Unlocking Students' Interest in STEM Education through Career Guidance Services: Experiences from Tanzania

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Abstract

This study examined influence of career guidance services (CGSs) on promotion of students' interest in Science, Technology, Engineering and Mathematics (STEM) Education. A total of 510 participants including students, science teachers and teacher counsellors from secondary schools in Ilala Municipality were involved in this study. Quantitative and qualitative data collection techniques were used. Binary regression model and thematic analysis employed to analyse quantitative and qualitative data respectively. The findings indicated that CGSs had an influence over science subjects' interest across gender. Male students demonstrated high interest in science subjects with an average of 81.2 percent while female students had 58.2 percent. Further, the study revealed that career guidance promotes students' interest in STEM by creating self-awareness. The study concludes that it is possible to have a good number of male and female scientists in Tanzania if provision of comprehensive CGSs is considered as mechanism to stimulate students' interest in STEM.

Keywords : STEM education, interest, career guidance, science subjects

Introduction

Science, Technology, Engineering and Mathematics (STEM) education has been receiving great attention worldwide as fundamental to sustainable development of any country. This implies that the role of STEM education cannot be denied for sustainable social, economic and political development of a country. Given the role of STEM education, students should be encouraged to develop their interest towards STEM as a way of creating awareness among them and get ready to engage in social and economic activities within and across countries (Mazana et al., 2018). The Sustainable Development Goals (SGDs) 2015 – 2030, particularly goal number nine, focuses on sustainable industrialization and foster innovation through technology in attempt to address global challenges and create jobs. This can be well achieved if the emphasis is put on STEM education by ensuring that people especially students are well engaged in STEM since they comprise the key workforce of the near future. Harackiewicz et al., (2016) asserts that for effective engagement in any activity, people should first develop interest into it in order to shape their behaviour and actions towards achieving the intended goals. As for this matter, there is a need to ensure that career guidance services are appropriately provided in secondary schools especially during subjects' choice in attempt to enhance students' interest in STEM. Specifically, career guidance services in this context include the provision of academic and career information (career education), career explorations through role models and conducting individual and group career counselling. According to Leung (2008) many students are lacking insights of their abilities and interest into various academic and career domains therefore, career education may serve as an eye opener to become aware of their

interest and potentialities in STEM. However, it is difficult to achieve this by a student alone hence, providing comprehensive career guidance services and assist them make appropriate career exploration while managing academic and career challenges is significant.

Worldwide, STEM education has been identified as the priority area for the fast-moving technology driven world (Ismail, 2018). The governments and researchers have been trying to find out appropriate strategies in attempt to create STEM literate societies ready to face the ever-growing challenges stemming from science and technological change. However, the situation still demands more interventions to be done across the continents, Africa in particular, to prepare potential workforce to take charge in the field (Han et al., 2022; Leyva et al., 2022; Sáinz et al., 2022). This implies that Africa lags behind in terms of producing STEM workforce to bring about sustainable development in the region. The United Nations policy paper on STEM revealed this as an enabler for development and peace (United Nations, 2022). It was reported that less than 25 percent of Africa's higher education students have been enrolled in STEM fields and the majority of higher education students pursue social sciences and humanities-related fields. The situation is different in United States of America where STEM education represents about 30 percent at the bachelor and master level, 50 percent at research doctorates and almost 65 percent at professional doctorates (United Nations, 2022). However, apart from having a few scientists around the world, women are confirmed to be underrepresent in STEM especially in two fields: Information and Communication Technologies (ICT), Engineering and Manufacturing. Based on the data from World Economic Forum, particularly the Global Gender Report of 2022, women graduates took 1.7 percent in ICT compared to men graduates who took 8.2 percent worldwide. Moreover, women represented 6.6 percent while men represented 24.6 percent in Engineering and manufacturing. This situation calls for serious interventions around the world, Africa in particular, in attempt to invite more young people to engage in STEM with no one left behind. Boys and girls in schools and out of school systems should be assisted to identify their talents and develop interest in STEM, thus preparing them for various careers in the field. The government officials, policy makers and researchers should work together and come up with leapfrog measures to curb the present situation.

