private schools (crossed as per grade, gender, and nationality).

Table 1. Demographics of the participants (by number).

Type of School	Grade	Gender	Nationality	Number
Govt. school (n = 509)	11th (n = 281)	Male (n = 119)	Qatari	12
			Expatriate	106
		Female (n = 161)	Qatari	70
			Expatriate	88
	12th (n = 226)	Male (n = 58)	Qatari	8
			Expatriate	50
		Female (n = 168)	Qatari	47
			Expatriate	120
Pvt. school (n = 917)	11th (n = 413)	Male (n = 155)	Qatari	14
			Expatriate	141
		Female (n = 257)	Qatari	12
			Expatriate	245
	12th (n = 503)	Male (n = 235)	Qatari	18
			Expatriate	215
		Female (n = 268)	Qatari	13
			Expatriate	255

2.2. Survey Procedure

The survey was carried out in three phases: (1) survey formulation, (2) survey piloting, and (3) survey implementation. In the first phase of survey formulation, the researchers designed and developed the survey questions based on the existing literature [34,35] and aligned with Kier et al. (2014) framework on the STEM career interest survey [36]. The survey included a total of 24 items with response options provided in a 5-point Likert scale format under four dimensions: (1) demographics, (2) STEM interests, (3) STEM supports/barriers, and (4) STEM career aspirations (Figure S1).

Questions on students' demographics included their gender, age, nationality, school, grade, subjects (STEM/Non-STEM), parents' educational qualifications, and careers

(Figure S1). Questions based on STEM interests and STEM supports/barriers were of the 5-point Likert scale type, with a range −2 to +2 coded as follows: −2 = "Strongly Disagree", −1 = "Agree", 0 = "Undecided", 1 = "Agree", and 2 = "Strongly Disagree". The variables used to define STEM interest were performance, ability, and confidence in STEM. Similarly, under the STEM supports/barriers category, the variables investigated were the support from parents, society, and teachers. The questions about STEM career aspirations were nearly open-ended (Figure S1). Students' responses were analyzed as 1 = "STEM career" and 2 = "non-STEM career" aspirations. The students' responses were coded per the International Standard Classification of Occupations (ISCO-88). Binary coding (1 and 0) was applied for questions related to students' gender (male, female), nationality (Qatari, Non-Qatari), majors (STEM, Non-STEM), the parent's profession (STEM, Non-STEM), Grades (11, 12), etc.

The second phase involved piloting the survey, where the questions were tested with two focus groups, one in Arabic and the other in English. The focus group discussions assisted us in addressing concerns related to the wording of questions. Feedback from the focus groups helped alert the researchers to certain areas that needed revising, including the wording of some questions for clarity.

In the third phase of the survey implementation, the questionnaires were distributed to students. Before administering the survey, the relevant signed consent forms were collected from the students, teachers, and school authorities. Students took nearly 15 to 30 min to complete the survey. They responded in either English or Arabic, considering that students were enrolled in schools where the medium of instruction is either Arabic (public schools) or English (private schools), respectively. Responses in Arabic were later translated into English to facilitate hassle-free analysis.

2.3. Data Analysis

Data were analyzed using the Statistical Package for the Social Sciences (SPSS) statistics software 29.0.0.0 (241). Firstly, reliability and validity have been established. Factor analysis (confirmatory factor analysis (CFA) and exploratory factor analysis (EFA)) has been measured to comprehend the data reliability, item quality, and construct validity. The general steps of factor analysis involved: assessing the suitability of the data, extracting the constructs, employing specific criteria to determine which factors should be removed, using a rotational method, and interpreting the results. EFA aids in building a structural model with items contributing to the constructs.

In contrast, CFA computes if the measures of a construct are coherent with a researcher's understanding of that construct. For EFA, Kaiser Meyer Olkin's value and Bartlett's test of sphericity were computed. Likewise, CFA was calculated, considering the Root mean square of approximation (RMSEA), standardized root mean square of residual (SRMR), and Tucker Lewis index (TLI). The survey model was then assessed for reliability. Indicator reliability has been calculated to examine how much of each indicator's variance is justified by its construct. Cronbach's Alpha and MacDonald's omega reliability tests were assessed for internal consistency reliability. The construct validity, i.e., the convergent and discriminant validity of each construct, has been computed to understand the convergence and discrimination of the constructs for comprehending the variance of its indicators. The construct's convergent validity is computed by the average variance extracted (AVE) for all indicators on each construct. Wherein the AVE is the mean value of the squared loadings of the indicators linked with the constructs. Discriminant validity was measured by the heterotrait–monotrait ratio (HTMT) of correlations. HTMT assesses the mean value of the indicator correlations across constructs relative to the mean of the average correlations for the indicators measuring the same construct.

