

By

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MWANZA SECONDARY SCHOOL

SUB-THEME: SCIENCE, TECHNOLOGY, ENGINEERING, ARTS AND MATHEMATICS (STEAM) AND LEARNING

Abstract

This paper seeks to analyze the impact of Science, Technology and Innovation (STI) clubs, on performance of secondary school students. The study focuses on Mwanza Secondary School. The study will look at the experiences, challenges and success stories of the school. The year 2018 saw the introduction of STI Clubs in most secondary schools of Malawi including Mwanza Secondary School. These clubs were spear headed by Dr. Chomora Mikeka who is currently the Director of the Department of Science, Technology and Innovation. The Department now works with the Department of Innovation and creativity in the office of the president and cabinet, which was established in November 2020 by His Excellency, Dr. Lazarous MCathy Chakwera, The President of the Republic of Malawi. Through these initiatives, Mwanza secondary school's performance, especially in science subjects improved and more students are currently being selected to public universities. The club helps equip all science students with the necessary skills and knowledge to solve various problems in their community through innovation and creativity. These innovations are fostering the achievement of the pillars of Malawi 2063 and the Malawi Recovery Plan. Since 2018, the club has participated in four National School Sciences Fair hosted by Kamuzu Academy. Currently, on October 2023, Mwanza secondary school registered one of its innovations, "Antifungal lotion", with the Innovation and Engineering Hub of the Malawi University of Science and Technology (MUST-MIIRI).

SCIENCE, TECHNOLOGY AND INNOVATION (STI) CLUBS AND THEIR IMPACT ON STUDENTS' ACADEMIC PERFORMANCE.

INTRODUCTION

Science clubs have always been present in Malawian secondary schools since the Dr. H. Kamuzu Banda era. They play a big role in the education of students from primary to secondary education. Extra-curricular activities (ECA) outside normal classroom hours can help schools to promote learning and overcome barriers to learning (Cadwallader, Garza & Wagner, 2002). As such, the term extra-curricular activity (ECA) is similarly used in this study to include study support and Senior Science, Technology and Innovation (SSTI) clubs which is the focus of this study (Im, Hughes, Cao & Kwok, 2016; Nuffield Foundation, 2016; Donnelly et al., 2019). SSTI club in the

then when?" (Dr

Chomora Mikeka,

2018)

context of this study is framed as an after-school activity designed to provide extra support to students by promoting their interests in learning to enhance their social, emotional, moral, cultural, and academic development (Tseng et al., 2020). In Malawi, SSTIC clubs, align with [The Ministry of Education \(MoE\) in Malawi which has the following mission statement: “To equip students with knowledge, skills and values to be self-reliant, and to contribute to national development.” The ministry aims to promote education in Malawi irrespective of race, gender, ethnicity, religion or any other discriminatory characteristics](#) (MoE, 2017). This is centred on promoting extra-curricular activities to enable students to stay safe and healthy, enjoy and achieve, make a positive contribution to their learning, and achieve economic well-being so that students can realize their full potentials (Cheminais, 2007). Extra Curricula Activities can provide improvements in various aspects of the educational experience including fun and healthy activities, personal attributes, skills development, confidence, self-reliance, self-esteem, initiative, resourcefulness, loyalty, and academic performance (Im et al., 2016; Nuffield Foundation, 2016; Behtoui, 2019). These outcomes are attributed to its inherent social capital (Behtoui, 2017). The club helps equip all science students with the necessary skills and knowledge to solve various problems in their community through innovation and creativity. The students, especially girls, have become more motivated and confident to pursue sciences unlike in the previous years. At the same time, they are able to solve various problems in their community including issues of technology, food preservation and value addition as well as health.

