# UGANDA SESEMAT PROGRAMME: IMPACT AND CHALLENGES IN ITS IMPLEMENTATION

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**ABSTRACT**

The Secondary Science and Mathematics (SESEMAT) programme has been recognized as an effective tool in enhancing the quality of teaching and learning science and mathematics in secondary schools. The SESEMAT programme was introduced in 2005 with the purpose to improve the teaching ability of science and mathematics teachers at secondary level; and to improve performance in those subjects. The main objective of the study was to assess the impact of the SESEMAT programme on science and mathematics in Uganda; a case study of Jinja district located in Eastern part of Uganda. It also found out the challenges of implementing the SESEMAT programme. However, the study focused mainly on fifteen secondary schools out of the 26 secondary schools in the district and the period under consideration was 2009-2013. The researcher used a descriptive cross sectional survey, where data was collected at one point in time from a cross-section of respondents. This was useful in the study because it involved collecting data from a relatively large number of respondents from various schools in the district. Primary data was collected mainly through in-depths interviews and self-administered questionnaires instruments. Both quantitative and qualitative analyses were employed on data collected from 135 respondents.

The findings show that, the SESEMAT programme had the greatest impact on: improved teachers and student's attitudes towards science and mathematics; improved the performance of students in the national examinations; and has developed/promoted practical teaching as thought by; as thought by the respondents respectively. The study also discovered most challenges hindering the programme as: Time consuming; inadequate science/ instructional materials; and high enrollment of students in class respectively. The researcher recommends the policymakers, development partners and the government through the MoES to ensure that, there is right balance of the teaching staff within a department; that the level of resources provided for teaching is sufficient; reduce the teacher student ratio/ decongest the classes; and finally recommends prospective researchers to assess the role of secondary science and mathematics education in industrial and technological development; and a similar study to be conducted in other districts with a large sample for comparison of the findings.

***Key Words: SESEMAT Programme; In-Service Training; Universal Secondary Education***

## 1.1 Background to the Study

The progress report on Secondary Science and Mathematics (SESEMAT) Teachers' project (as per 16th July, 2008) points SESEMAT as a joint venture between the Uganda government through Ministry of Education and Sports, and the Government of Japan through Japan International Cooperation Agency (JICA) initially on pilot basis. The SESEMAT Project is mainly involved in In-Service Training (INSET) of Serving

Teachers of Mathematics and Science in Secondary Schools in Uganda. It came into being when the consistently poor performance in Mathematics and Science (Biology, Chemistry and Physics) became a matter of serious concern. Broad curricula, lack of facilities and inadequate staffing were always cited as the major causes of the problem. Although dismal performance in these subjects had almost been accepted as the norm in some schools, the Ministry of Education and Sports (MoES) and other stakeholders felt there had to be an intervention; Hence, the introduction of Secondary Science and Mathematics (SESEMAT) Project. This is because science and mathematics play a major role in many areas such as banking, business, engineering, technology research, medicine, manufacturing and industry, Jerry, (2002).

Furthermore, the Ministry of Education and Sports, (2008) report; states that over the years the Government of Uganda has made interventions to see that the performance in science and mathematics improves at secondary school levels through: building new laboratories and renovating the existing ones, supplying laboratory equipment, chemicals and science text books to schools, giving an incentive of extra ten thousand Uganda shillings to science and mathematics teachers, recruiting more science teachers, establishing of Teacher Resource Centers (TRCs), introducing computer science and ICT skills to both teachers and students.

The programme was then piloted in the districts of Butaleja, Tororo, and Masaka, where significant positive impacts were observed after the implementation. The purpose of the Programme was to improve the teaching ability of Science and Mathematics teachers at secondary level and the overall goal was to improve performance in those subjects. With the Government's science policy and the Universal Secondary Education (USE), there was need to retool the teachers concerned. The contents and activities of the INSET were based on the issues and topics established by the baseline survey that was carried out by Ministry of Education and Sports (MoES), Kyambogo University in November 2004 and the National Trainers in 2005 under the auspices of JICA. Three cycles of INSET for the pilot phase both at the national and district levels have been accomplished, Ministry of Education and Sports, (2008).

Each of the cycles have addressed specific topics and issues from the aforesaid surveys with three (3) specific themes. These themes were: Positive attitude to enhance quality teaching and learning of Science and Mathematics; Strengthening Hands-on and Minds-on activities to enhance the teaching and learning of Science and Mathematics while that for the third cycle was Actualization of ALEI/PIEI Principles to enhance the quality of teaching and learning of Science and Mathematics.