Descriptive statistics and other relevant statistical tests (non-parametric) were computed for the overall analysis of the data based on the data evaluations according to the paper's scope [34]. To address the first research question, descriptive statistics involving mean, standard deviation, and frequencies were calculated. This was employed to com-

prehend the percentage agreement and disagreement of students 'perception of support from the family, teachers, and society, followed by the Mann-Whitney test to investigate the divergences in male and female students' perceptions of support from the family, society, and teachers. Social support was utilized as the dependent variable, and gender was the independent variable. For the second research question, Spearman's Rho correlation test was employed to understand the relationship between social support (from the family, teachers, and society) and students' interests in science, mathematics, engineering, and technology. Finally, bivariate logistic regression was performed to comprehend how students' perceived social support is correlated with their likelihood to pursue STEM careers (addressing the third research question).

3. Results

3.1. Validation of the Instruments

EFA and CFA were measured to comprehend the data reliability, item quality, and construct validity. For EFA, Kaiser Meyer Olkin's value of 0.934 and Bartlett's test of sphericity ($p < 0.05$) were computed (acceptable). Likewise, CFA was calculated, and all the values were within the thresholds (i.e., RMSEA = 0.07, SRMR = 0.02, TLI = 0.91. The loading values ranged from 0.71 to 0.75 (acceptable). Indicator loadings of above 0.708 (acceptable value) have been computed. For internal consistency, Cronbach's Alpha and MacDonald's Omega values for each survey construct have been calculated and illustrated in Table 2. The Alpha and Omega values typically range from 0 to 1, with acceptable values greater than 0.7. The values above 0.70 are regarded as reliable, and above 0.8 as highly reliable. The reliability test revealed that all the questions used in analyzing this study's data were reliable.

Table 2. Internal reliability test (Cronbach's Alpha and MacDonald's Omega).

Survey Parts	Constructs	No. of Items	Cronbach's Alpha	MacDonald's Omega	Reliability
Part II	Interest in science	5	0.781	0.799	Reliable
	Interest in mathematics	5	0.721	0.730	Reliable
	Interest in engineering & technology	5	0.844	0.856	Highly reliable
Part III	Role of society	4	0.876	0.892	Highly reliable
	Role of family	3	0.674	0.702	Reliable
	Role of teachers	9	0.971	0.945	Highly reliable

For the construct validity, i.e., the convergent and discriminant validity has been assessed. The convergent validity is computed by calculating the AVE for all indicators on each construct. The AVE of above 0.7 (acceptable value) has been computed. Discriminant validity was measured by the HTMT of correlations, and the value was 0.8 (acceptable value).

Furthermore, descriptive statistics and non-parametric analyses (the Mann-Whitney U test, Spearman's Rho correlation, and bivariate logistic regression models) were computed per the research questions. The significance levels of 0.05, 0.01, and 0.001 were considered in interpreting the results.

3.2. Research Findings

This study's findings offer insights into the significant role of social support as a strong determinant in framing students' interests in STEM degrees and career aspirations. The findings are presented in response to the study's three research questions (RQs) to provide an understanding of the role of families, teachers, and society in defining the students' interests in a STEM degree and a future STEM career.

3.2.1. RQ1: Do High School Students Perceive Their Families, Teachers, and Society as Support or a Barrier to Cultivating Their STEM Interests?

