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Influence of Science Congress Activities on Secondary School Students' Perception and Achievement in Physics in Vihiga County of Kenya

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Abstract: **The school curriculum consists of formal, informal and non-formal dimensions. Informal dimension is the school environment that influences a learner's behaviour. The common assumption is that participation in non-formal activities enhances perception and achievement in the formal curriculum. However, secondary schools in Kenya tend to emphasize more on formal curricula and non-formal activities (NFA) are given least emphasis. In Vihiga County, participation in non-formal activities has been reported to be as low as 25%, meaning that NFA were neglected and Literature reviewed indicated students' achievement in Physics in the county was low. Physics County mean grade was a D (plain) over the period of 2006 to 2015 and was lower as compared to the national mean grade of C (minus). Objectives of the study were to: establish influence of participation in Science Congress activities on students' achievement and establish influence of participation in Science Congress activities on students' perception. Constructivist theory of learning informed the theoretical framework of the study. The independent variable of the study was scope of participation in Science Congress and dependent variables were perception and achievement. The study population was 1200 Form Four Physics students' and 100 teachers of Physics. A sample size of 311 students and 35 Physics teachers was selected from 114 schools through stratified simple random sampling technique. Instruments for data collection were Student Perception Questionnaires (SPQs) and Physics Achievement Test (PAT). Qualitative data was presented by frequencies, percentages, means and standard deviations. Inferential statistics of correlation and independent t-test were used to analyse data. Descriptive data was analysed by use of thematic categories based on objectives of the study. The results showed that participants of Science Congress had highly significant perception mean scores towards Physics than non-participants. It was concluded that Science Congress activities influenced students' perception and achievement in Physics at secondary schools.**

Keywords: **Science Congress activities; students' Perceptions and Achievement.**

1. INTRODUCTION

Science congress competition is an annual event in Kenya secondary school calendar and is directed by the Department of Quality Assurance and Standards in the Ministry of Education (KIE, 2006). Science congress activities start at school level and winners proceed to sub-county, county and regional and then finally to national science congress competition. During the competition student's present talks and exhibits in the areas of Mathematics, Physics, Chemistry, Biology, Home science, Technical subjects, and Agriculture (KIE, 2006).

Mathematics and science clubs are some of the most popular clubs in the Kenya secondary schools and generally attract science oriented students who aspire to pursue careers in science engineering and technology. The student's presentations are based on science concepts, laws, theories and principles learned in classroom and focus on application of science and technology in solving society problems.

The competitions are judged by teachers at school, sub county and regional levels, however, at national level judges are drawn from the industry and universities. Some of the projects presented in previous science congress activities include: automated multi-story irrigation system; automatic water switch, homemade water recycler, ammonia fertilizer from Sodom apple and bird feathers, mosquito repellent from cypress and cow dug, formula for balancing chemical equations, making soft board from water hyacinth; computerized fishing system; fireless charcoal balls from cow dug and mud, a number line using logarithms, "anthosa" detector-chicken feeding system applying moments of forces, solving surd using logarithms and making briquettes from saw dust and waste paper (KSEF, 2017).

According to (Gonca 2015, 149) there are differences between Science festivals, Science Olympiad and Science Fairs, though both contribute to students' achievement is science subjects. Science Festivals are global phenomena which include small, localized events reaching small groups up to nationwide events targeting millions of participants (Bultitude *et al* 2011, 120-127). Science festivals on the other hand are events that include fairs, exhibitions, science shows, and demonstrations, stage shows, street presentations, workshops, outdoor activities, interviews that reflect the integration of science and technology and enable dissemination of scientific knowledge.

Finally, science fairs are events in which participants share their research findings and innovation with parents, friends, teachers, scientists and the general public and are generally smaller than science festivals. Although, science festivals, science Olympiad and science fairs that taken different forms around the world, they have the same general aims as follows: they contribute to creation of creative ideas by arousing scientific curiosity in human beings, allow people to base their everyday arguments on scientific facts, contribute to positive development of participants' knowledge and scientific studies within various application (Gonca 2015, 151).