After one year of the SESEMAT inception, 38 non-pilot districts applied to the MoES for the national extension of the SESEMAT activities in which Jinja district was inclusive. The MoES had no objection and the proposal was officially approved by the Government of Uganda and supported by Government of Japan. The joint evaluation on the pilot SESEMAT activities that was conducted by officials from the MoES and JICA in February, 2007 confirmed positive impacts on the attitudinal change of teachers, improved pedagogy and administrative/parental support. The Ministry of Education and Sports, (2008), observes that; the SESEMAT project captured a strong attention to most of secondary schools and districts in Uganda for her unique methods of teaching and learning of Science and Mathematics. The successful implementation of the pilot project contributed to formulation of the expansion pilot phase that was implemented in August 2007, Ministry of Education and Sports, (2008).

### 1.2 Statement of the Problem

There is a widespread concern about the outcomes of science and mathematics education at ordinary level (O-Level). For example, the representatives of industry say that they need more high-grade scientists, technicians, and engineers if the country is to compete successfully in technology-intensive global markets, Ryan, (2003). The Secondary Science (Biology, Physics, and Chemistry) and Mathematics (SESEMAT) Programme was introduced in 2005 in Uganda to address the then poor performance or failure rate in these subjects at O-Level. A number of teachers and stakeholders have been exposed to this programme through training and workshops with the aim of producing better qualified teachers who can impart scientific and

mathematics knowledge and skills through hands- on and minds- on activities in a constructive learning environment. Birgen, (2004) states that despite the explosion of trained teachers in the last decade, the outcry on the poor performance in mathematics and sciences have persisted year in and year out. This finding is in agreement with the country's situation where there has been public outcry over the dismal students' performance in science and mathematics at secondary school level over the years; as reflected by the Uganda National Examinations Board (UNEB) since 1980 to date. Njuguna, (1998) notes that; it had already been observed that schools in Africa had failed to adequately provide the needed scientific and technological manpower for development. The failure in these subjects has however, continued to be reported in O-Level national examinations in spite of this programme. Thus, in this study; the researcher seeks to establish whether the SESEMAT programme has made an impact on the subjects in question in Jinja District.

### 1.3 Objectives of the Study

i. To assess the impact of the SESEMAT programme in Jinja District.
ii. To find out the challenges faced by science and mathematics teachers in implementing the SESEMAT in Jinja district.