LITERATURE REVIEW

Mtunda and Safuli (1985) argued that “It is important to note that real learning occurs when pupils are given first hand experiences”. Science clubs mostly offer various hands on activities that engage students and spark their interest. It can be argued that a structured SSTI club can make Science, Technology, Engineering and Mathematics (STEM) or science interesting to students as it can develop non-academic skills and attitudes towards the subject, Magaji, Ade-Ojo & Bijlhout 173 International Journal of Instruction, July 2022 • Vol.15, No.3 application to real-life situations and help shape students’ views of science (Gonsalves, 2014). SSTI club provides the opportunity for students to develop skills that can have a positive impact on their academic achievements. Bekomson et al. (2020) conclude that participating in such activity promotes social, academic, language, and moral efficacies as a collective gain, and encourages teachers and school leaders to create the opportunity for students to engage in activities that will promote such skills. It can also promote curiosity and an enjoyable learning environment (Tseng et al., 2020). In the same vein, Wade-Jaimes, Cohen & Calandra (2019) assert that SSTI club can promote inclusive learning, STEM skills, using

scientific equipment, and help make connections between science and students' interests by influencing their views of science. Activities in SSTI club develop students' attitudes that are more predisposed to academic study and promote their long-term goal and opportunity to develop a network with others, as it influences their educational aspirations. The nature of the skills identified as a product of SSTI club underscores their potential for encouraging educational achievements. For example, although developing networks with students, teachers, and other people involved in SSTI clubs' activities have also been considered as a strong element in promoting socialization and connecting with the larger community of learning (Ginosyan, Tuzlukova & Hendrix, 2019; Tseng et al., 2020; Buckley & Lee, 2021), these skills are also seen as having the potential to help students transition from secondary to university education especially for navigating issues of social and cultural imbalances. A more direct link between SSTI clubs' achievements and academic development is provided by McVee et al. (2017) who found that an after-school engineering club created the opportunity for a hands-on activity for children who are English language learners and supports the children in constructing knowledge, bridging the gap on language, culture, or gender, and especially promoting social interactions. The outcomes of SSTI clubs are, therefore, not solely academic but can be a mixture of academic and non-academic skills.

BACKGROUND HISTORY

In August 2020, the Government of Malawi established the Directorate of Science, Technology and Innovation (DSTI) whose first Director is Associate Professor Chomora Mikeka. The Directorate is within the Ministry of Education to give policy direction in all aspects of Science, Technology and Innovation in Malawi.

Also under the Ministry of Education is the Parastatal named the National Commission for Science and Technology (NCST), an apex body to implement the STI Policy according to the dictates of the 2003 Science and Technology Act. The Commission works with all stakeholders to promote STI in Malawi while implementing the programmes as conceptualized to be beneficial for economic growth and development. The NCST principally provides Science and Technology (S&T) advice to the Government and other stakeholders on all matters related to science and technology in order to achieve a science and technology-led development. It derives its authority from the Minister responsible for Science and Technology to ensure that it reaches out to highest levels and all sectors of social and economic development in the country. The NCST secretariat started its operations in December, 2009.

The STI clubs also get support from the Department of Innovation and Creativity in the office of the president and cabinet, which was established in November 2020 by His Excellency, Dr. Lazarous MCathy Chakwera, The President of the Republic of Malawi. It has supported various innovations through sponsoring of competitions, scaling and patenting. The department was created as a strategic solution of accelerating the use of innovation and creativity of achieving different pillars of the Malawi 2063 and the Malawi Economic Recovery Plan.

In 2018, Associate Proffessor Chomora Mikeka, who was then working with the University of Malawi-UNIMA (recently called Malawi University of Business and Applied Sciences –MUBAS) in collaboration with the MoE introduced the SSTI club to Mwanza secondary school. Mwanza secondary school adopted the initiative and the traditional science club became known as Mwanza Senior Science, Technology and Innovation (MnSSTI) club. Although many factors can be attributed to students’ performance, the club has played a big role in improving student’s performance exponentially as more students are also making it to various public universities.

GENERAL OBJECTIVE

To analyze the impact of SSTI clubs on students’ performance.

SPECIFIC OBJECTIVES

1. To analyze the impact of SSTI club on students’ attitude towards science.
2. To analyze the trend in students’ performance from 2018 to 2023.
3. To analyze the impact of SSTI club on students’ university selection.

ACTIVITIES, CHALLENGES AND SUCCESS STORIES

The aim of the study is to analyze the impact that SSTI clubs play in improving students’ performance. The study population involved Mwanza secondary school students.