Based on the national development vision of 2025 and basically the attribute number five which focusses on creating strong and competitive economy, STEM education in Tanzania is cited as vital to achieve the vision in question. Moreover, the Education and Training Policy of 2014 appropriately elaborates on producing a good number of citizens educated in science and technology to meet the national development needs (URT- MoEST, 2014). National development vision (2025) and Education and Training Policy (2014) documents actually highlight the prerequisite of creating STEM literate society that could be able to adapt the growing scientific and technological dynamics. Various studies tried to reveal STEM situation within the country specifically in secondary schools. For example, Mazana et al. (2018) investigated on the students' attitude towards mathematics. Among other issues, their study found that most of the students demonstrated negative attitude towards mathematics, the thing that probably lowers their academic performance in science since mathematics is the key subject in STEM. The fact that most of the students demonstrated

negative attitude towards mathematics is supported by Ndijuye and Tandika (2020) who affirmed that STEM education should start early in order to create its awareness among children and promote positive attitude towards science subjects. Therefore, coupled with other strategies, the career guidance services should be well provided in attempt to stimulate students' interest in science subjects and build confidence in them for better academic performance. This is based on the fact that several studies have confirmed that the aspect of interest to be an important motivational factor to engage in a certain activity, content or situation (Harackiewicz et al., 2016).

Students' Interest in STEM Education

Hidi and Renninger (2006) define interest as the motivational variable that constitutes psychological state of engaging or the predisposition to reengage with particular classes of objects, events or ideas. According to Hidi and Renninger, an aspect of interest is always content specific and not predisposing that applies across all activities. This means that a person may be interested in engaging in, let say, music activities but less interested in research activities. Similarly, Harackiewicz et al. (2016) report interest as the powerful motivational process that energizes and guides learning, academic and career trajectories respectively and it is essential to academic success. In the same vain, Lent et al. (2000) confirm that personal interest is the important motivational factor for choice behaviour and skill acquisition. Therefore, based on such perspectives, it is important to assist the students to develop strong interest in STEM and eventually come up with expected outcomes. Concisely, interest in STEM could serve as the motivational variable for success. As it has been argued by Harackiewicz et al. (2016) that any interventions intending to develop students' interest is vital in any educational context especially in academic domains where many students do not find initially interested or those domains in which interest typically declines over time. In so doing, there is a strong need to assist students to develop interest towards science subjects, mathematics in particular, since most of the studies conducted in this area confirmed students to demonstrate less interest and achieve poor results (Leyva et al., 2022; Matete, 2022; Mazana et al., 2018).

Career Guidance and Students' Interest in STEM Education

Promoting interest towards STEM is very important move since the aspect of interest is considered to be the motivating variable in academic success (Blotnicky et al., 2018; Sáinz et al., 2022). The four phase interest development model by Hidi and Renninger (2006) and the interest model by Lent et al. (2000) recommend external factors such as experiences and support that an individual receives as vital in the development of personal interest. This is to say that physical environment and social interactions play a big role in stimulating interest towards a certain activity. This implies that there is a high possibility for such person to initiate intention to engage in those situations if a person have interest in a certain content or activity. If he/she initiates the move without any motivation provided in the process, there is a possibility of withdrawing the intention. Therefore, the need to provide career support is of paramount importance. Across the world, evidences have shown that, career guidance services may promote students' interest in science. For example, the current studies by ElSayary (2023), Sidiq et al. (2022), Whitehead and Alves (2022) in Dubai, Indonesia

and USA, respectively showed clearly the effectiveness of career guidance in increasing students' interest in STEM fields by providing career information, career exploration support and exposing students to role models. This is also evidenced by Musset and Kureková (2018), who conducted a study in Finland, Sweden, Canada, Norway and German secondary schools. The findings revealed that students who received career guidance services showed more interest in science subjects and STEM fields than those who were not given career guidance services. Similarly, a good number of studies have been conducted in the area of career support in Africa. For example, Babalola et al. (2023) and Chauke (2022) in South Africa revealed the power of career information and career exposure to encourage STEM engagement. The same is reported by Badmus and Jita (2023) in Nigeria where career exploration, career mentorship and guidance showed significant role in enabling students to understand themselves in relation to the world of work and develop interest in STEM. Apart from being effective, scholars have identified several challenges on the implementations of career guidance interventions. Some of these challenges among others include lack of career guidance professional training among teacher counsellors, multitasking among teacher counsellors, limited career guidance professionals in schools and lack of strong career guidance policies (Alloph & Msonge, 2023; Magere, 2022; Rodliyatun et al., 2022).