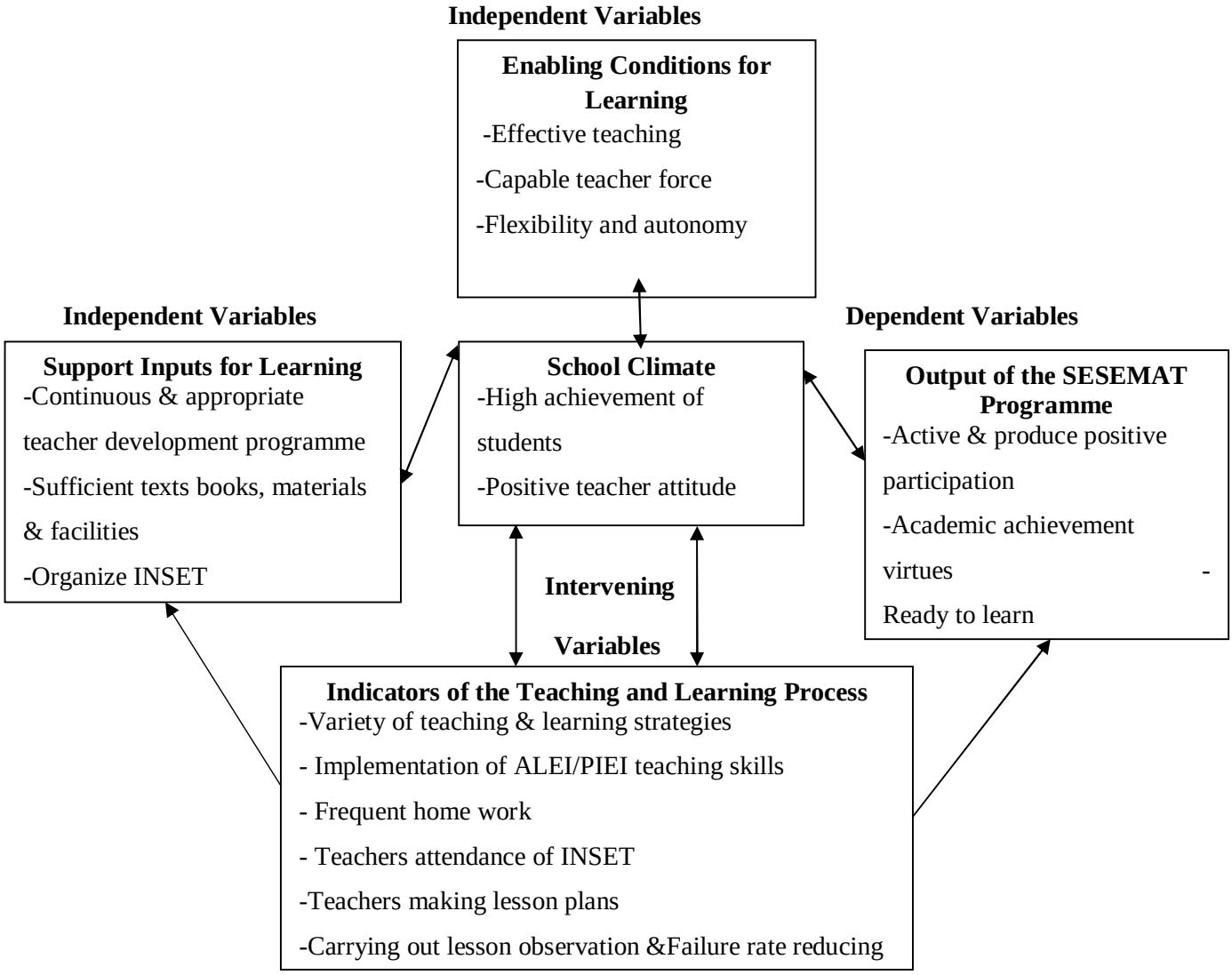
### 1.4 Significance of the Study

The study will be useful to scholars, policy makers, practitioners and for staff and student as a reference material on issues of the SESEMAT programme implementation. Secondly, the study findings would be beneficial to future researchers and policy makers in education. Academically, since there was few country studies conducted on the SESEMAT programme; the study would supplement the existing pool of knowledge or literature in the area of education in Uganda and could be of great value. Furthermore, the study findings would provide monitoring and evaluation information about the SESEMAT project implementation in the country. Finally, the findings may also be used by other stakeholders like the Donor countries, relevant NGOs' and academicians in public and private sector in policy formulation/management decisions on education and administration planning.

### 1.5 The Conceptual Framework

From Figure 1, the independent variables were the teaching and learning experiences carried out in the science and mathematics classrooms and the dependent variable was the ability of the learners to understand and conceptualize the subject matter, the indicators were the improved performance in science and mathematics, less supervision, use of ALEI/PIEL lesson plans by teachers, teachers' willingness to be involved in school activities, acceptance of making lesson observations and critiquing each others' lessons and attending INSETS.

**Figure 1: The Conceptual Framework for Implementation of SESEMAT**




*Source: Constructed from the Reviewed Literature, 2013*

## 2.0 Literature Review

### 2.1 The Impact of the SESEMAT Programme

A background in science enables students to quickly learn and understand how things around them work. The SESEMAT programme has the significant impact at ensuring that student acquires the best in science. The following were the impact of the SESEMAT:

Since the implementation of the programme in August 2005, the teachers who have consistently undergone SESEMAT training have shown a positive attitudinal change towards their professions and improved their lesson delivery. The students have also improved participation in the lessons as suggested in the SESEMAT progress report, July 2008. In addition, Kuhn, (1989) states that, some writings on science education have acknowledged that there is tension between inducing students into a structure of agreed and essentially impersonal knowledge and the personal and social values associated with education and schooling. But this insight has been sporadic and has not influenced teaching significantly in some schools.

Significant work has also been conducted on the ways in which classroom communication, and particularly talks, can be used to support students in coming to understand scientific content, Ogborn, et al, (1996); Mortimer & Scott, (2003) and Erduran, (2004). This evidence shows how teachers can use different patterns of talk for different teaching purposes. It can be used while working with individuals, small groups or whole classes, and can help achieve aims such as introducing new ideas or supporting learners to use newly-introduced content for themselves.

Driver, et al (1994) suggests that usable tools for addressing difficulties in science and mathematics have been developed. The insights that come from the research do not lead to simple prescriptions of 'what works' and what science teachers should therefore be made to do. But research can inform science teachers as they plan how to tackle difficult content in a way that their students understand, and can help guide their conversations with students during teaching. There are now scientific calculators and Bisectional kits/sets materials available for teachers to support them in teaching some of these difficult areas as proved by research evidence. Driver, et al (1994) further states that' there is an exciting future agenda in developing and evaluating research evidence approaches to teaching other parts of the science curriculum. .

The high demand from stakeholders towards INSET; the compulsory Science at secondary level; and the necessity of quality enhancement in USE and establishment of continuous in-service training has called for national expansion of the SESEMAT activities. This implementation commenced in August 2008 and ran for three years in which 2,500 teachers in addition to the 2,508 already trained were targeted. Furthermore 180 tutors of Science and Mathematics at Primary Teachers Colleges (PTCs) and 30 lecturers of the same subjects at National Teachers' Colleges (NTCs) were provided with training as suggested in the SESEMAT progress report of July 2008. There is very strong empirical evidence that some of the fundamental concepts on which scientific understanding is built are commonly misunderstood by learners, and that there are patterns in the difficulties that they experience. For example, when first encountering explanations of the behaviour of simple electrical circuits consisting of components connected in series, many learners use a source-consumer model inappropriately, with the result that they can't accept that the current is the same at any point in the circuit, Shipstone, (1985).