To see whether family, teachers, and society support or impede the cultivation of STEM interest among high school students, we coded the students' responses as "positive beliefs", "undecided", and "negative beliefs". The coding is graphically illustrated in Figure 2 below. Whereas nearly 79% of the students expressed positive beliefs regarding support from their family and society, 64.74% expressed positive beliefs regarding teachers' support for cultivating their STEM interests.
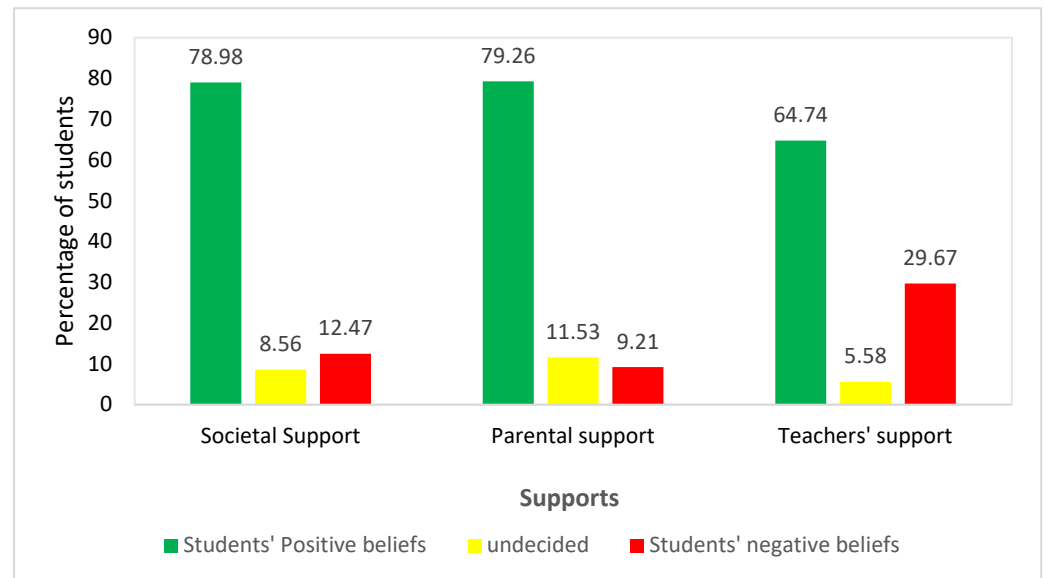

Figure 2. Students' perception of support from the family, teachers, and society.