Besides the studies conducted and the established policies that aim to increase students' interest in STEM worldwide and Tanzania in particular, there are practical efforts focusing at promoting STEM education in the region. For example, starting from 2021/2022 academic year, the Government of Tanzania has been providing scholarship to high performing students in the form six national examinations in science combinations to join University's science programs. The manifesto of Chama Cha Mapinduzi (2020-2025) as well have put forward the intention to stimulate the use of research, science, technology and innovations, prepare STEM competent teachers and reforming science learning environment with the intention of stimulating social and economic development (Chama Cha Mapinduzi, 2020). This is also observed in the University of Dar es salaam where the entry cut-off points have been lowered to female students to increase their enrolment rates especially in science programs (Kilango et al., 2017). All these are ongoing efforts to ensure that students are appropriately engaged in STEM at all levels of education for sustainable development in Tanzania. However, the need to unlock student' interest in STEM amplify the efforts in place which serves as the motivation for the current study.

Research Objectives

The main purpose of this study was to promote STEM education in Tanzania. Specifically, the study sought to:

i. Determine students' interest in STEM education across gender;
ii. Examine the extent to which academic and career information influence the students' interest in STEM education; and
iii. Explore the role of career guidance services in promoting students' interest in STEM Education.

Methodological Procedures

Study Approach and Design

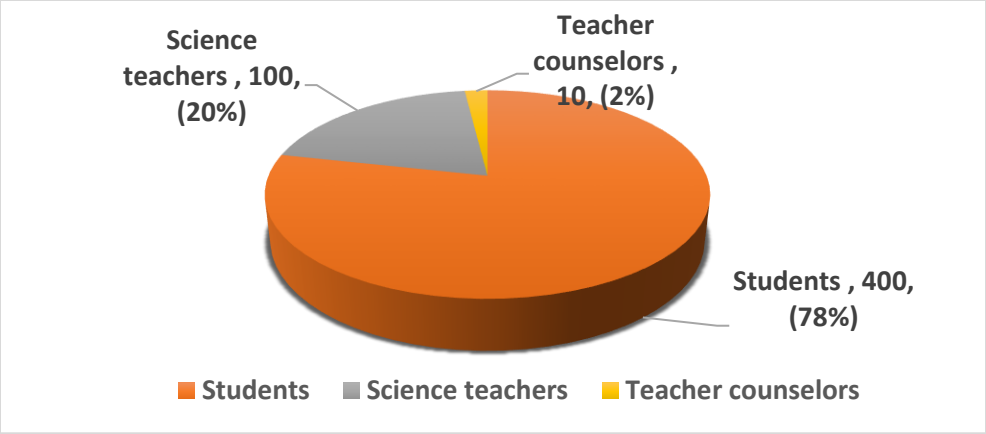
This study employed mixed methods research approach which guided the data collection process, analysis, interpretation, discussion and reporting of the findings. The ultimate reason to adopt the mixed methods research approach was based on the fact that the key variables which include career guidance and interest cannot be well investigated by a single approach. Therefore, combining the two approaches provided an opportunity for in-depth and breadth investigation of the phenomenon understudy as proposed by Ary et al., (2010). In this case, both quantitative and qualitative approaches were embraced in a concurrent manner in order to find out the influence of career guidance services in promoting the students' interest towards STEM education, science subjects in particular. In terms of quantitative aspect, ex-post facto design were employed to facilitate the investigation of the existing cause-and-effect relationship as proposed by Ary et al. (2010). On the other hand, multiple-case study design was employed to collect in-depth qualitative data from science teachers and teacher counsellors. Yin (2014) advocates that multiple-case study design is an empirical inquiry that investigates a contemporary phenomenon within its real-life context in which multiple sources of evidences are used. Therefore, the choice of this design allowed the researcher to explore the experiences, perceptions and opinions of the respondents with regard to students' interest in STEM education and the role of career guidance services in stimulating the students' interest in STEM education.