Furthermore, a review of the research literature has shown that there is very clear evidence that formative assessment has led to significant improvements in students' test scores, that is; their attainment as measured by summative assessment, Black, (1998). In the past, science teachers in particular have been discouraged from adopting this approach to assessment. Formative assessment has been explored and developed with teachers who tried various approaches as part of their normal classroom work as added by, Black, (2003). A two-year programme showed that teachers found the SESEMAT programme improved their teaching and raised students' test scores. Similar innovations have been the basis of a development programme for the Ministry of Education in Scotland and of national programmes of study in science in England for Key Stage 3 and even at primary level, Hutchinson, (2005). These developments have involved four main changes that is; the classroom dialogue, interactive feedback on written work, involving students in working in small groups to assess each other's work and making use of the formal tests that teachers regularly apply to add extra value to learning. However, working in this way has led students to become more active participants in their learning and to become more motivated to take learning seriously.

### 2.2 The Challenges of Implementing the SESEMAT Programme

Science and Mathematics are very important subjects in the school system. The study of science and mathematics is compulsory in Uganda today, and anyone who wishes to enroll in any engineering or technology related programmes in the tertiary institution must obtain at least credit level passes in mathematics, as well as physics, biology and chemistry. A credit level pass in mathematics is also required for enrolment into first degree programmes in the social or management sciences including economics. These makes science and mathematics to become indispensable. However, the duo subjects have the following challenges in the implementation:

Inadequate provision of relevant instructional materials militates against effective teaching and learning of science and mathematics. Kalejaiye (1985) submits that; despite Africans' wealth, her educational institutions still suffer from inadequate teaching aids. The author stresses that the present state of affairs where science and mathematics teaching is mainly a blackboard and chalk affair does not make for proper understanding of the subject. The use of appropriate teaching aids is essential for subject matter conceptualization and concretization in mathematics. The SESEMAT has advocated the establishment of mathematics and science laboratories, libraries, in the nation's schools for the effective teaching and learning of science and mathematics without much success.

Poor methodology of teaching seriously affects the understanding of science and mathematics and can lead to fear about the subjects among the students. Lefrancois, (1982) submits that a student may like or dislike school as a result of some classical conditioning procedures. A student may perform brilliantly or poorly in a subject depending on his cognitive capacity, and above all, the instructional methodology. For example, students can develop emotions (attitudes) towards subjects, learning and school as largely as a function of classical conditioning. Lefrancois, (1982) further states that; it is entirely possible to teach students science and mathematics while at the same time teaching them to dislike mathematics. And in many instances, the teacher acts as a conditioning stimulus, dictating how the student should be conditioned over the subject matter being learned. The fact that some presentations of science and mathematics are often perceived as authoritarian, thus arousing resentment on the part of the students has been highlighted by David & Hersh, (1981). The need for better approaches and strategies in science and mathematics teaching has been emphasized by Ojiabor, (2000); Odebode, (2004); Oyodele, (2006) and Osuji (2007).

According to Kalejaiye (1985); poor questioning habits by the students appear to contribute to poor conceptualization and science or mathematics phobia among them. The poor questioning habits arise from culture which makes it difficult for young ones to ask their elders (including teachers) questions freely in Uganda. Young ones are restricted by culture from calling their elders by their names in Jinja, Uganda. The male teachers are called *Sir* while the female teachers are called *Ma* or *Aunty* as a sign of respect for the elders. In some parts of Uganda, young people kneel down while greeting their elders. Kalejaiye (1985) states that the African culture is so dictatorial and conservative that it does not encourage inquisitiveness, a necessary ingredient for the understanding of science and mathematics; the African culture requires one to do what he is asked to do without asking questions.

Lack of motivation for the teachers is a serious problem in the school system. The teachers need to be motivated so that they can in turn motivate the students. Motivation strategies for teachers include prompt payment of salaries, decent accommodation, payment of transportation allowances, in-service training, free medical service, car and housing loans, etc. These factors of motivation appear to be conspicuously absent in the Ugandan school system, *(SCPSC, 2010).*

Jirschhmer et al., (2006) describes constructivist teaching methods as unguided methods of instructions. The authors suggests more structured learning activities for learners with little for no prior knowledge since constructivism is a problematic doctrine that has little benefit for practical pedagogy or teacher education. In addition, many teachers describe the SESEMAT approach as of science and mathematics teaching as time wasting and not very effective to solving challenges.

Furthermore, Bajpai (1984) describes Mathematics as the "queen of the sciences" which is generally viewed with awe by many students who perceive it as a difficult subject, especially in the developing areas. The gravity of phobia which students have for mathematics appears to be quite phenomenal, and this tends to frustrate Ugandas' quest for technical manpower development and industrialization. The developing countries are obviously saddled with developmental problems in virtually every area of human endeavour. These problems find expression more specifically in the training institutions where internationally recognized standards are hardly adhered to. A poor achievement in science and mathematics by students,

however, seems to be global. Deji (2005) cites examples of poor performances and waning interest in mathematics among some students in United States of America, France, Ghana, United Kingdom, Tanzania, Brazil, etc; but the situation in Uganda seems to be very worrisome as students now engage in cheating in order to pass science and mathematics examinations. A few authors have suspected some factors as being responsible for the poor handling of mathematics which invariably leads to fear and poor performances in it among many students in Uganda schools Kalejaiye, (1985) and Amos, (1998). These factors seem to include lack of motivation for the mathematics teachers, inadequate provision of relevant instructional materials, poor methodology of teaching, indifference among the teachers, lack of proper counseling and poor questioning habits among the students.