Our results were further broken down to examine the likely relationship between the role of constructs attributed to positive beliefs and the role of family, society, and teachers. As Figure 3 demonstrates, the students' positive outlooks on the role of the family in promoting their STEM pathways are associated with the three constructs of encouragement, conversation, and active participation, by the family. While 80.7% of the students agreed that their parents encourage them to follow STEM pathways, 76.3% indicated that their family engages in regular conversation about their activities in school. Concerning the role of parents' active participation in STEM-based activities, our results yielded a mixed response. Looking at the students' perceptions of support from society, the results indicated that the majority of students believe that Qatari society has a positive outlook on STEM pathways for both males (70.4%) and females (65.3%) (Figure 4). Our study's results also revealed that students expressed positive beliefs that Qatari society promotes success stories of males (70.8%) and females (66.2%) in STEM.
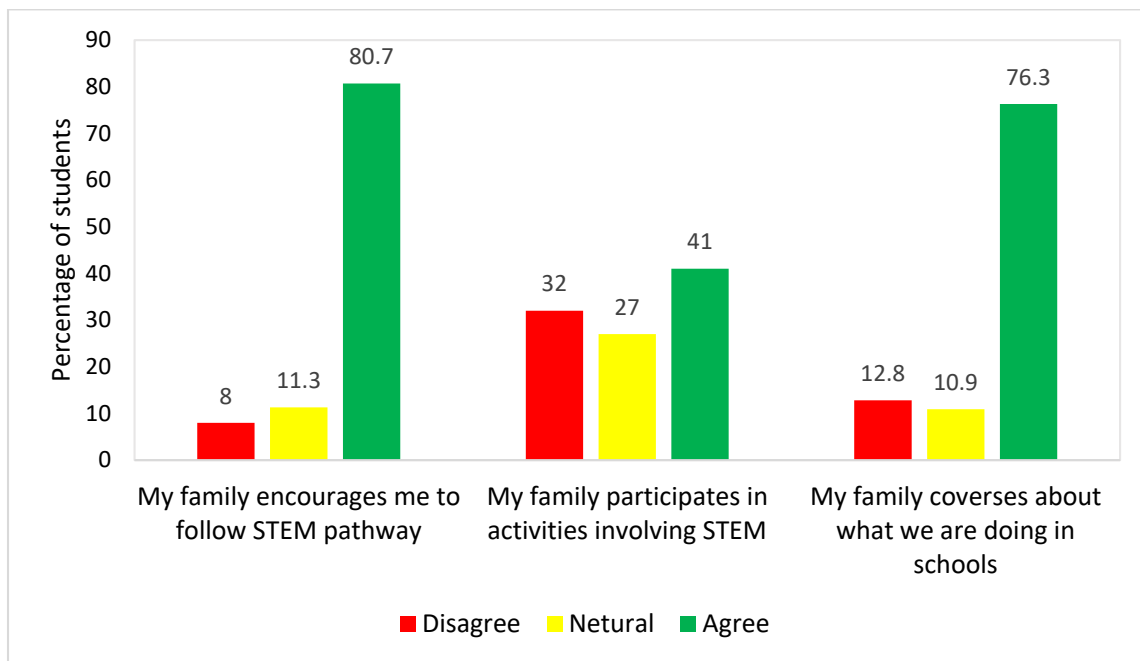
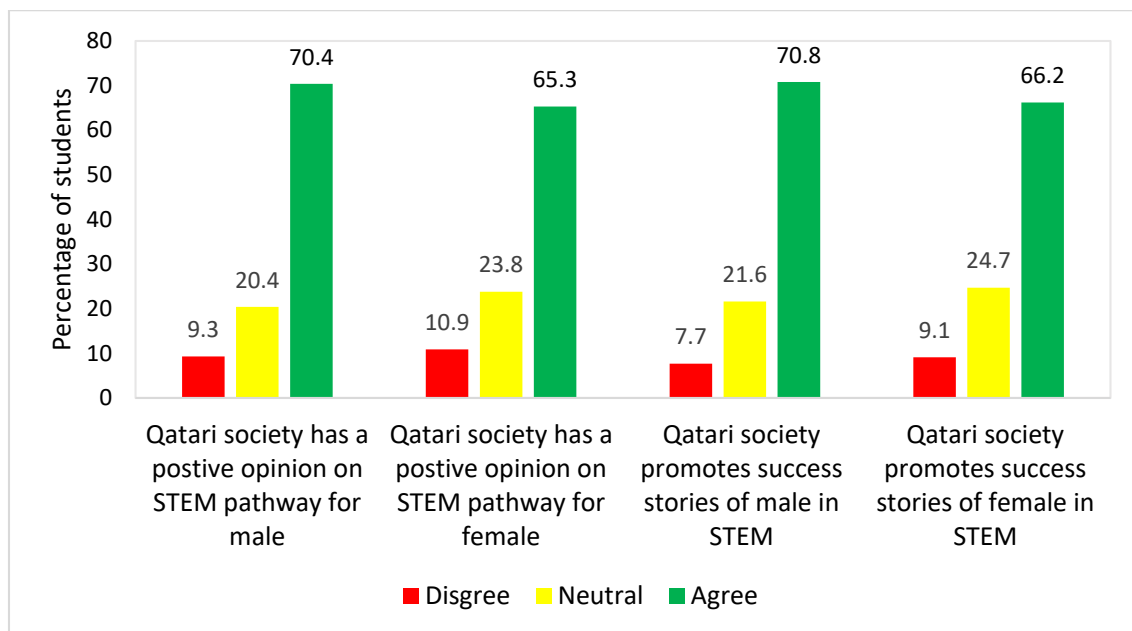**Figure 3.** Students' perception of support from the family.

Figure 4. Students' perception of support from society.