Location of the Study and Study Participants

The study was conducted in Dar es Salaam city specifically in public and private secondary schools in Ilala Municipality. Public and private secondary schools were chosen based on diversification factor which provided a wide range for exploration of the research problem in question. Dar es Salaam was selected since it is the leading city in Tanzania Mainland in terms of students' enrolment rate. Based on MoEST (2020) data, Dar es Salaam had a total of 231,612 students who were enrolled in secondary schools. Ilala was selected since it is the leading Municipality in terms of students' enrolment rate. For instance, in 2020, the students' enrolment in Ilala Municipality was 79,265 students while in other Municipalities the enrolment was as follows: Kigamboni (12,712 students); Kinondoni (40,776 students); Temeke (60,166 students); and Ubungo (38, 693 students). Therefore, Ilala Municipality provided freedom to select the respondents from the large population. The current study involved three categories of participants, namely Form III and IV students, science teachers and teacher counsellors from ten (10) public and private secondary schools. Form IV and III students were involved because they had already selected their subject streams and, therefore, they were in a good position to talk about their interest in STEM in relation to career guidance services provided. Science teachers and teacher counsellors were also chosen based on their responsibilities in teaching and guiding students especially in the matters relating to education, career and life in general. Figure 1 presents the number of participants involved in this study.

Figure 1

Study participants based on their categories



Source : Field Data (February, 2022)

Data Collection and Analysis Procedures

The process of data collection involved the usage of both quantitative and qualitative procedures whereby Self-report Questionnaires (SRQ) which consisted thirty (30) items with five-point scales ranging from *(1) strongly disagree to (5) strongly agree* were employed to collect quantitative data from students. Before administering the SRQs, item and reliability analysis was done to evaluate the quality of the questionnaire. The item-test correlations were found to be positive as they ranged from 0.34to 0.85. This indicates that all items were moderately to strongly correlate with total score on the test. This suggests that all items measured the same underlying construct (academic and career information in science subjects). The alpha coefficient for the test was high (0.96), thus indicating high internal consistency and reliability of the test. The alpha coefficients for each item ranged from 0.96 to 0.96. Such coefficients seemed very high and indicated that each item contributed to the overall reliability of the test. Focus Group Discussion (FGD) and semi-structured interviews were administered in attempt to collect qualitative data from science teachers and teacher counsellors. The collected quantitative data from the first and second objective were analysed through both descriptive and inferential statistics with the help of Statistical Package for Social Sciences (SPSS IBM) version 25. Specifically, the frequencies and percentages were obtained through descriptive statistics while the influence of academic and career information towards science subjects was determined through the Binary Logistic regression analysis. Thematic analysis was used to analyse the data collected through FGD and semi-structured interviews whereby six stages suggested by Braun and Clarke (2006) were adhered. Thus, the data were firstly familiarized by the researcher, the task which was followed by transcription and translations of the recoded voices since FGD and interviews were conducted in Kiswahili. Thereafter, initial codes were generated followed by defining and naming the themes that informed the role of career guidance services in promoting students' interest in STEM education.