## 3.0 Methodology

### 3.1 Study Design

The research used a descriptive cross sectional survey, where data was collected at one point in time from a cross-section of respondents. This was useful in the study because it involved collecting data from a relatively large number of respondents from various schools in the district. According to Amin, (2005) a descriptive research is concerned with describing characteristics of an event or item being studied with the aim of providing a systematic description that is as factual as possible. In addition to a descriptive research design, the study further used both quantitative and qualitative approaches for data collection and analysis.

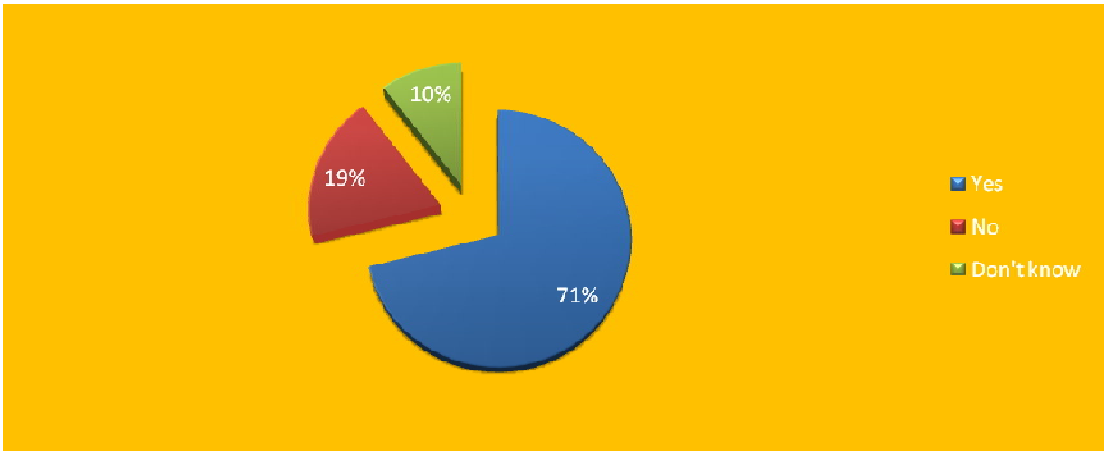
### 3.2 Area of Study

The study was conducted in 15 secondary schools out of 26 schools in Jinja district, Busoga sub-region. This included five (5) schools in urban, five (5) peri-urban and five (5) in rural areas. The district was chosen because of the poor performance of students in science and mathematics in Uganda Certificate of Examination (UCE). The district also had both universal secondary schools as well as the old traditional schools hence the results was a representative of the teaching and learning of science and mathematics in the District. A total of one hundred fifty (150) respondents were expected to participate in the research. These include: 15 Head teachers, 115 teachers, 15 district trainers and 05 district councilors however, one hundred thirty five (135) respondents participated whole-heartedly giving a response rate of 90%. This population was deemed appropriate because it fulfills the requirements of representativeness, efficiency and reliability of the study. Thus, the results of such a sample were a representative of the whole of Jinja District and they were adequately reliable.

## 4.0 Results and Findings of the Study

### 4.1 The Impact of the SESEMAT Programme on Science and Mathematics

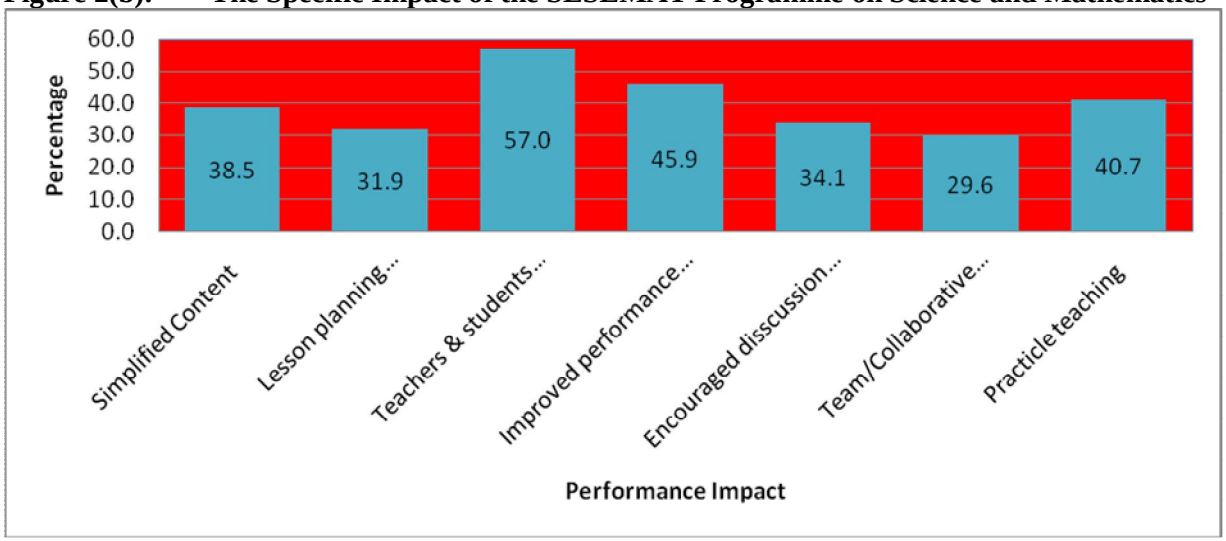
**Figure 2(a): The General views of the Impact of the SESEMAT Programme on Science and Mathematics**