Research indicates that student engagement in science competitions or activities in their early years enhances their interest and perception in the science subject and in particular Physics which is perceived as difficult by many learners (Sahin 2013, 205). According to (Brehrendt and Franklin 2014, 237) Olympiad or science competition is a form of non-formal activity and is an effective method to develop students' perception in Physics since it creates authentic opportunities for students to learn regardless of the content area. Researchers note that a strengthened perception in science may easily lead students into science related career paths or establish higher quality scientific literacy. In addition researchers observe that science competitions or Olympiads offer a unique opportunity for students to create connections which help them to understand, develop and enjoy learning.

According to (Behrendt and Franklin 2014, 240) outdoor activities especially science competitions and field trips provide opportunities for students to develop increased perception, greater vocabulary and increased interest in surrounding environment. Other studies have indicated that science competitions boost students' confidence in learning the subject matter and help improve perception (Anderson *et al* 2006, 370).

Research also shows that students are much more confident in meeting academic challenges as a result of participating in science competitions (Whitesell 2015, 450). (Zietsman and Naidoo 1997, 124-250) concur on this finding by providing research findings indicating that understanding of Physics concepts improved when what is taught to learners was related to science competitions.

Science congress activities can easily affect students' perception about the role of science in society, broaden their views about contribution of Physics to society and also increase students' interest about scientists. However, despite the activity being an annual event in the Kenyan secondary school calendar and has been argued to be assisting students to learn Physics, the influence of the science congress activities on students' perception of Physics in Kenya secondary school has not been documented, thus the need of this study.

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2. RESULTS AND DISCUSSION

Influence of Participation in Science Congress Activities on Physics Achievement

This study looked at perception towards Physics arising from science congress activities which is a subsection of science club activities in secondary schools. Table 1 displays membership of students in science congress activities in secondary schools sampled for this study.

Table 1: Enrolment of Students in Science Congress Activities

Category	Membership	Numbers	Percentage (%)
Participants	Yes	155	65
Non-participants	No	60	25
Non-committal	N/I	23	10
Total		311	99

N/I=Not indicated their participation level at all

Table 1, indicates that over 60 per cent of the students sampled in this study participated in science congress competitions while less than 40 per cent did not. These results are contrary to Quality Assurance and Standards of Vihiga County report (QAS Report 2011, 20) which indicated that participation in non-formal activities is on the decline and stands at 25 percent of the total secondary school population in the county. Table 2 shows the summaries of numbers, means and standard deviation for science congress activities participants and non-participants on Physics achievement test (PAT).

Table 2: Mean and Percentage Score of Science Congress Activities Participants and Non-Participants on Physics Achievement Test (PAT)

NFA	Statistic	Participants	Non-participants
Science Congress Activities	Number	161	66
	Mean	18.60	18.12
	Standard deviation	7.49	7.44

Table 2, shows that of the total sample of the study, participants (n = 161) of science congress activities were more than non-participants (n = 66). From Table 2 it is clear that participants and non-participants of science congress activities who had an equivalent performance on Physics Achievement Test (PAT) and performance was below the average of the tool of thirty (30) marks. A difference in the mean scores was tested using independent t-test and no significant difference was found, (t (225) = 0.422, p <.05) between the two PAT scores. This shows that both participants and non-participants of science congress activities fared poorly on PAT. Further, Table 2, still illustrates that despite there being a large number of participants of science congress (n = 161) they still registered a slightly higher mean score (M = 18.60) on Physics Achievement Test (PAT) compared to non-participants who had a mean score (M = 18.12).

These poor results on PAT for both participants and non-participants are consistent with Kenya National Examination Council reports for the years 2006 to 2014 which indicate dismal performance in the subject. These results are in agreement with (Njoroge, Changeiywo and Ndirangu 2014, 10) who observed that students' performance in Physics at Kenya Certificate of Secondary Education (KCSE) is generally poor. This is also consistent with Kenya National Examinations Council reports (KNEC) (2006, 2008, 2010, 2011, 2012, 2013 and 2014) which indicated general poor performance among learners in secondary school Physics.

