International Journal of STEM Education for Sustainability, Vol.3, No.1, 2023, pp. 94-110
e-ISSN 2798-5091. DOI. 10.52889/ijses.v3i1.69

Determinants of Girls' Educational Performances in Science, Technology, Engineering, and Mathematics (STEM) Subjects across Selected Schools in Oromia Regional State, Ethiopia

Submitted 27 February 2022, Revised 19 April 2022, Accepted 19 April 2022

Endalew Fufa Kufi[1*]

[1]College of Education and Behavioral Science, Arsy University, Asella, Ethiopia
Corresponding email: endalewkufi@gmail.com

Abstract

The purpose of this research was to investigate key determinants of girl's performances in STEM subjects in selected schools of Oromia Regional State, Ethiopia. Interpretive explication method was employed in which interview and focus-group discussion were instruments of data collection. Participants' interview and focus-group data were carefully collected based on which due transcription was made. In the transcription process, careful selection was made on issues that related to basic research questions. Then, coded categories were formed under each team to analyze the data. The findings indicated that, while girls outsmarted boys in almost all natural science and mathematics subjects, there were gaps among female students themselves owing to low economic standards to cover the costs of living and learning, negative peer-pressure, and shortage in schools to scale up intra-group support among female students. In spite of the existence of some outsmarting girls in schools who were able to perform much more than males, there also existed socio-economic determinants which created barriers on average achieving girls' performances. There were also digital divides among girls from providing and less-providing homes from the point of view of facilities.

Keywords: Equity, Girls, Education, STEM, Performances

INTRODUCTION

Girls' education marks the development of healthier, wealthier and safe society (Somani, 2017). Research findings underline, however, that there have been several conditions that have marking effects on girls' education, especially in STEM areas. For instance, He (2018) researched female underrepresentation in STEM subjects in China, and came up with the findings that, there were pressing influences from the nature and scope of curriculum, teachers' attitudes and skills, partiality in labor-market, parents' undermining girls' education, and peer harassment. Researches held by McNally (2020) and Musau, Migosi and Muola (2013) denoted determinants of girls' performances in STEM subjects to be teachers' qualification standards to support students with different backgrounds, heavy workload at home, resource shortage and class-size. Personal attributes (confidence, self-efficacy, competitiveness, preferences and expectations) were also found to be barriers as well as educational contexts (peers, teachers, role-models and curricula), and cultural influences (McNally, 2020:12).

Rutto and Mulwa (2019) asserted school environment, household chores, family size, cultural practices and prior performance to be strong predictors of girls' success in their education. Ngesu, Wachira, Mwelu and Nyabsi (2012) underline early marriage, nomadic life-style, parents' preference to boys' education and long distance to schooling to be

negative determinants to girls' education in arid and semi-arid areas of Kenya. Donkor and Justice (2016) found out also that, parents' low level of education, poor performance at school, inadequate school and family resources, peer harassment, inadequate role-models and lack of motivation were barriers to girls' progress in their education.

To the specific, girls' educational progresses in science are affected negatively by self-motivation, parents' attitudes, teachers' efforts and skills and location (Ampousah, Ametefe & Menash, 2013; Yohanna & Muhammad, 2022). Lack of basic needs is also stated to have pressing effects on girls' education (Ngeno, Simatwa & Sol, 2013). Miji and Makgato (2006) indicate teaching strategies, depth of content knowledge, motivation, laboratory-use and course completion to be barriers to girls' success in mathematics and physical science subjects.

Yeshimebrat, Alemayehu and Firew (2013) carried out a study on factors affecting female students' academic achievement at Bahir Dar University, and came up with the findings that, previous academic background, family background, loose entertainment style at evening clubs and economic barriers were strikingly deterring issues.

Fasika, Ashenafi and Temesgen (2015) held a study on factors affecting female students' academic achievement in high school, and came up with the finding that, household responsibilities, inadequate support from family, lack of instructional support and inadequate guidance and counseling at schools to be grand factors. Likewise, Simegn (2021) researched techniques of improving female students' participation and their academic performance in Ethiopian Technical University, and found out university climate, department choice, lack of tutorial classes, and poor training support to preliminary issues to be worked on.