*Source: Derived from Primary Data Analysis of Instrument; April, 2014*

As shown in Figure 2(a) above, 71.0% of the respondents feel that the SESEMAT programme has contributed positive impact on science and mathematics as reflected on the national examination, whilst 19.0% disagreed that the programme has no impact on the subjects in questions. However, 10.0% of the respondents had no stand point which is an indication that, they could have not heard about the SESEMAT programme or not implementing the practice. One female teacher from Jinja SS, says; *"Attitude of mathematics and science teachers toward teaching has been changed positive while interest of students in subjects has also been enhanced."* The findings in conformity with the SESEMAT progress report, July 2008, which says; the teachers who have consistently undergone the SESEMAT training have shown a positive attitudinal change towards their professions and improved their lesson delivery. The students have also improved participation in the lessons.

**Figure 2(b): The Specific Impact of the SESEMAT Programme on Science and Mathematics**




*Source: Derived from Primary Data Analysis of Instrument; April, 2014*

From figure 2(b), 57.0% of the respondents thought that, the SESEMAT programme has tremendously improved teachers and students attitudes towards science and mathematics. This results show that, students and teachers had their own attitudes towards the subjects and attention must be paid to them for the better. While 45.9% of the respondents argued that the SESSEMAT programme has improved the performance of students in the national examinations. This means suitable science and mathematics teaching methods that are compatible to students have been used. *"We have qualified and experienced teachers in the subjects,"* says a Teacher, Jinja SS as he comments on the performance. This study finding is in conformity with Driver, et al (1994) which revealed in their study of Constructing Scientific Knowledge in the classroom that; usable tools for addressing difficulties in science and mathematics have been developed.

As figure 2(b) indicates, the study findings also revealed that, 40.7% of the respondents thought that the SESEMAT programme has developed or promoted practical teaching in schools at the district. This is because practical teaching plays a vital role in increasing the engagement and motivation of the learners, thus the student is able to understand and integrate the subjects' concepts. A Teacher, Jinja SS says, *"We do practicals with our students and even conduct critiquing of lessons… quite good because it enables one to polish up and change."* The author supports that, practical activity is an important factor affecting students' attitudes to science, Walport, et al (2010).

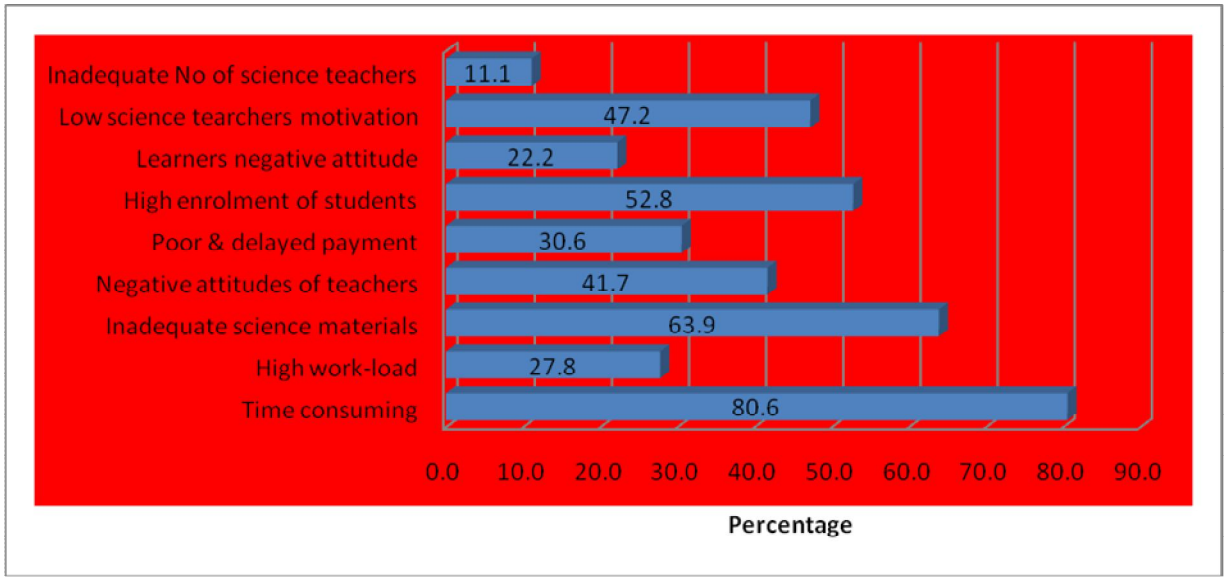
Furthermore, 38.5% of the respondents feel that SESEMAT has simplified difficult content hence easy learning and effective teaching. Here, teachers who attended the in-service training adapted the new teaching approach as compared to the usual they obtained from college/university. Whilst 31.9% of the respondents