Previously known as Mwanza science club, Mwanza SSTI club was an improvement on the traditional science club. It was more active since there was support from the Department of Science, Technology and Innovation under the Ministry of Education, Science and Technology (MoE). The members were equipped with guidelines and strategies on how to run the clubs more effectively. Appendix A on page 10 and Appendix B on page 17 shows these guidelines from the DSTI under MoE. One is for senior clubs and the other for junior clubs respectively.

In 2018, Associate Professor Chomora Mikeka, conducted a sensitization campaign around the country with the Ministry of Education. This involved conducting an audience with students and patrons on various issues concerning the SSTI clubs. Members of the clubs were also sensitized on innovation, creativity and technology. During that time, Mr. Trevor Mtsekwe was the Head of Sciences Department and Patron for the Mwanza SSTI club. With the support of the school administration, the club became very active and had many activities that involved students' participation. This is still the case for the academic year 2023/24 with the current school Principle, Mr. Henry Saka and his Deputy, Mrs. Ida Chitsukwa who are still fully supporting the initiative.

The presence of SSTI clubs in schools affects performance as evidenced by previous studies. Mwanza SSTI club conducts several activities with the students so they become motivated and inspired to pursue sciences and become future innovators, creators and entrepreneurs. These activities are as stipulated in the DSTI's SSTI and JSTI guidelines. Some of the activities include;