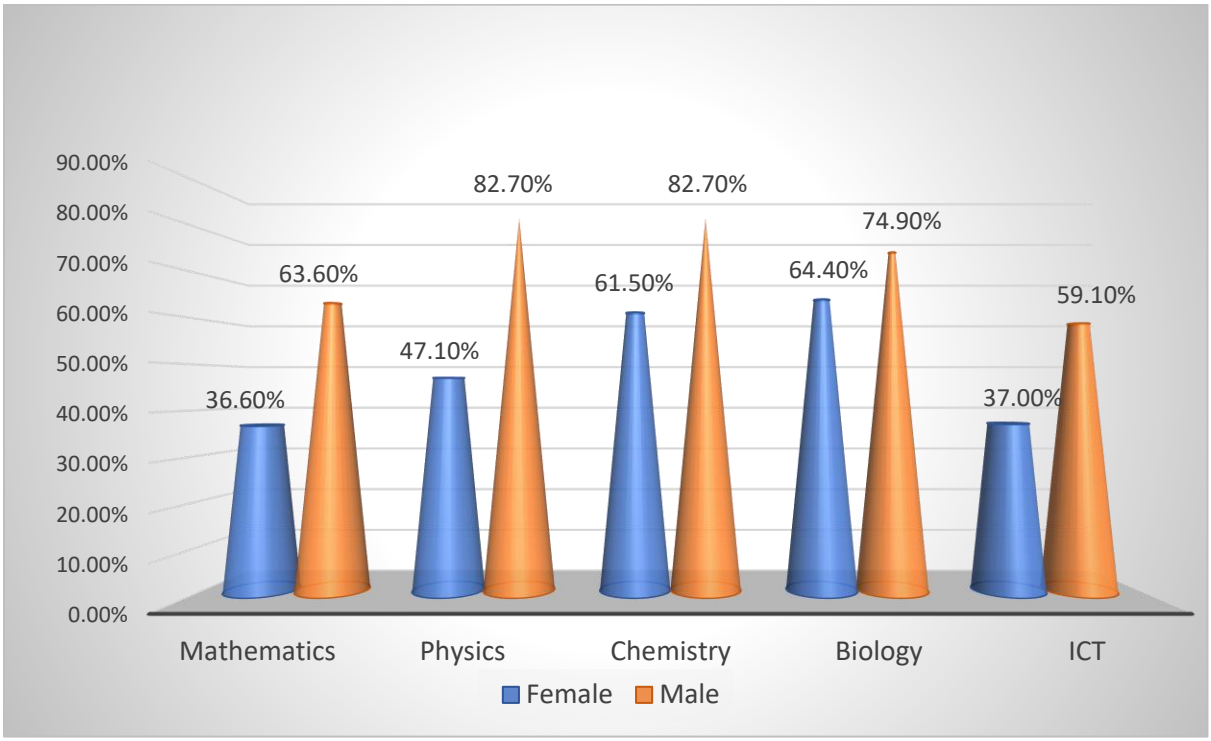
Results and Discussion

Students' Interest in STEM Education across Gender

The first objective sought to determine the students' interest in STEM education based on gender. The frequencies and percentages were calculated to describe male and female students' interest in science subjects, which determine STEM education. The total of four hundred (400) students were involved in the study. Out of the study sample in question, two hundred and five (205) constituted female students while one hundred nighty five (195) constituted male students. The students' score in five science subjects (Mathematics, Physics, Chemistry, Biology, and ICT) is clearly shown in Figure 2.

Figure 2

Students' interest in STEM education across gender



Source : Field Data (February, 2022)

Figure 2 presents the students' interest score in STEM education based on five science subjects as per Tanzania education curriculum for secondary schools. With reference to five science subject scores, male students reported to demonstrate high interest in Physics (82.70%) and Chemistry (82.7%). However, their interest is also high in the remained subjects compared to female students. With reference to female students' performance, it appears that female students had low interest in Mathematics (36.60%) and ICT (37.00%) although Mathematics is one of the compulsory subjects for secondary school students. Such findings are in line with the findings of the study conducted among post-primary students in Ireland by Lane et al. (2022). The study findings indicated that male and female

students demonstrated lower interest in Mathematics which is one of the science subjects in their context. The difference between the study by Lane et al. (2022) and the current study is based on the fact that Mathematics appeared to be the subject of low interest among female students in Tanzania while both male and females students in Ireland appeared to have low interest in it. Moreover, the study by Leyva et al. (2022) among college students in Switzerland indicated that female students had low interest in Mathematics besides being the key subject in STEM careers. Similarly, Abdallah (2015) in Tanzania found that a good number of girls are not much interested in science subjects especially Mathematics, the fact that widens gender gap in STEM fields in higher education levels. With the support of the findings from previous studies, the current study shows that interest in science and STEM in general is still a challenge among most students. However, the magnitude of the problem differs across science subjects as stated in Figure 2. Hence, raising male and female students' interest in these science and STEM in general could be the best mechanism to boost a good number of scientists suitable for the current technological era.