agreed that the programme has also enhanced teachers in making/preparing lesson plans. They attributed that; lesson plan enhance the lesson flow, it pedagogically arrange the content to be taught, guides and make teaching easy.

Finally, the SESEMAT programme in Jinja district has encouraged teachers and students in learning science and mathematics through discussion groups as shown in figure 2(b), with 34.1% significant respondents' views. For teaching to be effective, then it must involve interaction between teachers and students as suggested by the findings. Ogborn, et al, (1996); Mortimer & Scott, (2003) and Erduran, (2004) attests with the results because of the views that; classroom communication, and particularly talks, can be used to support students in coming to understand scientific content. While on the other hand, 29.6% of the respondents say teamwork/collaborative teaching has also been encouraged through the SESEMAT programme.

### 4.3 The Challenges of Implementing the SESEMAT Programme

**Figure 3 The Graph showing the Challenges of Implementing the SESEMAT Programme in Jinja District**




*Source: Derived from Primary Data Analysis of Instrument; April, 2014*

Figure 3 indicates the majority of 80.6% of the respondents agreed that time consuming was the greatest challenge hindering the implementation of the SESEMAT programme in Jinja district. Wanyange Girls SS, Teacher says, *"…SESEMAT requires a lot of time on the part of the teacher to prepare adequately."* While 63.9% of the respondents look at inadequate science/ instructional materials to enhance practical teaching as another challenge faced by the programme. In regard to the above responses, the inadequacy of instructional materials has made the teaching and learning of science and mathematics to suffer. The study finding conforms to Kalejaiye (1985) which states that, inadequate provision of relevant instructional materials militates against effective teaching and learning of science and mathematics.

The researcher also found 52.6% of the significant number of the respondents' highlighted high enrollment of students in class. The introduction of Universal Secondary Education (USE) has contributed to massive increase in students' number thus, a problem of classroom space. *"Increase in student's enrollment has not kept pace with the number of teachers and classrooms,"* says one of the District trainers. While 47.2% of the respondents feel that poor/low teachers' motivation which has led to low morale among science teachers. One of the Teachers from MM College Wairaka explains that; *"If teachers are well paid and motivated, they will spend more time teaching and guiding the students."* He further adds that; when teachers are not well paid and motivated, they will spend more time on outside activities as alternative means of survival, thus devoting limited time to teaching. The study findings attest to *CPSC, (2010)* who discussed that, lack of

motivation for the teachers is a serious problem in the school system. The teachers need to be motivated so that they can in turn motivate the students.

In addition, 41.7% of the respondents agreed that attitude of teachers to change from the traditional teaching method to new approach has also contributed negatively to the SESEMAT implementation. *"The school has no time for SESEMAT because it is not time tabled,"* says a Teacher, Holy Cross Lake View SS. Here, teachers look at the science and mathematics curricula as a barrier to prepare students for tests and exams, rather than being able to explore areas in more depth and make time more practical work. This study is in conformity with Walport, et al (2010), who revealed that, the content of science curriculum had become woolly with a lack of focus on real science which failed to equip students with the knowledge they needed for advanced level of study. Whilst, 22.2% of the respondents prescribes the challenge as the learners negative attitudes and perceptions that science and mathematics are difficult and they are meant for boys. Lefrancois, (19827) also admits that, a student may like or dislike school as a result of some classical conditioning procedures, hence, making the results of the study valid.

From the findings, the researcher also found out that 30.6% of the respondents' thought that poor and delayed payment of teachers was also one of the challenges the SESEMAT programme is facing at the district. This has made science and mathematics teachers to leave their profession because of the high demand; however, some find it relatively easy to move between schools in search for better pay and the schools management ends up recruiting non trained teachers. This has resulted in formulaic teaching as unqualified teachers lacked the confidence and ability to stray from textbooks and provide more interesting and challenging lessons. *"The challenges of SESEMAT programme is lack of specialist, motivated teachers to fire enthusiasm of students in mathematics and science,"* says a Teacher, MM College Wairaka.