- Science fair competition within the school and at national level. Mwanza has participated in four National competitions hosted by Kamuzu Academy since 2018. Currently, on October 2023, Mwanza secondary school registered one of its innovations, "Antifungal lotion", with the Innovation and Engineering Hub of the Malawi University of Science and Technology (MUST) for patenting. The Institute of Industrial Research and Innovation (MIIRI) at MUST, involved various secondary and primary schools in the project.
- Conducting experiments for concepts that are difficult for students to understand.
- Group discussion on various challenging topics. These groups are called study circles. Students are given academic work to discuss and teachers supervise.
- Conducting remedial lessons by involving expert teachers and resource persons.
- Conducting projects that involve student's innovations to everyday problems in the community.
- Conducting science debates and quiz.
- Teaching computer skills to students.
- Offering motivation talks by resource personnel.
- Science trips and excursions so they have a hands on experience on how some science concepts are applied to the real world.

RESULTS OF THE STUDY

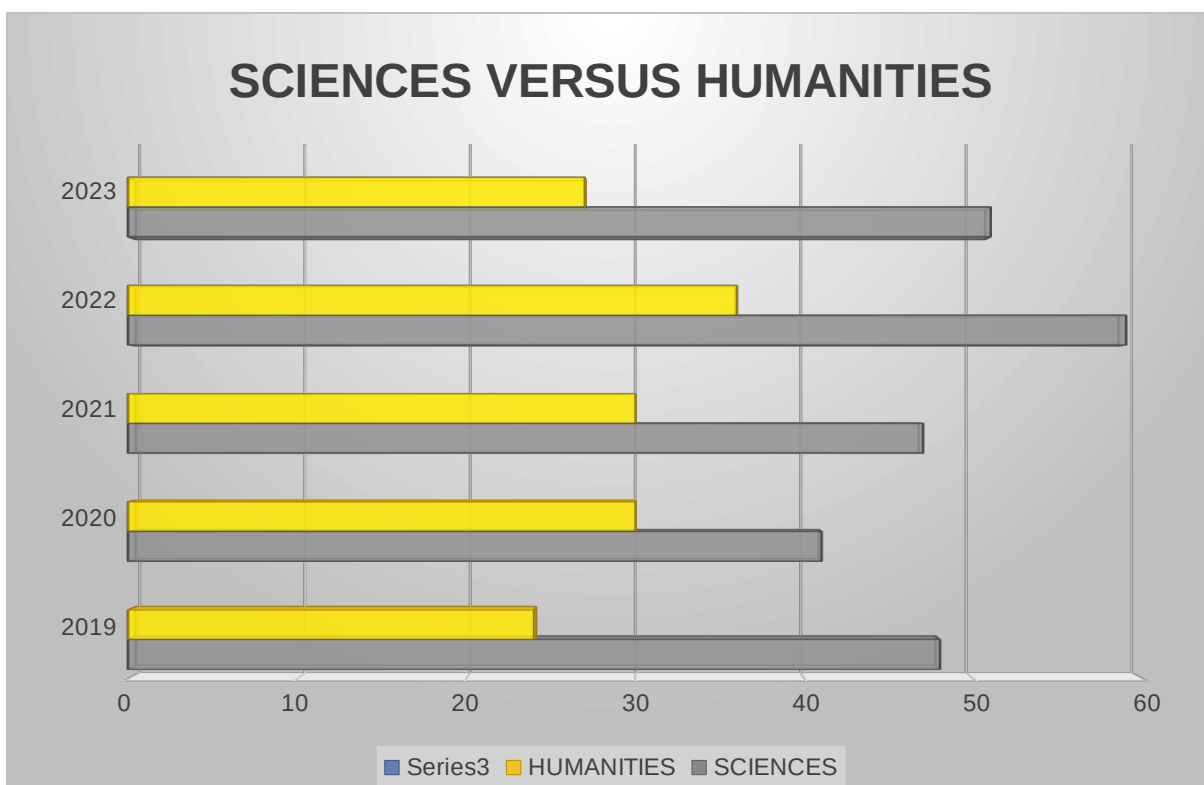
1.0. Analysis of the impact of Mwanza STI club on students' attitude towards science.