The study also captured students' perception towards Physics using student perception questionnaire (SPQ). The questionnaire statements were grouped into following classroom practices: Physics marks increased; perception increased; enjoyed Physics and handed in assignments. Table 3 gives the mean, standard deviation and interpretation (IP) of perceived benefits of science congress activities for participants and non-participants on Student Perception Questionnaire (SPQ).

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Table 3: Mean, Standard deviation and Interpretation (IP) of Perceived Benefits of Science Congress Activities for Participants and Non-Participants from SPQ

Statement	Participants(n=161)			Non-participants(n=66)		
	Mean	SD	IP	Mean	SD	IP
1) Science congress has helped me increase my perception of Physics.	3.84	1.15	High	2.92	1.28	Moderate
2) Class work has helped me increase my perception of Physics.	4.00	0.57	High	4.35	0.86	High
3) Science congress has increased my perception to learn Physics.	4.35	0.88	High	3.25	1.22	Moderate
4) Class work has increased my perception to learn Physics	4.21	0.80	High	4.25	0.82	High
5) I like Physics when we do class work	3.80	1.07	High	4.07	0.97	High
6)I like Physics when I participate in science congress	4.03	1.08	High	3.00	1.11	Moderate
7) I feel like a Physicist when I participate in science congress activities	4.25	1.09	High	3.03	1.20	Moderate
8) I feel like a Physicist when I learn Physics in the classroom or laboratory	4.14	0.95	High	4.25	0.86	High
9) I understand the nature of Physics by participating in science congress (how Physics and Physicists work)	4.10	1.00	High	3.03	1.06	Moderate
10) I understand the nature of Physics by doing class work(how Physics and Physicist work)	3.83	1.15	High	4.14	0.89	High
11)All Physics classes should incorporate more class work	3.28	1.39	Moderate	3.57	1.03	High
12) All Physics classes should incorporate more science congress activities.	3.59	1.32	High	3.13	1.19	Moderate
13) I am more likely to hand in Physics assignments when they involve science congress activities	3.47	1.33	High	3.00	1.19	Moderate
14) I am more likely to hand in Physics assignments when they involve assignment in the class.	3.90	1.18	High	3.97	1.09	High
Group Mean	**3.91**	0.69	High	**3.57**	1.05	High

Source: Researcher. **IP**-Interpretation

From table 3, it is evident that the overall group means of participants (M = 3.91, SD = 0.69) and non-participants (M = 3.57, SD = 1.05) were above the questionnaire average mean score of (M = 3.00). The discrepancy between participants' perception group mean score (M = 3.91, SD = 0.69) and non-participants' perception group mean score (M = 3.57, SD = 1.05) was found to be significant, (t (225) = 2.87, p <.05).

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From Table 3, it can be noted that participants of science congress activities had "high" perception on all statements of student perception questionnaire (SPQ) with exception for the statement all Physics classes should incorporate more class work which had a moderate perception towards Physics subject. The non-participants had equivalent number of "high" and "moderate" perception on the statements of SPQ.

Participants in science congress activities had high perception mean scores on the following statements: "science congress activities increased their perception in Physics" (M = 4.35, SD = 0.88); "feel like a Physicist" (M = 4.25, SD = 1.09) and "I understand the nature of Physics by participating in science congress activities" (how Physics and Physicists work) (M = 4.10, SD = 1.00). This could be attributed to the fact that science congress activities involve inquiry learning and teaching approach which entails designing, planning and investigating which assist in learning the content.

The least rated statements by science congress activities participants are: "all Physics classroom work should incorporate more class work" (M = 3.28, SD = 1.39) and "one is more likely to hand in Physics assignments when they are involved in science congress activities" (M = 3.84, SD = 1.15). In contrast, the non-participants of science congress highly rated "class work as helping them increase their perception in Physics" (M = 4.35, SD = 0.88), "class work increased their perception to learn Physics" at (M = 4.25, SD = 0.86) and "one felt more like a Physicists when they learned Physics in the laboratory" at perception mean (M = 4.10, SD = 1.00).