The Influence of Academic and Career Information to Students' Interest in STEM Education

To gain insight into the influence of academic and career information on students' interest in STEM education, Binary Logistic regression model performed to calculate academic and career information scores in relation to students' interest in five science subjects (Mathematics, Physics, Chemistry, Biology and ICT) across male and female students. The results of the model presented using estimated odds ratio (OR). The OR greater than one (1) indicated that the likelihood of having high interest in science subjects increases with an increase in academic and career information in science subjects. On the other hand, when the OR is less than 1, it implies that the likelihood of being highly interested in science subjects is lower if there is an increase in academic and career information scores in science subjects. Table 1 and 2 present the model results for male and female students.

Table 1

Influence of academic and career information on students' interest in science subjects across gender (logistic model)

Subjects	**Males**			**Females**		
	OR	SE	P-Value	OR	SE	P-Value
Mathematics	1.07	0.0109	**<0.001**	1.03	0.0079	**<0.001**
Physics	1.03	0.0235	0.161	1.05	0.0343	0.121
Chemistry	1.03	0.0265	0.217	1.01	0.0247	0.631
Biology	1.02	0.0076	**0.02**	1.03	0.0081	**<0.001**
ICT	1.03	0.0071	**<0.001**	1.04	0.0086	**<0.001**

Source : Field Data (February, 2022) **Notes :** OR-odds ratio, SE-standard error

Table 2

Proportion of students interested in science subjects with respect to academic and Career Information

Subjects	Female			Males		
	Moderate	High	p-value	Moderate	High	p-value
Mathematics	N=100	N=105	0.0001	N=85	N=110	<0.0001
No	77 (77.0%)	53 (50.5%)		57 (67.1%)	14 (12.7%)	
Yes	23 (23.0%)	52 (49.5%)		28 (32.9%)	96 (87.3%)	
Physics			0.0971			0.0018
No	3 (100.0%)	52 (51.5%)		2 (100.0%)	16 (15.7%)	
Yes	0 (0.0%)	49 (48.5%)		0 (0.0%)	86 (84.3%)	
Chemistry			0.0262			0.0018
No	3 (100.0%)	37 (36.6%)		2 (100.0%)	16 (15.7%)	
Yes	0 (0.0%)	64 (63.4%)		0 (0.0%)	86 (84.3%)	
Biology			0.0003			0.0604
No	48 (48.0%)	25 (23.8%)		27 (31.8%)	22 (20.0%)	
Yes	52 (52.0%)	80 (76.2%)		58 (68.2%)	88 (80.0%)	
ICT			<0.0001			0.0007
No	72 (80.0%)	44 (46.8%)		42 (55.3%)	30 (30.0%)	
Yes	18 (20.0%)	50 (53.2%)		34 (44.7%)	70 (70.0%)	

Source : Field Data (February, 2022)

With reference to Table 1 and 2, the data clearly show that male students' interest in Mathematics was high (OR =1.07, p<0.001 in Mathematics), which is significantly higher for each unit increase in academic and career information. Similarly, their odds for being highly interested in Biology and ICT subjects significantly increased by 1.02 (p=0.02) and 1.03 (p<0.001) respectively for unit increase in academic and career information score. However, there is no significant effect of academic and career information on their interest in Physics (OR=1.03, p=0.161) and Chemistry (OR=1.03, p=0.217). For female students, the odds of being interested in Mathematics (OR=1.03, p<0.001), Biology (OR=0.13, p<0.001), and ICT (OR=1.04, p<0.001) were significantly higher for each unit increase in academic and career information. Nevertheless, the effect of the academic and career information on their interest in Physics (p=0.0121) and chemistry (p=0.631) was not significant. These findings imply that academic and career information had significant and positive relationship with the students' interest in science subjects. It seems that the likelihood of stimulating their interest also becomes high as the students receive adequate academic and career information. This applies to both male and female students although the magnitude of interest increase differs across subjects. For example, male students were found to significantly increase their interest in Mathematics, Biology and ICT while this was not the case in Physics and Chemistry. Likewise, the female students were reported to increase their interest in Mathematics, Biology and ICT while the effects observed for Physics and Chemistry subjects were non-existent.

Besides the differences in magnitude across science subjects, there is academic and career information block to career guidance services. It was observed to have an influence in students' interest in science subjects, which constitutes the base for STEM education. These results are similar to the findings by Harackiewicz et al. (2016) in that interventions which are necessary to assist students to develop interest in subject areas seem to be of less interest and less motivate the students. With strong interest in science subjects, the students could be able to believe in themselves and, therefore, succeed in their academic endeavours as document by Kwon et al. (2021).