Addisie and Singh (2021) researched factors affecting women's performances in engineering and technology education in Ethiopia, and came up with the findings that, field-related pre-orientation, institutional follow-up and support, peer learning habits and accessibility of infrastructure were the positively affecting determinants. Contrary to the positive determinants, there were negative determinants related to sexual harassment and lack of role models in the family. Moreover, Aemiro (2018) points out personal dispositions, university-related factors, previous academic background and economic problems to be challenging issues on girls' education in science classes.

In spite of the necessity to consider multiple determinants on girls' performances in STEM subjects across Ethiopian schools, researchers gave less attention to interpretive analysis of institutional, individual and socio-cultural issues related to girls' performances in

the science, technology, engineering and mathematics subjects. Most researches were quantitative and failed to explicate the manner and status of different determinants. So, the current study was held to investigate determinants of girls' performances in STEM subjects in Ethiopian schools, most specifically selected centers in Oromia Regional State. Research questions were stated as under:

1. What are the individual determinants of girls' performances in STEM subjects?
2. What are the institutional determinants on girls' STEM performances?
3. What are the socio-cultural determinants of girls' performances in STEM subjects?
4. How do schools manage the pressure of individual and socio-cultural determinants?

METHOD

Interpretive method of qualitative approach was used in order to interpret target determinants that pertained to individual, institutional and socio-cultural determinants of girls' performances in STEM subjects (Frey, Botan & Creps, 1999). Data for the research were collected through interview and focus-group discussion which Involved target experiential reflections and organized discussion with teachers, school principles and joint team of both to gain information about their views and experiences (Mathers, Fox & Hunn, 1998).

The preliminary condition for data collection was arranged through communication of the research purpose and development of mutual understanding with participants. For this purpose, Adama Woreda Education experts working with proximate secondary schools were consulted. Through the esteemed experts, four schools: Three public schools and one private school were purposively selected. These included Goro Preparatory School, Goro General Secondary School, Adama Number 4 Primary School, and Nafyad Secondary and Preparatory School. From each school, one principal and two to four female STEM Teachers were selected as data-providers.

The principals were contacted through interview which was scheduled for two hours, and female STEM teachers through focus-group discussion which took two hours to the average. Participants' interview and FGD accounts were recorded and taken note of, based on which due transcription was made. In the transcription process, careful selection was made on issues thematically set. Then, coded categories were made under each team to analyze the data.

Presentation and analysis of data

The presentation and analysis of data for this study were held based on pre-identified themes. The themes were so identified in order to typify response units more relevant for presentation and to form response categories for interpretation. Supporting this technique, Ryan and Bernard (2003) assert themes to be possibly drawn from data or the writers' theoretical underpinnings. So, the data presentation and analysis followed the understated themes:

Teachers' and principals' perception of girls' STEM performance

Under this theme, two consecutive questions related to teachers' and principals' perceptions about girls' participation and factors triggering poor performance in STEM subjects were presented. In response to the questions, the participants of focus-group discussion provided the succeeding comprehensive data:

> Both in number and performance, girls outsmart boys. This is especially true among students of grades 5 and 6 where majority of the top-10 students are girls. They are much better than boys, for that matter. Their participation is higher and they are active when they work in a homogenous grouping because in the mixed group, specifically with males, they are a bit frustrated to participate, and are more likely to be overshadowed (FGD, A-4).

In the set of participants' responses above, it could be plain that, in STEM subjects, girls had better performances where excellence was the point of reference. But, most references were made to the top-ten in ranks, and the situation did not work for most of the students. Moreover, girls happened to outsmart boys in instructional and co-curricular activities attached with STEM subjects whereas boys far excelled girls in presentation. So, the greatest gap was still in girls' assertiveness, as the teachers' perceptions denoted. It is evident in most research works both domestic and international that, girls show minimal success in STEM subjects. In this regard, teachers of the target school were asked to explicate factors related with girls' poor performances in STEM subjects.

The succeeding quoted category of responses was taken from teachers' responses to the focus-group question:

> One of the factors is in-school; that means, the way schools handle students, especially girls as per their conditions as they come to school to learn. Overall, there are students, especially girls, who live with relatives. They serve the relatives with their labor. At times, they are sexually abused even by the so-called relative males. Some of the girls face hazard of sexual abuses. Those who decide to live independently in fear of abduction are also trapped by the drive to get money for which they go out to work in hotels and get drawn to paid sexual commitments. Among the school girls, there are some who have contracted HIV/AIDS. As a result of this exposure, they are alienated from friends. They are stigmatized to the level of

> being evicted from houses they get on rents. They cannot get food even once a day (FGD, GGSS).