Finally, the minority of 11.1% of the respondents noted inadequate number of science teachers has partially contributed to the programme challenges. This finding is in agreement with Walport, et al (2010), which revealed that, lack of resources has prevented them from engaging students in science and mathematics. On the other hand, 27.8% of the respondents postulates high work load by teachers which cannot allow adequate lesson planning, see figure 3. A Teacher from Wanyange Girls SS says, *"Many rural schools lack sufficient science teachers and I admit it is possible to find one teacher handling both physics and mathematics from S.1-4."* In such a situation the teacher is overworked and has no time to prepare sufficiently.

### 4.3 Conclusion and Recommendations

#### 4.3.1 Conclusion

Conclusively, science and mathematics share several commonalities in regards to values as well as several challenges. While the position of mathematics is well established with its own logical and approaches, the case of science in schools is rather different. The approaches to science teaching and learning are less widespread and so some of the challenges for developing science education are different from those facing mathematics. This is because science is seen as an essential part of culture and a powerful way of thinking. Therefore, the government should think more seriously about giving more support to the SESEMAT programme if the country is to improve on science and technology.

#### 4.3.2 Recommendations

The SESEMAT programme is considered to be quite relevant and feasible in terms of attaining its overall goal; but in order to expand positive impact in the region and Uganda as a whole, then the following need to be addressed:

The government through the MoES should ensure that, there is right balance of the teaching staff within a department in order to meet the needs of the students. This is because; the most promising students need at least one expert teacher who has deep understanding of the subject such that they can go well beyond the curriculum and inspire the students with higher level of discussions.

The curricula of science and mathematics should be revised in consultation with the subject teachers, Uganda National Examination Board (UNEB) and National Curriculum Development Centre (NCDC). This is because, the subjects (science and mathematics) needs an exciting and engaging curriculum that leaves room for teachers to learn, innovate and allows freedom to adapt quickly to changes. Thus, the content must be up to date in order to fill the knowledge gaps of non-specialist teachers and develop their intrigue in the subjects.

Reduce the teacher student ratio/ decongest the classes so as to enhance effective teaching and learning. This is because; the quality of teaching and learning is a major determinant of students' interest and achievement in science and mathematics. Thus, both teachers and students feel convenient to study in a decongested environment.

There is also need to train and retain more science and mathematics teachers. Here, further training needs to be given to enable teachers to carry out practical. Refresher course should also be ongoing to ensure that teachers remain interested, enthused and able to demonstrate up-to-date knowledge. To add on, there is need to recruit sufficient numbers of teachers with specialist knowledge of these subjects so that they bring the subjects to life; to support and motivate their students so that they may fill their potential. These will also help to reduce the teaching work load.

Good leadership within the school which values the importance of science and mathematics; and promotes its study and a supportive and objective Board of Governors is necessary if the SESEMAT programme is to succeed.

For science and mathematics subjects to be effective, then the government need to ensure that the level of resource provided for teaching is sufficient to enable the delivery of high quality and relevant science and mathematics education. This can be done by ensuring that right people with right skills are place in the job.

Motivate the teachers by increasing and improving their pay and welfare. This is because; a well motivated teacher will persuade the learners to put their interest in science and mathematics subjects. It is also important to bear in mind that, "Motivation is not separable from achievement." Therefore, appropriate incentives such as good accommodation, transportation, free medical service, in-service training should be provided to the teachers in order to motivate them.

The researcher also recommends the government to ensure that, they should set clear rules for the distribution of the SESEMAT programme resources across different regions and schools; by monitoring the outputs and outcomes across schools and regions in order to identify whether there is need to strengthen the performance by increasing support, inspection and specific capacity building.

To engage the civil society organizations in the debate about the direction of the SESEMAT programme. This is because civil society organizations are effective in community participation, empowerment and holding local and national governments and international organizations accountable to their commitments.

The students should become active in the learning process while the teacher should carefully guides the process and there will be more meaningful learning activities in the science and mathematics classrooms. In addition, the researcher strongly urge teachers to interprete the intention of the SESEMAT programme and be able to pass on the objectives as has been planned for the betterment of the learners and the nation at large.

Relevant instructional materials and science laboratories should be provided and appropriate teaching methods should be adopted for the teaching of mathematics to obviate the negative feelings and enhance students' interest in the subjects.

Finally, the government should curb the corruption in the education sector so as to win the heart of the donors and the international agencies. This will enable the donors to increase level of their financial contributions towards the programme.

### 5.3 Areas Recommended for Further Research

The following are the areas the researcher has seen prudent for the future research:

- The researcher recommends prospective researchers to assess the role of secondary science and mathematics education in industrial and technological development.
- Other critical issues for further investigations would include but not limited to; examine the performance of students in science and mathematics in pre and post SESEMAT programme.
- Finally, future researchers should conduct the similar study in other districts so as to compare the findings.

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