At the beginning of secondary education at Mwanza secondary school, form 1 and form 2 students take all subjects being offered. By default, they all attend SSTI club meetings and take part in its various activities. Since the introduction of the new curriculum, when the students reach form 3, they are given the chance to choose from **TWO** routes; the pure **Sciences route** (physics and chemistry) or take the **Humanities route** (Geography and History). Although this is the case, all students are recommended to take English, Biology, Agriculture, Mathematics and Chichewa by compulsory. Over the previous years, most students preferred the Humanities route as compared to the pure Sciences route. Most students commented that it was way much easier than the sciences. Currently, with the introduction of the STI club, the trend has changed and most students are taking the Sciences route. Most girls have also started having a positive attitude towards science which most once perceived as difficult and only meant for boys.

In general, students' attitude towards the science subjects has improved over the years. This can be attributed partly to the activities of the science club which has motivated many students to pursue science subjects.

In general, current data shows that more students are pursuing sciences (Physics and Chemistry) than those pursuing humanities (Geography and History) at Mwanza secondary school.

The graph1. Shown below shows the number of students taking Sciences versus those taking humanities from 2019 to 2023.



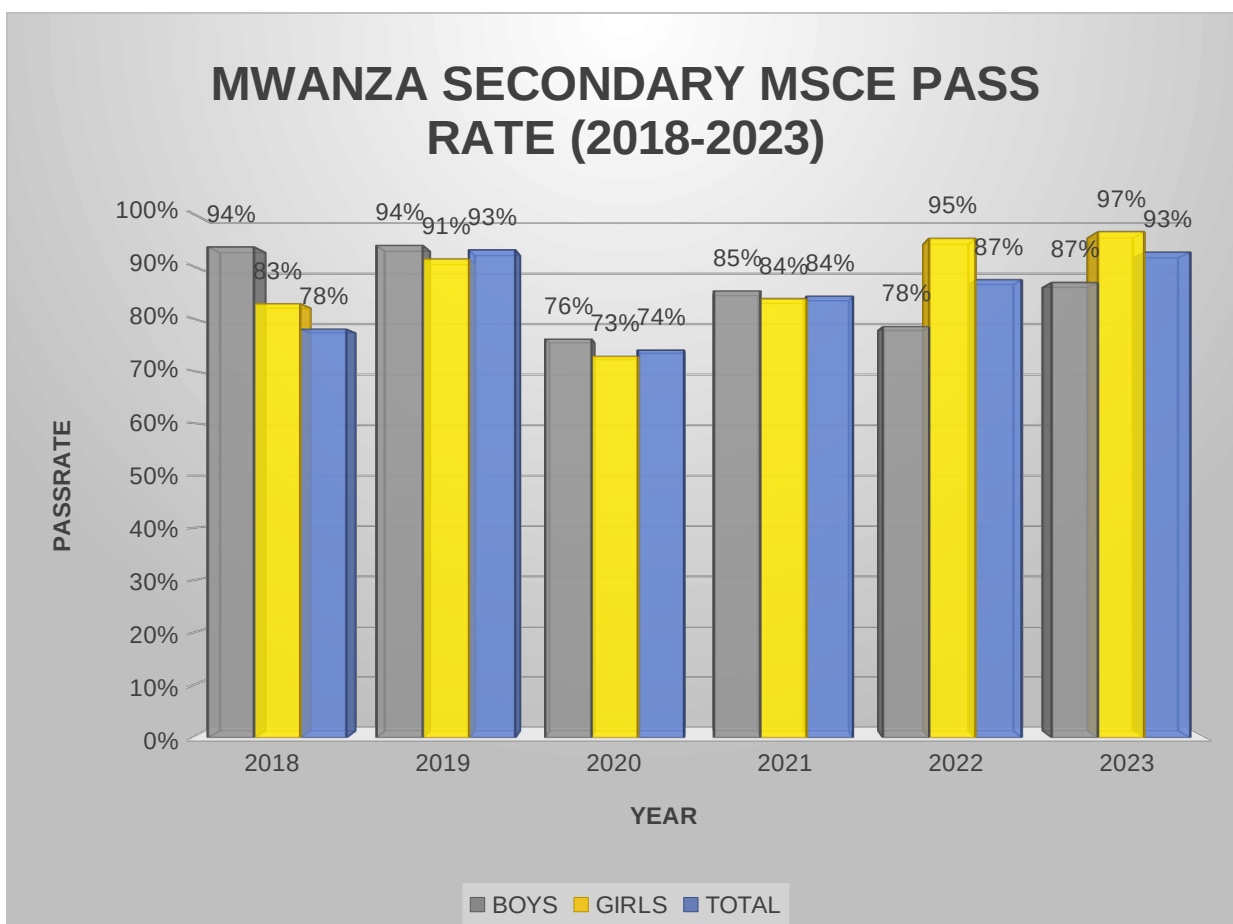
Graph 1. Mwanza secondary Sciences versus Humanities students.

2.0. Analysis of the trend in students' performance from 2018 to 2023.

Ever since the traditional science club was rebranded to become a SSTI club, the school's performance at MSCE has improved. An analysis of the MSCE results over the years shows evidence that supports role the SSTI club has played in improving students' performance. There is a large improvement in the MSCE pass rate over the years.

Currently in the 2023 MSCE results, the Highest Student at Mwanza secondary school is a girl with **10 points**. She was also taking Sciences.

The graph 2. Below shows the performance of students in MSCE exams at Mwanza secondary school for the years 2018-2023