With regard to students' perceptions of support from teachers, our results demonstrate that 63.74% of the students agreed that their teachers are supportive (Figure 5). Teachers' support was expressed in how students perceived teachers' use of diverse teaching strategies, such as differential instruction, integrated learning, personalized learning, flipped classrooms, peer teaching, collaborative learning, and inquiry/project-based/experiment-based learning (Figure 5).
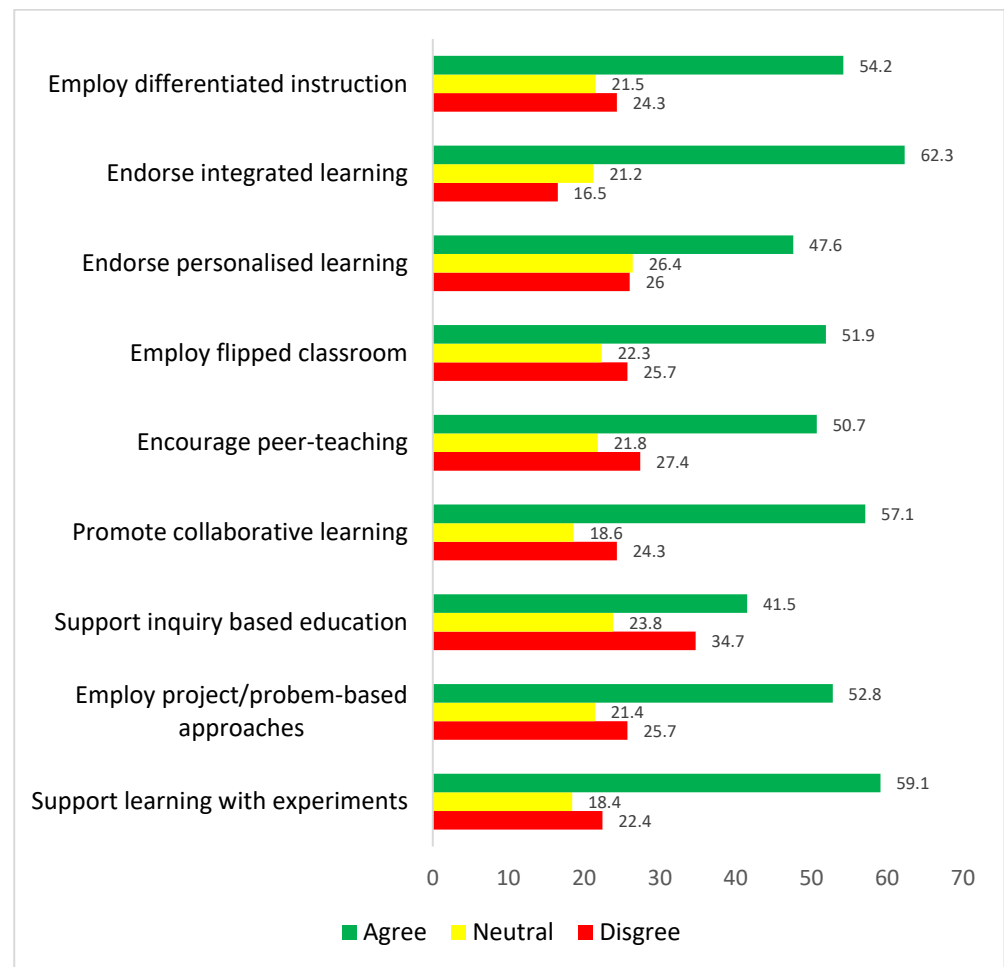
Figure 5. Students' perception of support from teachers.

Finally, a *t*-test was performed to investigate the comparison of mean responses regarding the perceived support from family, society, and teachers ($p < 0.001$). The findings illustrated that perceived support from family (M = 3.01, S.D. = 3.45) and society (M = 2.81, S.D. = 2.50) is more than the teachers (M = 2.17, S.D. = 2.62). Finally, to ensure the reliability of the findings associated with students' beliefs about teachers' support, a correlation test was performed with the responses from teachers on the different STEM-driven teaching strategies. Accordingly, nine constructs (Figure 5) indicating students' perceived support were investigated by correlating the mean of the students' and teachers' responses, as shown in Figure 6 below. As Figure 6 demonstrates, a close correlation was observed in the responses from both teachers and students on the teaching strategies employed in the classroom.
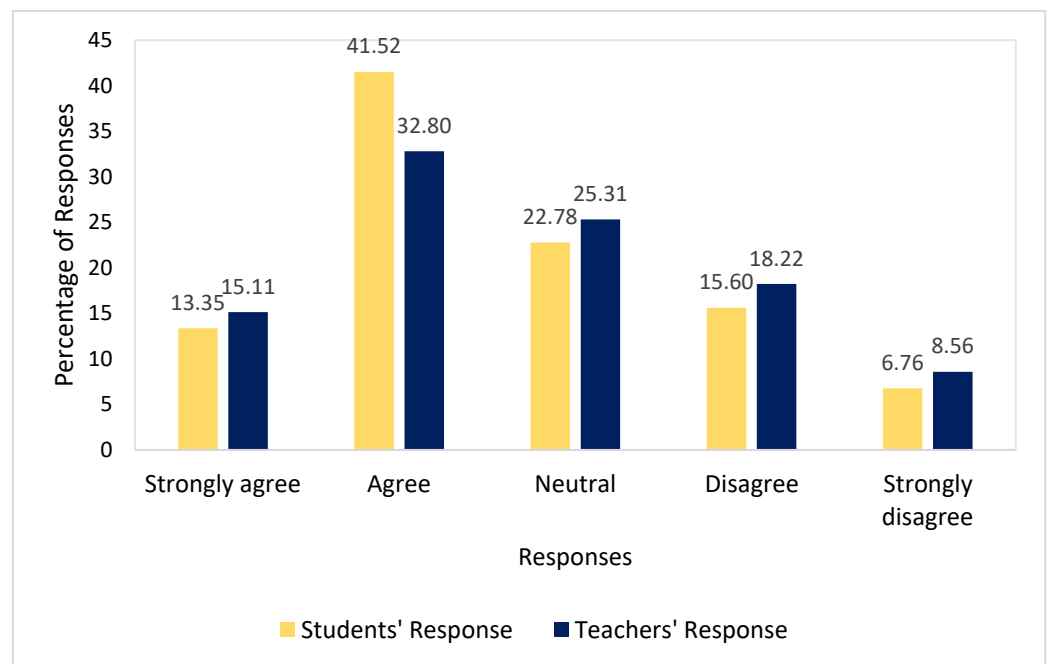
Figure 6. Mean scores for students' and teachers' responses, defining perceived teachers' support.