The Role of Career Guidance Services in Promoting Students' Interest in STEM Education

To understand the contribution of career guidance services (CGSs) provided in secondary schools in raising students' interest in STEM education, ten (10) FGDs and interviews were administered to science teachers and teacher counsellors respectively. Among the unveiled data from FGDs are presented in Table 3.

Table 3

Key roles played by career guidance services in promoting STEM Education interest among male and female students

Theme	Sub-themes	Quotations from FGDs
Creation of self-awareness	Identification of strengths and weaknesses	CGSs assist students to identify areas of their strengths and weaknesses as individuals in relation to education and other life parameters.
	Recognition of interest in relation to subjects	SGSs provide an opportunity for students to discover their interest in relation to subjects understudy by identifying how they feel about the subjects and their behaviours as well.
	Building confidence	Sometimes, it is difficult to believe in yourself unless you receive the feedback from the people around you. This is actually done by those responsible in the counselling unit.
Attainment of educational goals	Identification of appropriate study habit	To achieve educational goals, students need to develop appropriate study habit such as following the timetable, attending classes actively, group discussion and self-study.
	Appropriate subject selection	At the end of Form II, students were assisted to choose subjects that they think they are competent and interested in. It is a very challenging moment since students get confusion about what to choose as subject majors. Therefore, teacher counsellors, in collaboration with other teachers and parents, provide support during this critical time.

	Appropriate use of available resources	This has been done regularly to ensure that students make good use of subject teachers, the books in the library and other facilities available. Sometimes, they are encouraged to seek assistance from their fellow students especially in upper classes whenever the need arises.
	Handling of educational and life challenges	As part of the community, students are also faced with a number of challenges at school and outside the school. Therefore, it is the responsibility of the school, through counselling unit, to provide a room for students to share their issues and provide appropriate and immediate support.
	Provision of educational and career information	Teacher counsellors provide information on what to study and its implications in the future plan. They also invite various professionals every year to talk to students in order to motivate them because seeing people with success in the area of your dream is encouraging**.**
Cultivation of individual productive skills	Developing interpersonal skills	In order to be an acceptable and productive individual in the society, you must know how to relate with other people starting at family level.
	Teaching self-respect and value	In most cases, students who regularly get guidance are actually likely to know how to respect themselves and demonstrate the same to others.
	Developing self-understanding	CGSs assist students to believe themselves including their responsibilities as students and expected good members of the society.
	Assisting exploration and understanding of the world around	Understanding what is going on in the society is very important. However, since students are not in a good position to make such exploration, teacher counsellors are assisting them through various talks and activities in their schedule here at school**.**

Source : Field Data (February, 2022)

The study findings from Table 3 indicate that CGSs provided in schools has not only improved students' interest in STEM but also contributed a lot to students' life in general. For example, among the conducted FGDs, creating self-awareness, assisting students to attain educational goals and cultivation of productive individuals were the three major themes which were developed from the findings. This was also reported during the interview with teacher counsellors. One teacher counsellor from school A had the following elaboration:

> … Career guidance services provided at our school help a lot. Many of our students come with little knowledge about how to get good marks that will help them go further with their studies. Therefore, we always train them study skills, how to get well with their fellows and how to adhere to school rules and regulations (Interviewed teacher counsellor on 09th November, 2022).

Similarly, another teacher counsellor from school C had this to say:

> … Career guidance facilitates teaching and learning. We (counsellors) have our own timetable for talking to students and encouraging them to study hard and learn life skills. This has been a help to them since we observe positive changes from time to time since we started the program (Interviewed teacher counsellor on 16th November, 2022).