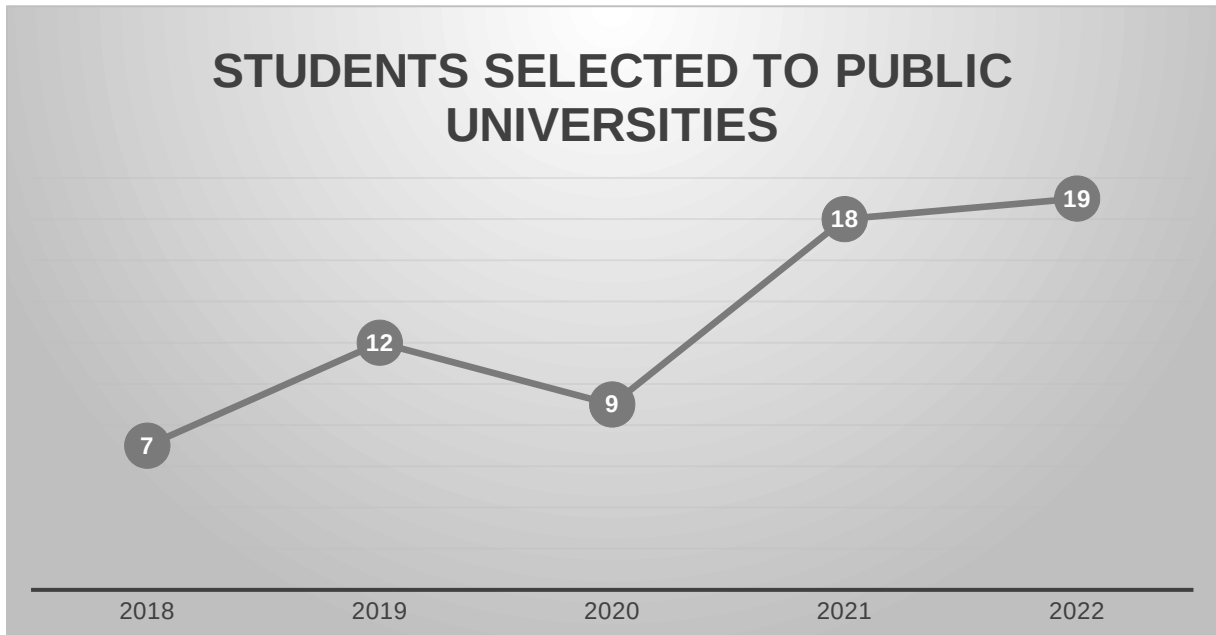
Graph 2. Mwanza Secondary School MSCE results 2018-2023.

From the graph shown, the pass rate increased at first in 2019 from 78% in 2018 to 93%. Due to the COVID pandemic, the pass rate dropped in 2020 as classes were disturbed and the SSTI club activities were suspended as gatherings were banned. After resumption of the club activities, the pass rate of girls has improved from 73% in 2020 to 97% in the year 2023. On the other hand, Boys' pass rate has increased from 76% in 2020 to 93% in the year 2023. The overall performance of the school has also improved from 74% in 2020 to 93% in 2023. This evidence supports the theory that SSTI clubs have contributed to the improvement in the academic performance of the students.

3.0. To analyze the impact of Mwanza STI club on students' university selection.

As more students are pursuing sciences, they are also being enrolled in more science related courses in various public Universities. Over the years, the number of students that are being selected has improved with more girls being selected as well.

The graph 3. Shows the trend of students being selected to various public universities from Mwanza Secondary school since 2018 to 2022.



Graph 3. Students selected to public universities from Mwanza Secondary School.

From the data shown in all the three graphs, the major challenge faced by Mwanza SSTI club was during the COVID pandemic. All club activities were postponed and students were working in isolation. This is part of the reason why the performance dropped in 2020.

Another challenge faced by the club is lack of funding to perform some important activities like local science fairs, educational trips and some science experiments. Most students come from poor economic background and therefore fail to contribute for some of the activities like trips, this means some are left out.

CONCLUSION

The study has shown that Secondary School Science, Technology and Innovation (SSTI) Clubs have a positive impact on students' academic performance. They also help equip students with the necessary knowledge and skills to improve their communities with innovation and creativity. This eventually has an impact on the country's economic recovery plan as more communities will become economically

independent through business, agriculture and entrepreneurship. The health status of the communities will also improve as more indigenous herbs are being discovered which are easily accessible.

RECOMMENDATIONS/WAY FORWARD

1. More sensitization campaigns are required across the country in order to orient more schools, including Private, on the impact of SSTI clubs on academic performance. In Mwanza alone, only two schools are more active in Science, Technology and Innovation as evidenced by their activeness in the National School Science, Technology and Innovation fair. There also need to orient the schools on the DSTI guidelines for running the SSTI clubs.
2. SSTI clubs need more support from various stakeholders. Currently, there is still support from the Ministry of Education (MoE), Directorate of Science, Technology and Innovation (DSTI), the National Commission for Science and Technology (NCST), the Department of Innovation and Creativity (DIC), Kamuzu Academy, Malawi University of Science and Technology-Institute of Industrial Research and Innovation (MIIRI), TEVETA, Press Trust, Lab Enterprises and other organizations. Although that is the case, more investors and sponsors are needed if innovators and creators/inventors are to be identified and supported across Malawi. This will enable Malawi to achieve its Malawi 2064 goals and the Malawi Recovery Plan.