To gain better clarity into the gender-based distinction in the above findings, we disintegrated the overall student data. Thus, the study explored if there existed any variability between the male and female students' perceptions. Findings from Table 3 reveal that female students exhibited relatively more positive perceptions of support from society and teachers than males ($p < 0.05$). Concerning support from families, no significant differences were detected between the two gender variables.

Table 3. Mann-Whitney U test, examining students' perceived social support (from the family, teachers, society) across gender.

	Dependent Variable	Independent Variable	Test Statistics	Values
1	Support from family	Male	Mean rank	532.59
		Female	Mean rank	539.22
			p-value	0.728
2	Support from teachers	Male	Mean rank	507.99
		Female	Mean rank	556.35
			p-value	0.012 *
3	Support from society	Male	Mean rank	509.77
		Female	Mean rank	555.11
			p-value	0.017 *

Note: * Statistically significant at 0.05 level.

3.2.2. RQ2: Is There a Correlation between Students' Perceived Support from Family, Teachers, and Society and Their Interest in STEM?

Based on Spearman's Rho correlation test performed to understand the relationship between social support (from the family, teachers, and society) and students' interests in science, mathematics, engineering, and technology, our results revealed positive trends ($p < 0.01$) (Table 4), indicating a direct dependence between the variables. The better the social support, the more likely students' interest is further developed or improved.

Table 4. Spearman's Rho correlation depicts the relations between social support and students' STEM interests.

	Support from Society	Support from Family	Support from Teachers	Interest in Mathematics	Interest in Science	Interest in Engineering & Technology
Support from society	1.000					
Support from family	0.361 *	1.000				
Support from teachers	0.357 *	0.366 *	1.000			
Interest in mathematics	0.155 *	0.214 *	0.083 *	1.000		
Interest in science	0.235 *	0.296 *	0.181 *	0.244 *	1.000	
Interest in engineering & technology	0.178 *	0.215 *	0.077 *	0.353 *	0.095 *	1.000

Note: * Correlation is significant at the 0.01 level (2-tailed).

When examining the students' gender-based opinions about the relationship between social support and their interest in the individual STEM subjects (i.e., science, mathematics, engineering, and technology), no significant difference was observed, as is shown in Tables S2 and S3 (refer to Supplementary File). Regression tests were executed to examine the role of social support on students' career aspirations, thereby shedding light on the RQ3.

3.2.3. RQ3: How Do Students' Perceived Support from Family, Teachers, and Society Influence Their Likelihood of Choosing STEM Careers?

Bivariate logistic regression was performed to comprehend how students' perceived social support correlates with their likelihood of pursuing STEM careers (Table 5). In our analysis, the students' perceived support from the family, teachers, and society was considered the independent continuous variable, and the career aspirations (STEM or Non-STEM) were the binary dependent variable. The findings revealed that support from the family is highly significant (the level at 0.001) in student pursuit of STEM careers. The perceived support from teachers and society doesn't increase their likelihood of pursuing a STEM career (Table 5). With respect to gender-based opinions, similar findings were observed, as shown in Tables S4 and S5 (refer to Supplementary File).