From the quoted response above, it could be plain that, students were of diverse backgrounds such that, they were not equally successful owing to the institutional setbacks, that means their failures were backed up by family and socio-economic conditions. Two striking conditions were there to stress. In the first place, girls happened to move to the school areas where they could access, specifically to Adama City. In Adama City, they had to either live with relatives or try their fate by making businesses. To live with relatives had a very big impact on girls because they had to serve all.

Responses to the FGD denoted, there were seemingly male relatives who used girls as sex partners. To escape that form of harassment, some of them decided to learn by renting rooms, thereby working to earn their bread.

That endeavor itself has not been simple. For one thing, the type of work they involved in was against the academic demand they had to cross to succeed in their learning. For the other, they were more likely to be drawn to sex-industry since they had very high exposure to working in restaurants, hotels and bars. That form of exposure stood as the major health hazard to their very existence sanely. So, economic, psychological, and psychosocial conditions of rural girls and urban girls with lower economic standards are the first line barriers blocking girls' achievements.

Reflection from Goro Preparatory School had the inflection that, girls had the higest achievement in terms of ranks, and the overall cohort in STEM also had that reflection. The succeeding lines reflect the principal's experiences:

> In my school/Goro Preparatory School/, the number of girls is higher than boys. Majority of the female students have deep tendency to study natural science rather than social science fields. Besides, the population of students shows that, there are more girls than boys seeing success as grade-levels advance. This reveals that, as the grades increase the girls' participation is increasing from time to time. (Pri.1, GSS).

From the above quoted response, it could be evidenced that, the school had a large number of girls in the Natural Science stream than it does in the Social Science. Moreover, the majority top-10 achievers in the school are girls. So, the impression was that, both in instructional delivery and outputs observed overall, girls had better performance than boys.

Gender-balance in STEM instruction

Regarding gender-balance in the STEM classrooms, teacher participants indicated their experiences in treating students to be positive and inspiring. The responses are referred to as in the lines below:

> In science classrooms, students are equally treated, and girls are more at advantage. We [teachers] support and advise them on how they can advance in their learning. We prepare special practice questions and study-teams for their learning (FGD2, GSS).

In the quoted response above, it was evident that, teachers treated students equally [boys and girls], and that, the amount of care was stated to have been more to the females' advantage. Special treatments were also stated to have been given in the form of material and spiritual supports. Moreover, special guides and leading questions were given to all students but more to the advantage of girls. Since the teachers were from STEM subjects, the type of treatment was unquestionably STEM-based. The teachers also denoted that, they encouraged girls to ask and answer questions; to be forefront in presenting project works and lead discussions.

With respect to administrative support to accelerate students' participation and performance in STEM subjects, the principal from Goro Preparatory School had the following to say:

> We have scarcity of female teachers in the natural science fields. We have only two biology teacher and one mathematics teacher. However, all the three female teachers work with female students more effectively and closely. They also arrange tutorial classes to support students in general and female students in particular. We have established girls' clubs to facilitate female students' involvement. The students stay on campus the whole day to use library and laboratories. To give a tutorial, we select teachers and offer lessons usually on Saturdays (Pr1., GSS).

While the school works to its might to initiate girls in STEM, scarcity in science teachers, especially female teachers, was said the most striking of all. Perhaps, the school had a very interesting experience of attracting teachers from different schools. But, parallel to the rising number of students, and students' interest to join the STEM subjects, the number of teachers is still lower than expected.

More positively, boosting tasks were reflected in terms of clubs, open climate for library use the whole day, and week-end classes. But, week-end classes are less probable for rural students since they move back to collect their rations.

Teachers' co-curricular roles in supporting girls in STEM classrooms

Regarding their co-curricular roles to boost girls' STEM performances, teachers explicated that, their focus was to instructional delivery to the most. It is evident in the teaching-learning process that, the teacher's roles are three-pronged: Handling the subject-matter well, presenting in a clear and participative manner, and considering individual

differences during instruction (Rosenshine, 2012). In line with this, participants gave their experiential accounts as under:

> We largely focus on teaching. When the school gives us special assignments, we arrange female-clubs and science club in which we play facilitative roles. Where there is female-oriented induction training in the school, we are partaking. Perhaps, as teaching staff, since we see students' problems from proximity, we also arrange remedial strategies for those who are needy, especially girls (FGD1, A-4).