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APPENDIX A: SENIOR SCIENCE, TECHNOLOGY AND INNOVATION (SSTI)
CLUBS GUIDELINES



MALAWI GOVERNMENT

MINISTRY OF EDUCATION

**DIRECTORATE OF SCIENCE, TECHNOLOGY AND
INNOVATION**

**GUIDELINES FOR THE ESTABLISHMENT OF SCIENCE
TECHNOLOGY AND INNOVATION CLUBS IN SECONDARY
SCHOOLS IN MALAWI**

NOVEMBER, 2022

**GUIDILINES FOR THE ESTABLISHING AND OPERATION OF
SCIENCE, TECHNOLOGY AND INNOVATION CLUBS IN SCHOOLS
IN MALAWI**

1.0 INTRODUCTION

Over the years, science clubs have been effective tools for promoting awareness of Science, Technology and Innovation (STI) amongst students in the education system world over. Science clubs offer students the chance to do science-related activities that extend and enhance the science they experience in the classroom; help students to explore areas of science not covered by the curriculum; gives them opportunities to do practical science; and orient and educate them on concepts and newer developments in the field of STI.

It is in line with this that the Ministry of Education (MoE) through Directorate of Science, Technology and Innovation (DSTI) embarked on the capacity building program on the application of science, technology and innovation in schools. One of the activities in this program is to facilitate the establishment and operationalization of Science ,Technology and Innovation (STI) clubs in schools.

These guidelines therefore outline the methodological and operation framework to be followed when establishing these STI clubs in schools in Malawi.

2.0 PURPOSE

The purpose of the STI club shall be to promote learning, application and utilization of science and technology and innovation amongst students.

3.0 AIMS

The following shall be the aims of the club

- a) Organize club meetings.
- b) Encourage interest in learning of science, technology and innovation amongst students

- c) Encourage interest in the application of science and technology and innovation amongst students
- d) Improve performance of STI subjects amongst students
- e) Encourage the participation of female students in STI subjects
- f) Encourage students to pursue STI carrier path
- g) Enhance collaboration and networking with other STI clubs

4.0 ACTIVITIES

These clubs will among others perform the following activities:

- a) Promote awareness for STI among school going students;
- b) Offer students to apply science concepts they have learnt in class;
- c) Conduct debate on STI matters
- d) Offer opportunities to explore areas of STI not covered by the curriculum.
- e) Builds the capacity of students to use locally available materials to develop technologies that can be used to improve the lives of people in the communities that they are living in.
- f) Offer students remedial classes of the work covered in the curriculum

5.0 NAME

The club shall be called by the name of the school.

6.0 MEMBERSHIP

- a) Membership of the club shall not be denied to any learner on the basis of race, religion, gender, political affiliation or physical handicap.
- b) Membership shall be limited to learners.
- c) People giving outstanding service to the club such as parents, teachers, club alumni may be voted in for honorary membership.
- d) Any member may use club facilities and equipment on such conditions as determined by the executive committee.

7.0 EXECUTIVE COMMITTEE

The Executive committee shall be as follows:

- a) Chairperson
- b) Vice Chairperson
- c) Secretary
- d) Treasurer
- e) 2 ordinary members
- f) Club patron-Ex official member

8.0 DUTIES OF THE EXECUTIVE COMMITTEE

The duties of executive committee members shall be as follows:

Chairperson

- a) Presiding over all meetings of the club.
- b) Official spokesperson of the club.

- c) Representing the club in school activities and other related events

Vice Chairperson

Presiding over meetings of the club in the absence and upon request by the Chairperson.