Table 5. Logistic regression model illustrating the influence of students' perceived social support on their likelihood to opt for STEM career aspirations.

Dependent Variable	Independent Variables	B	S.E.	Sig.	Exp(B)	Effect Size
STEM career aspirations	Support from society	0.021	0.023	0.378	0.980	0.113
	Support from family	0.195	0.031	0.000 *	0.823	0.600
	Supports from teachers	0.002	0.009	0.839	0.998	0.203

Note: * Statistically significant at 0.001 level. Abbreviations: B relates to the coefficient for the model, Exp(B) relates to the odds ratio (i.e., probability of the event happening/probability of the event not happening).

4. Discussion

Expatriates account for around 85% of Qatar's population, thus making up an essential component of the country's workforce and a key driver of its economy. As such, a critical challenge Qatar faces is the unbalanced labour force distribution with an evident under-representation of the national workforce, especially in STEM fields. In line with available scholarship dealing with the dearth of Qatari nationals in the labor market [37–39], further research is needed to shed more light on the factors likely to encourage or deter youth participation in STEM careers. This study has focused on exploring the role of different

environmental variables, specifically social support such as the family, teachers, and society, in developing the STEM-related interests and aspirations of high school students.

In response to research question 1, the results in Figures 2–5 demonstrate that society, family, and teachers are presenting support in developing their STEM interests, as agreed by the majority. These results align with the SCCT, which defines social agents (parents, teachers, and society) as significant predictors of students' STEM interests and career aspirations. Students indicated that their families encourage them to follow STEM pathways and engage in conversations associated with STEM. These observations align with the studies conducted in different parts of the globe. However, while those studies validated the role of parents in shaping female students' choice of STEM [40–42], no significant difference was detected in the perceptions of male and female students of parental support as in the current study. As supported by findings, providing equitable support to both females and males is increasingly being promoted in Qatar [43].

A path analytic study by Sellami and colleagues investigated students' STEM interests in Qatar and found that Qatari students' STEM interests are directly influenced by teachers with distinct gender-based differences [10,27,44]. Interestingly the findings from the current study revealed that females perceived enhanced support from teachers and society. Female students' positive outlook on the role of different social supports, including teachers and society, may be interpreted in light of the educational and job opportunities available to them alongside their male counterparts in Qatar, with relatively higher life satisfaction levels [42,45]. Studies analyzing the factors and experiences driving STEM interest among male and female students suggested that females rely more heavily on support from parents, teachers, peers, etc. [46,47]. This reinforces female students' enhanced reliance on different social supports in this study.

Addressing research question 2, analysis of the role of social supports in contributing to students' interest in individual STEM subjects revealed that social supports (from family, teachers, and society) positively correlated with students' STEM interests. This finding aligns with the prior research, which reported that students who perceive greater social support (from parents, teachers, and peers) display more positive attitudes toward STEM education [48]. Teachers also have been found to play a significant pedagogical function through nine different teaching strategies (Figure 5) in the classroom, training students in academic subject areas and placidly contributing to developing distinct subject interests [49]. In line with the SCCT and EVT, the findings indicate the importance of teachers and parents in fostering student interests and self-efficiency in science [50] and mathematics [49,51]. Though studies offer insight into the distinct gender-based differences in the role of social supports in influencing STEM-based subject attitudes [52,53], the current study did not report any significant difference in the perception of male and female students.

Finally, in addressing research question 3, this study explored whether the perceived social support was correlated with students' likelihood to pursue STEM careers using the Logistic Regression model, which disclosed that the students' perceived social support from the family was positively related to their tendency to opt for STEM careers. As was shown above, parents constitute an important determinant of students' STEM career aspirations [54,55]. These results align with EVT, pertaining to the influence of parents' beliefs on children's motivation and performance, thereby contributing to their career aspirations. Parents influence children's STEM career aspirations by constant bonding and everyday science talks, contributing to their career decision-making, self-efficacy, and cognitive flexibility [56–58]. In sharp contrast, further research findings revealed that students' perceived support from teachers and society doesn't correlate to their STEM career aspirations. This begs the question positing whether parental advice/support is more effective in shaping their child's career choices and course decisions when compared to advice/support from teachers and peers.