In this quoted response, the participants indicated their roles to have been highly instruction-based, order-driven and prescriptive. Their roles were highly instructional since they reflected their experiences from the point of delivering instruction, where the term "teaching" was repeatedly traced. The other point was that, they went on supporting students on the basis of roles and orders from departments. That implied their roles to have been order-based or driven. Doing what was given as per the arranged task-share was the additional issue which largely meant responding to given task-assignments than actively engaging. Simply stated, as the participants indicated, they were not duly empowered to take the case of girls STEM involvement and performances to themselves and support in a proactive manner.

The participants denoted a term "female-oriented induction" to refer to what gender issue appeared like in the school, which they indicated to have been *their share in the order*. The progressive part was that, they attended to students' cases from proximity [near], and adjusted make-up conditions for students on the whole, and girls to the most. So, special supports were to all the needy where emphatic advantage was taken to girls.

Teachers' model-role for female students in STEM

Teachers indicated that, they worked as models by doing certain instruction-based and co-curricular activities. They also indicated their model input in terms of advising students to be courageous in STEM learning. By far, they had the impression that, they were very near to the girls in their provisions more, though they were also providing for boys. They stated that, in club activities they inspired girls by giving them special guides and supports where necessary so that, the latter could have access to do and inquire more. The succeeding quoted response bears the detail:

> We work as models in lesson-delivery. We also play roles in forming and leading clubs, arranging contributive supports for those low in purse, give material supports, advisory supports and telling their own examples of success. We also provide supports for students according to their backgrounds. As per their backgrounds, students belong either to urban or rural settings. Their conditions also vary as per their life events. So, female teachers act as social role-models besides academic. In that case, about 400 students, most them females, get advisory supports (FGD1, A-4).

Female teachers' model action is reflected in their teaching, and arranging science clubs, which is highly led by girls. They also take the credit for the leading role of girls to their guides and encouragement. But teachers gave supports spontaneously or intuitively rather than thinking and getting in advance. So, their model provision was in an action-reaction form. Actually, female teachers had motherly contributions for girls in schools since they understood the situation of girls in socio-economic situations. The term "background" in the quotation was a point of high concern in the model support teachers had since it had direct appeal to the nature of handling students which highly demanded care on the part of the school and the community. So, they had a positive mediation and remediation role.

The principal of Goro Preparatory School stated that, the school had female teachers in STEM subjects. Female teachers' distribution across subjects was disparate. In that, the school had biology and mathematics teachers. The teachers are committed to supporting female students. They are members of the girls club. The female teachers plan tutorial and prepare a worksheet for the students. They are performing with a good stand, by attending their regular class, consistent personality in terms of their approaches to girls and dressing.

Teachers' remedial supports to girls in STEM subjects

In their responses, teachers indicated their having instructional, managerial and counseling supports among others.

> Besides arranging clubs, we encourage girls by providing practical activities. We also act as exemplary and spearhead for girls' learning as they act on their managerial roles by organizing and working out the physical and psychological setup. We, actually, reach a few since it is hard to reach all who are needy. Though there are specifically stricken females, majority of the students, both boys and girls, are needy (FGD2, GGSS).

Teachers the impression that, they had instructional supports by providing guiding questions besides lesson-based notes. That could be taken as one breakthrough to girls' STEM learning setbacks. But, besides that cognitive set, they did not indicate any other means of identifying students' inclinations, preferences and reflections on their success in STEM. Conditions were also dictating for teachers to give a holistic support since there were

as many needy boys as girls at average achievement level, and the classroom composition, in number and inflections, was also large. In that scenario, they tilted to girls but gave supports to all. Most of the supports were traced to be science-based but the teachers preferred not to split that into specifics.

Implementation of gender strategies in STEM classrooms

This point was addressed in reference to clubs, supportive guides, advisory roles, and special tutorials or remedial given to females (girls). The participants' responses denoted the succeeding points:

> Gender strategies work in terms of subject-specific clubs and holistic life-skills. The subject-oriented clubs involve different supportive exercises which students learn with across subjects, wherein attention given to STEM subjects. As in subject learning, girls excel in their club-participation as well. In life-skills, they are given social advisory supports on how to manage in-school and out-of-school pressures to succeed in their education. Top-achievers are also rewarded on a special occasion arranged with woreda education office. Such supports are inspirational since they initiate students to work hard, and they are more so for girls (TP, NYSS).