Treasurer

- a) Handling of all financial matters of the club.
- b) Maintaining books of accounts.
- c) Presenting financial reports during scheduled meetings

Secretary

- a) Taking minutes during club meetings.
- b) Records keeping
- c) Preparing agenda for meetings in collaboration with the chairperson
- d) Managing attendance register
- e) Publicity of the club activities

Patron

- a) Giving guidance and direction in activities of the club.
- b) Updating management of the school on all STI club activities.

9.0 FINANCIAL MATTERS

- a) The club shall be responsible for determining the annual membership fee which shall be approved by school management.
- b) The income and expenditure of the club shall be applied solely towards the objectives of the club.

- c) In the event that the club has disbanded, all assets shall be the property of the school.
- d) The club shall be involved in income generating activities
- e) The club shall also source funds from well-wishers like parents, club alumni and other donors

10.0 DISCIPLINE

- a) The club shall abide by the rules and regulations of the School.
- b) The executive committee shall handle all discipline matters.

11.0 MEETINGS

General meetings shall be held to:

- a) Club meetings shall be held once a week
- b) The executive committee shall meet once every month

12.0 ELECTION OF EXECUTIVE COMMITTEE

- a) Committee members shall be elected once every school year at the beginning of each academic year.
- b) All committee members shall be available for re-election for a maximum of two terms
- c) Any member is entitled to be elected as a committee member.
- d) The patron shall preside over the elections
- e) In the event an elected committee member is unable to fulfil his/her term of office, there shall be a "Special Election".

13.0 ROLE OF THE DIRECTORATE OF SCIENCE, TECHNOLOGY AND INNOVATION

- a) Providing support and guidance to clubs
- b) Monitoring and evaluating the performance of clubs

APPENDIX B: JUNIOR SCIENCE, TECHNOLOGY AND INNOVATION (JSTI) CLUBS GUIDELINES



MALAWI GOVERNMENT

MINISTRY OF EDUCATION

DIRECTORATE OF SCIENCE, TECHNOLOGY AND INNOVATION

GUIDELINES FOR THE ESTABLISHMENT AND OPERATION OF JUNIOR TECHNOLOGY AND INNOVATION CLUBS (JST) IN SCHOOLS IN MALAWI

MARCH 2020

GUIDELINES FOR THE ESTABLISHING AND OPERATION OF JUNIOR SCIENCE AND TECHNOLOGY CLUBS IN SCHOOLS IN MALAWI

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activities that extend and enhance the science they experience in the classroom; help students to explore areas of science not covered by the curriculum; gives them opportunities to do practical science; and orient and educate them on concepts and newer developments in the field of STI.

It is in line with this that the Ministry of Education (MoE) through the Directorate of Science, Technology and Innovation (DSTI) embarked on the capacity building program on the application of science technology and innovation in schools. One of the activities in this program is to facilitate the establishment and operationalization of Junior Science Technology and Innovation (JSTI) clubs in schools.

These guidelines therefore outline the methodological and operation framework to be followed when establishing these JSTI clubs in schools in Malawi.

2.0 PURPOSE

The purpose of the JSTI club shall be to promote learning, application and utilization of science and technology and innovation amongst students.

3.0 AIMS

The following shall be the aims of the club

- a) Organize club meetings.
- b) Encourage interest in learning of science and technology and innovation amongst students
- c) Encourage interest in the application of science and technology and innovation amongst students
- d) Improve performance of STI subjects amongst students

- e) Encourage the participation of female students in STI subjects
- f) Encourage students to pursue STI carrier path
- g) Enhance collaboration and networking with other JSTI clubs

4.0 ACTIVITIES

These clubs will among others perform the following activities:

- a) Promote awareness for science and technology and innovation among school going students;
- b) Offer students to apply science concepts they have learnt in class;
- c) Conduct debate on STI matters
- d) Offer opportunities to explore areas of science, technology and innovation not covered by the curriculum.
- e) Builds the capacity of students to use locally available materials to develop technologies that can be used to improve the lives of people in the communities that they are living in.
- f) Offer students remedial classes of the work covered in the curriculum

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- e) In the event an elected committee member is unable to fulfil his/her term of office, there shall be a "Special Election".

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- a) Providing support and guidance to clubs
- b) Monitoring and evaluating the performance of clubs