The eminence of STEM education and the role of teachers in nurturing student STEM interests remains critical to developing career aspirations and eventually joining the STEM workforce [59,60]. Evidence-based research is, therefore, needed to inquire further into

the potential lack of teacher influence in driving students to choose STEM careers despite developing STEM interests. Our study proposes some key recommendations that may guide policymakers, educators, and researchers in implementing necessary educational improvements to create a socially supportive environment that attracts students to STEM fields. The wide STEM career spectrum characterizing labor market needs in Qatar makes it imperative that teachers are well aware of the diversity of STEM career options, hence the importance of developing STEM career-based knowledge to guide students from earlier stages of schooling.

To ensure the feasibility and positive outcomes of a STEM-driven educational reformation nationwide, respective authorities should engage teachers, counselors, parents, and students in career guidance fairs or related events to inform, attract, and support student interest in STEM and promote related career opportunities [61]. Informal learning experiences, such as STEM conferences and [62] science fairs [63], are often recommended to augment students' confidence in attending university and interest in STEM. Likewise, robotics contests [64], and Olympiads [65], are reported to develop students' attitudes, particularly in science and mathematics. Also, out-of-school training [66] and research programs [67] must be encouraged as they are essential predictors of STEM interests and career aspirations. Recently STEM infused curricula have also gained traction and are often suggested for quality STEM education that influences students' STEM interests and career aspirations [68]. Also, to enhance quality STEM teaching, professional development should be an integral part of the support provided to teachers [69,70]. Specific research must be encouraged to understand the intrinsic/extrinsic challenges to STEM practices for teachers [71].

The results presented above need to be interpreted with some caution, however. The design of the current study should be considered in light of a few limitations. First, because a quantitative methodology was adopted in our study, it was not possible to delve in-depth into how and why students' views and perceptions positively or negatively impacted their interests and aspirations. In addition, the risk of potential biases in the self-report survey might also exist. Thus, our findings could have benefited from using qualitative data based on interviews or focus discussions [72]. Second, solely relying on student data may be another methodological limitation because various influences come into play in determining STEM interests and career aspirations (i.e., socioeconomic, cultural, and educational factors). Therefore, our study's results may be compounded by also looking at the perceptions of parents, teachers, and school officials.

5. Conclusions

This survey-based quantitative research investigated high school students' perceptions of social support (i.e., support from family, teachers, and society) in developing their STEM interests and career aspirations. Based on SPSS analysis, survey results from 1426 11th and 12th-grade students in Qatar revealed that family, teachers, and society are positive determinants of students' STEM interests ($p < 0.01$). Research findings further revealed that perceived social supports, such as from society and teachers, differ across gender, with females perceiving more support in developing their STEM interests ($p < 0.05$) compared to males. Meanwhile, distinct gender-based differences were nullable in the case of perceived support from family. Lastly, the logistic regression model illustrated that students' perceived support from the family was aligned with their likelihood of pursuing STEM careers ($p < 0.001$), which was not perceived in the case of teachers and society. Therefore, we believe this study's findings would guide policymakers, educators, academicians, and researchers in drawing on the educational, social, psychological, and other ways teachers and society could develop and sustain students' STEM interests and career aspirations. Thus, the study also possesses international scope, alleviating the concerns over the scarcity of STEM-literate people worldwide by urging respective authorities to address this leaky STEM pipeline, considering the social support aspects.

Finally, the future scope of this research may include additional analyses to establish an in-depth understanding of social support (including support from peers and school counselors) and other context-specific factors that can foster interest in STEM and career aspirations. More research is needed to contribute to our understanding of gender-based variability regarding students' perceived social support in Qatar. The incompatibility between students' perceived support from teachers and their STEM career aspirations could be re-investigated more deeply to understand the underlying reasons. Future research is also required to understand better, in further detail, the changes that may occur in students' STEM interests and aspirations over time and the possible variations in their developmental and educational paths and career trajectories.

Supplementary Materials: The following supporting information can be downloaded at: https://www.mdpi.com/article/10.3390/su151712960/s1, Figure S1: Student's Questionnaire. Table S1: Spearman's Rho correlation depicting the relations between social support and male students' STEM interests. Table S2: Spearman's Rho correlation depicting the relations between social support and female students' STEM interests. Table S3: Bivariate logistic regression illustrating the correlations between male students' STEM interests and their likelihood to pursue a STEM career. Table S4: Bivariate logistic regression illustrating the correlations between female students' STEM interests and their likelihood to pursue a STEM career.

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