The teachers reflected that, gender strategies had the form of specify in terms of subject streams, and generality in terms of social skills. Though girls may have had different social pressures in learning STEM subjects, social skills induction provided in schools did not have direct appeal to the problems. Even clubs were arranged for holistic purpose, wherein girls were said to excel boys. In reality, girls were said in most of the responses to be excelling but the ultimate aim of gender strategy goes far beyond excelling ones.

The social skills largely focused on push and pull factors. The push factors dealt with non-inviting instructional situations which could easily driven girls into boycotting, not complying with assignments and going out with "friends". That trend, in steps, could lead to going to entertainment rooms and other maladaptive situations. Where the classroom pushes girls out, the maladaptive environment easily breaks the shell and snatches students.

So, generic life skills could be viable in that accord. That type of induction does not, however, make students' success in STEM complete. Rather, it becomes essential to relate co-curricular supports, whatever their form or essence, with the subject-matter, pedagogic and psychological demand at the specific level.

Mechanism of improving girls' classroom participation and achievement

Regarding this theme, the teachers' reactions went to vertical and cross-sectional concerns in science education. Vertically, students were said to be well-handled and

courageous to come up with dependable skills in STEM, armed with skills on studying the STEM subjects.

In the cross-sectional realm, taken the official and project-based support with high credit, both the schools and education offices work with the community. This point is taken as an existing question, an urge even to this point. Further reflections given by the participants are stated as under:

> Community members need to get training and education to facilitate girls' education. In-depth attention needs to be given to shape the community's misconceptions on girls' science learning as something beyond capacity, since science-learning is widely believed to be for boys. Though there are proportionally higher rate of female-success models in science learning, as they go higher in learning, girls face challenges from parents and peers. So, attention be given to their progresses on the basis of society-wide induction (TP, GGSS).

The teachers' reactions denoted necessity to educate the community to iron out misconceptions about girls' STEM success. To that point, girls' success in sciences and manual operations were said to be underlined without any actual delimitation experienced by the girls. So, in order to break the cult of blindly asserting girls as weak and non-fitting for learning science, there was suggested induction training. Society-wide inductions were also said to be in place in order to improve societal view of girls' education overall, since there are invisible forces in the society which, still, detain girls in their education, with respect to forcible early marriage, abduction and other forms of sexual abuse. Society-wide induction was earmarked for that purpose.

RESULTS AND DISCUSSION

In line with the above core themes of analysis, the findings were discussed. So, this part of the research presents results and discussion.

Results

The school culture is inviting for girls as well as it does for boys but their upcoming style has a lot of pressure on their active role to perform as well as boys. Though most girls excelled in STEM subjects, the rate was very minimal when it came to number. Negative economic determinants were found to have belittled most school girls' efforts to achieve in STEM subjects.

Girls' competence in STEM subjects is a part of their overall endeavor, not that much of the initiation from other bodies other than schools since there are no further inputs for girls' STEM performances from families and supportive institutions right at instructional levels. All things are to the generic. So, both institutional and managerial determinants have

had bearing effects. To illustrate more, most of the assertiveness actions taken by institutions and offices concerned with women and youth affairs are delimited to seasonal awards to outsmarting boys and girls. In that, there are no tracking initiations as girls achieve on progress.

Both socio-cultural and spatial determinants have effects on girls' STEM performances. In terms of socio-cultural conditions, attention given to girls' learning in general and science learning in particular has very minimal attention on the part of the parents and the community since they leave all matters to the school. Spatially, rural students are less-benefitted when compared with urban ones. It was evidenced that, while striving to achieve best, some academically active girls in secondary schools lagged owing to lack of supports.

Family income level comes to affect girls' achievements differently as well, where those who can afford different technological resources excel those who cannot, to the level of creating disparity in their use of time. That comes with a *digital* divide denoting disparity among people which comes as a result of uneven use of technological resources, which creates barrier on those who are less-served (Moore, Vitale & Stawinoga, 2018).

Evidences from teachers' experiential reflection indicated some girls to have been busy on extra-time working while learning, which subsequently made them feel overburdened and hopeless. In that, girls undergo conditions of holding some small businesses with which they cover some personal expenses. To do that, they spare their time for reading and completing assignments. When they fail to complete assignments, they are easily ridiculed to the extent of dropping schools. The same challenge is confirmed to be pressing girls hard to succeed in learning, as underlined in King and Winthrop (2015) that, girls mostly lag behind boys owing to failure to cover their school expenses.