Based on the excerpt in question, it is evident that the provision of career guidance services in schools is vital since it facilitates teaching and learning process. As revealed in FGDs and interview with teacher counsellors, the students were provided with CGSs in order to acquire study skills and life skills and motivate them to love science subjects. Such findings are similar to the findings by Egenti (2017) in that career guidance in schools provides an opportunity for students to realize their full potential that support goal achievement and encourage them to be confident with their all subjects under the study. In the same vein, Roy (2020) insisted that comprehensive CGSs in schools help students reflect their interest, ambitions, abilities, qualifications and teach them how to plan and make appropriate decisions. Apart from its importance in teaching and learning, career guidance services were also found in small scale provision since those responsible for guidance and counselling unit are the also regular subject teachers. One of the teacher counsellor from school D had the following observation :

> … It is indeed true that these services are very important to our students. However, we fail to assist them appropriately due to the fact that we also have a huge load in teaching. As for me, I have to teach Mathematics and Physics in almost all four classes. This is a challenge because the time is too limited. I have to go to class, mark the exercise books and attend students in the unit. If the teaching load is reduced or if the government could employ professionals in guidance field, it could be a big help (Interviewed with the teacher counsellor on 07th November, 2022).

With reference to teacher counsellor's verbatim quote, it is evident that there is a need to widen the access of career guidance services to all students since the students do not adequately receive the services due to the limited number of teacher counsellors. This complements the findings from SRQ whereby male students had access to the information by 56.40% whereas female students had access to academic and career information by 51.20%. Such average acquisition of academic and career information calls for more provision of the CGSs since the findings confirmed that CGSs had an influence to students' interest in science subjects.

Generally, the findings from FGDs and interviews imply that CGSs play a very big role in secondary schools. Apart from supporting teaching and learning process, CGSs also assist students in a number of ways including

unfolding their interest, potentials, study skills and life skills. Good enough, those who had access to adequate information had high interest in science subjects. This improved that access to CGSs in schools should also be extended in order to stimulate students' interest in science subjects.

Conclusion

Based on the findings of this study, it can be concluded that academic and career guidance play an important role in enhancing students' interest in science subjects which constitute the foundation for STEM education. As it has been reported in this study, male students demonstrated high interest in science subjects by 81.2 compared to female students who scored 58.2 percent however, the magnitude of their interest varied across subjects. Further, findings from FGD and interview confirmed that, career guidance services create self-awareness among students and assist them to attain educational goals while preparing them to be active participants in the socio-economic activities in the society. Since, previous literature have recognised the power of interest as a motivational factor for behaviour initiation and effort persistence, it can therefore be argued that any intervention intending to increase students' interest in science subjects is substantial because of the significance of science for sustainable development. Besides the findings generated by this study, there are some limitations that were encountered including, firstly, this study was confined to ten secondary schools in Ilala Dar-es-Salaam which is urban area making it inappropriate to generalize the results to the entire country. This limitation underscores the need for future researchers to delve into schools situated in other regions for a more comprehensive understanding of *the influence of career guidance services (CGSs) on promotion of students' interest in STEM Education.* Secondly, the study focused to investigate students' interest in STEM education by looking at the role of career guidance services and thus limit itself to explore other factors that in one way or another serve as the model to increase students' interest in STEM education. Lastly, the study covered only form four and from three students based on the fact that, they had already chosen subjects of their interest. Thus, it was not possible to determine their interest before that decision is made and hence, a comprehensive study need to be done to explore STEM education interest among students at lower education levels.

Recommendations

The study recommendations are directed to the government of Tanzania through its relevant Ministry of Education, Science and Technology (MoEST). The government has to ensure that secondary schools should develop comprehensive career guidance programs in order to provide appropriate career guidance services to students regarding their educational, social and personal life. This should go with the recruitment of professional career counsellors to schools. The study findings revealed that most of the teachers who also serve in the counselling unit are the regular subject teachers with little knowledge on career guidance and counselling. In addition, most of the teachers were busy with teaching duties since they are very few in their respective departments. Given the small number of subject teachers in schools, career guidance and counselling services have not been sufficiently provided

to students in attempt to meet their educational, social and personal needs. From this view, it is recommended that teacher counsellors should have low workloads or should only be assigned for guidance and counselling programs. Future studies may be conducted to answer some questions like why male students are reported to demonstrate high interest in STEM than females? Is the concept of gender an issue in the context of interest in STEM education? Why career guidance services are not comprehensively provided in secondary schools in Tanzania, is it an issue of policy or awareness? Further, the study suggests for in-depth investigation on teacher counsellors' knowledge and skills on STEM education since they are the key players working with students' attitudes, perceptions and other important personality aspects.

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