There are also conditions when girls coming from remote rural areas and obliged to live with relatives to have hostage are subjected to labor and sexual abuse. Consequently, they either interrupt lessons or leave their relatives' hostages to which effect they are forced to live as laborers. That situation subjects them to being paid sex workers in the early youth age.

Science Clubs, tutorials and related supports are given across all schools but what matters much and needs care, in this regard, is holding programmed arrangements to enrich girls' performances in STEM subjects, the overall support being in place.

The existing cohort of excellence in STEM is to the ranked students, who have relative standing of better success in their performances. But, two conditions need attention here.

In working with key stakeholders, the tradition in most schools is reactive rather than proactive. Evidences are that, they work on solving created problems and attained achievements. There are rare cases of paving conditions for preventive action and performance-activation mechanisms. So, this research must be informatively used for schools and the key stakeholders such as District Education Offices, and Women and Children's Affairs.

Discussion

In line with the research questions and analysis held to come up with findings, determinants of girls' performances in schools related with individual, institutional and socio-economic as well as socio-cultural situations. Although girls outsmarted boys in achievements and overall performances in science and mathematics subjects, the overall proportion of high-achieving girls was very less.

In that sense, the likely determinants of girls' holistic engagement in learning STEM subjects could be related, first, to individual determinants. These could be manifested in the form of negative self-concept in learning subject-areas. In that, some of the students get aloof assuming STEM achievement to be a birth rite only to a few who are created for success. The other individual determinant is lack of peer and staff modeling at inter-personal level as a result of failure to value how others managed to learn.

At this point, it becomes essential to discuss what is referred to as "upcoming style" in order to make the issue clearer. Girls experience family-based pressure to work on house-chores after school. That is common among Ethiopian families. Moreover, girls are over-controlled from moving out to study after classes, as there is doubt that, they may be exposed to peer- pressure and get ill-disciplined. The overall reflection is on the fact that, family educational backgrounds, community engagement in schools to support girls with deep awareness and the arrangement of time for study at home and at schools are indicators of institutional determinants.

The ranking situation also alarms girls' excellence which works only for a few. To the majority, girls are under-achievers when they are considered as a group. The antecedent factor was that, most of the school-girls, especially those coming from low income families and rural areas are forced to get involved in small businesses after school in order to cover certain expenses. In that, a few girls' excelling in STEM subjects does not show generalizability in achievement.

Supports from other institutions than schools in order to boost girls' performances in STEM subjects were also limited both in extent and coverage. In extent, they were limited to only high-achieving students, and in coverage, they were provided by a few institutions in a non-consistent manner. Even in schools, the supportive programs were too general to be responsive to girls' needs overall. So, institutional limitations were determinants of high pressure.

Some school girls faced shortage of economic base to support their education. In that, they were forced to spare a lot of their time on businesses which could bring them income to cover expenses in house rent and food. As a result, they happened to lag behind others in their education. So, the socio-economic situation appears to be a striking factor on girls' success in STEM subjects. This corresponds with Tsegay (2014) who underlines family socio-economic situation and distance from school to have negative impacts on girls' performances at school. The result also concords with Owuor and Musani (2016) who assert family poverty levels, low level of bursaries and ignorance of resources available to affect girls' education negatively.

Challenges are also paramount as related to parents' low concern for girls' education and sexual harassment in and out of schools. These are a part of the socio-cultural pressures which pull girls back from their achievements in their education in general and in STEM performances in particular.

CONCLUSION

In line with basic questions of the research, individual, institutional and socio-cultural determinants were the key issues of explication. The conclusion section deals with these three by far. In the first place, there were individual determinants related to students' personal failure to work on STEM subjects which was might be related to their prior academic backgrounds. That was evident from the limited number of girls excelling in STEM subjects, especially the ranking ones. The rest majority were asserted as average and below. The other personal determinant was teachers' tendency to provide general supports for all students with the assumption that, girls could be benefitted from that.

The point, however, was that, there were reports about girls who could not attend opposite-shift classes and weak-end tutorials due to the reality that, they had to work on their provisions on week-ends. The fact that, there were a few role-models as there were a few teachers providing STEM; that point constitutes the third determinant. Programmed visits to

nearby the university to get lessons from STEM instructors was a progressive part of the enrichment program for model achievers.

The institutional determinants were in not being able to provide for the needy students who were not able to afford some technological demands and related school materials. In that, there were both formal and informal determinants as related to schooling and community engagement. The formal determinant was from shortage of supplies on the part of schools and related supportive agencies in terms of learning materials, uniforms, computers and financial backup for those who cannot pay for rental fee. On the informal side, school-community partnerships were given little attention as implied from the participants' reactions. Rewarding high-achieving students alone would help little when it comes to the holistic cohort in achievement. The other institutional determinant was in the nature of experiential exchange among schools to boost girls' instructional benefits from other schools. Such programs were not underlined in the participants' reactions by far.

Socio-economic determinants were also traced in the form of negligence on harassment, heavy workload leading school girls to quitting schools and lack of attention to support those in need. Across the target schools, most attention was given to supporting those who were able to achieve by themselves as popular figures.

With respect to mechanisms to handle gap in girls' STEM success, schools were said to have been arranging tutorials and remedial to recap missing lessons and boost students' endeavors. However, there were no any special arrangements for girls in STEM classrooms.

SUGGESTIONS

As in the public schools, it would be good if private school teachers get different short and long-term trainings (Halsey, Harland & Springate, 2007), since both have been working on cultivation of STEM skills across schools. So, both the school owners and the education offices need to give attention to teachers' skill-based inductions.

Laboratory setups and technicians should also be arranged and employed in large numbers in order to demonstrate hands-on skills across schools. Secondary school management bodies need to ascertain the existing needs for the realization of technical task-force across school labs to that effect.

In order to minimize the gaps between private and government schools, especially between boys and girls, girls themselves (Mosatche, Matloff-Nieves, Kekelis & Lawner 2013), and urban and rural school-settings, Ethiopian ministry of education and Oromia

Education Bureau need to devise a working platform for holistic progresses and enrichment on STEM.

School community and the public at large must be given awareness-raising seminars and training opportunities (Lopez, Rocha, Chapman , Rocha , Wallace, Baum , Lawler & Mothe , 2016) in order to have wide vision about girls' performances at secondary schools in general; and, more emphatically, on how to boost efforts on STEM performances.

ACKNOWLEDGEMENT

I am grateful to school teachers and principals who cooperated to avail during the interview and discussion sessions without reservation. Not only availing; they were also highly providing for the success of this work. It would have been too much tiring had it not been for their kind supports. I am also thankful to Adama District education experts for their professional supports in arranging conditions for data collection.

REFERENCES

Addisie M. & Singh, S. (2021). Women's Participation and Factors Affecting their Academic Performances in Engineering and Technology Education: A Study of Ethiopia. Retrieved from: https://doi.org/10.3390/su13042246.

Aemiro Tenaw. (2018). Factors Affecting the Academic Performance of Female Students at Higher Education. *Global Journal of Humanities and Social Science: G-Ling and Education*, Vol.18 (2), pp.2-5.

Ampousah, K.D.; Ametefe, J. & Mensah, F. (2013). Factors Affecting Female Students in their Performances in Science in Selected Colleges of Education in Ghana. *Global Research Journal on Mathematics and Science Education*, Vol.2(1),pp.1-24.

Donkor, A.K. & Justice, D.K. (2016). Girls' Education in Science: The Challenges in Northern Ghana. *Journal of Education and Social Policy*, Vol. 3(1), pp.82-96.

Fasika Tadesse, Ashenafi Zewdie & Temesgen Dagne. (2015). Factors Affecting Female Students' Academic Achievement in High School: The Case of Aberuswolkite School in Ethiopia. *American Research Journal of Humanities and Social Sciences*, Vol. 1, Issue 4, pp. 23-28.

Frey, L.; Botan, C. & Kreps, G. (1999). Investigating Communication: An introduction to research methods. (2nd ed.) Boston: Allyn & Bacon.

Halsey, K.; Harland, J. & Springate, I. (2007). Increasing Capacity in STEM Education: A Study Explaining the Potential for a Fellowship Program. *National Foundation for Educational Research.* Retrieved from: https://eric.ed.gov/?id=ED502392.

He, L . (2018). Female Underrepresentation in STEM Subjects: A Study of Female High School Students in China. Retrieved from: https://scholar.uwindsor.ca/cgi/

King, E. M., & Winthrop, R. (2015). Today's Challenges For Girls' Education. Retrieved from: https://www.brookings.edu/wp-content/uploads/2016/07/todays-challenges-girls-educationv6.pdf.

Lopez, C. A.; Rocha, J.; Chapman, M.; Rocha, K.; Wallace, S.;, Baum, S.; Lawler, B. R. & Mothe, B. R. (2016). Strengthening STEM Education through Community Partnerships. Retrieved from: https://www.ncbi.nlm.nih.gov/ .

Mathers, N.; Fox, N. & Hunn, A. (1998). Trent Focus for Research and Development in Primary Health Care: Using Interviews in a Research Project. Trent Focus. Retrieved from: http://simmons.edu.

McNally, S. (2020). Gender Differences in Tertiary Education: What Explains STEM Participation? Retrieved from: http://www.eenee.de/eeneeHome.

Miji, A. & Makgato, M. (2006). Factors Associated with High School Learners' Poor Performance: A Spotlight on Mathematics and Physical Science, *South African Journal of Education*, Vol. 26(2), pp.253-266.

Moore, R., Vitale, D., & Stawinoga, N. (2018). The Digital Divide and Educational Equity : A Look at Students with Very Limited Access to Electronic Devices at Home. *Insights in Education and Work.* Retrieved from: https://files.eric.ed.gov/fulltext/ED593163.pdf.

Mosatche, H. S. , Matloff-Nieves, S. , Kekelis, L. & Lawner, E. K. (2013). Effective STEM programs for adolescent girls Three Approaches and Many Lessons Learned. Retrieved from: https://files.eric.ed.gov/fulltext/EJ1003839.pdf.

Musau, L.M.; Migosal, J. & Muola, J.M. (2013). Determinants of Girls' Performances in Science and Technology Subjects in Public Secondary Schools in Kenya. *International Journal of Educational Administration and Policy Studies*, Vol. 5(3), pp. 33-47.

Ngesu, L.; Wachira, L.; Mwelu, B. & Nyabisi, E. (2012). Critical Determinants of Poor Performance in KCSE among Girls in Arid and Semi-Arid Regions in Kenya, *Journal of African Studies in Educational Management and Leadership*, Vol. 2, No.1, pp.63-70.

Ngeno, V.Ch.; Simatwa, E.M.W. & Sol, D.Ch. (2013). Determinants of Girl Students' Academic Achievement in Mixed Day and Borading Secondary Schools in Kericho District: An Analytical Study. *Educational Research*, Vol. 4(7), pp.543-544.

Owuor, D. & Musau, Ch. E. (2016). Economic Factors Affecting Girls' Academic Performance in Mixed Secondary Schools: A case of Nakuru Municipality. *European Journal of Contemporary Economics and Management*, Vol. 3(1), pp.77-111.

Rosenshine, B. (2012). Pricniples of Instruction: Research-Based Strategies that All Teachers Should Know. *American Educator*. Retrieved from: https://www.aft.org/sites/default/files/periodicals/Rosenshine.pdf.

Rutto, J.Ch. & Mulwa, A. (2019). Factors Influencing Performance of Girls Education Projects in Narok East Sub-County: A Case of Selected NGO-Sponsored Projects.

International Journal of Information Sciences and Project Management, Vol. 3(5),pp. 141-164.

Ryan, G. & Bernard, H. (2003). Techniques to Identify Themes. Field Methods. Retrieved from: https://www.researchgate.net/publication/241176170._

Sewagegn Molla. (2021). Improving Female Students' Participation and Academic Performance: Ethiopian Technical University, *Global Journal of Guidance and Counseling*, Vol. 11, Issue 2, pp. 110-118.

Tsegay Alem. (2014). Socio-Economic Determinants of Girls' Schooling Achievement in Tigray Region. (A Case in Hintalo-Wajerat Woreda). Retrieved from: https://opendocs.ids.ac.uk/.

Yeshimebrat Mersha, Alemayehu Bishaw & Firew Tegegne. (2013). Factors Affecting Female Students' Academic Achievement at Bahir Dar University, *Journal of International Cooperation in Education,* Vol.15, No.13, 135-148.

Yohanna, J. & Muhammad, H.B. (2022). Location and Gender as Determinants of Students' Academic Performance in Agricultural Science in Zariia Education Zone, Kaduna State. *International Journal of Innovative Science and Research Technology*, Vol. 7, Issue 2, pp. 95-99.