The perception high mean scores could be explained by the fact that non-participant in activities were only exposed to class work and laboratory activities while learning Physics hence their judgment. Notably, the least rated statements by the non-participants of science congress activities were that "Science congress activities helped to increase marks in Physics subject" (M = 2.92, SD = 1.28) and "One was likely to hand in Physics assignments when they were involved in science congress activities" (M = 3.00, SD = 1.11).

The students' perception that science congress activities improved their Physics marks and perception is strongly supported by (Brehrendt and Franklin 2014, 239) who stated that students who have perceptions and are alert in class. They learn concepts easily and their standardized test scores improve. Also, in support of study finding are (Eastwell and Rennie 2002, 150) found a strong positive relationship between students' perception and motivation and participation in non-formal activities. Research revealed that, students who participated in non-formal activities had high awareness on the value of scientists and science to the society.

Table 4 gives summaries of number of participants and non-participants, their mean scores and standard deviation from student perception questionnaire (SPQ).

Table 4: Summary of Number, Mean and Standard Deviation for Participants and Non-Participants of Science Congress Activities from SPQ

NFA	Variable	Participants	Non-participants
Science Congress SPQ	Number	n = 161	n = 66
	Mean	54.88	49.50
	Standard deviation	7.69	7.98

Table 4 illustrates variation between participants' mean score (M = 54.88, SD = 7.69) non-participants' mean score (M = 49.50, SD = 7.98) was found to be statistically significant, (t (225) = 4.728, p <.05), revealing that participants had higher perception towards Physics than non-participants as inferred from science congress activities. This findings therefore implied that participants in science congress activities highly regarded the activities as assisting them to learn Physics. This could be explained by the fact the activities enable the participants apply Physics concepts and principles in the projects the present during competitions hence increased internalization and conceptualization of the subject matter.

Correlation between Students' Perception and Physics Achievement

Table 5 gives number of students, mean score, standard deviation and Pearson correlation coefficients for both participants and non-participants of science congress activities sampled in the study.

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Table 5: Participants and Non-Participants Number, Means, Standard Deviations and Correlation Coefficient and PAT and SPQ- Science Congress Activities

Variable	Participants		Non-participants	
	PAT-participant	SPQ-participant	PAT-non	SPQ-non
Number	n = 161	n = 161	n = 66	n = 66
Mean	18.60	54.88	18.12	49.50
Standard Deviation	7.49	7.69	7.44	7.98
PAT-participant	1	.222*		
SPQ-participant	.222*	1		
PAT-non			1	.183*
SPQ-Non			.183*	1

*Correlation is significant at the 0.05 level (1-tailed).

Table 5 shows that total student population (n = 227) was sampled for the study a categorized as participants (n = 161) and non-participants (n = 66) of science congress activities. Participants had a slightly better mean score in Physics Achievement Test (n = 161, *M* = 18.60, *SD* = 7.49) as compared to non-participants (n = 66, *M* = 18.12, *SD* = 7.44). Participants' mean score (*M* = 54.88, *SD* = 7.69) in Student Perception Questionnaire three (SPQ) was almost five points higher than the mean score achieved by non-participants in science congress activities (*M* = 49.50, *SD* = 7.98). The mean scores were found significantly different at *t* (225) = 4.728, *p* <.05 indicating that participants had higher perception towards science congress activities than non-participants. Participants in science congress activities registered slightly higher Pearson correlation coefficient (*r* (161) = .222, *p* < .05), than the non-participants (*r* (66) = .183. *p* <.05).

Though, these results indicate Physics achievement was influenced by science congress activities, the number of participants in the sampled was overwhelmingly skewed towards participants. These results agree with (Adeyemo 2010, 115) who suggested that school based non-formal activities have significant influence on students' achievement in Physics. According to the researcher non-formal activities provide varied opportunities for learning, teaching, social interaction, and cognitive development. Thus every child in schools should be given a chance to participate in at least one non formal activity that suits his or her personal perception.

The findings also agree with (Marsh and Kleitiman 2002, 471) who pointed out that students who participate in any type of non-formal activities achieve better than non-participants. The researcher observed that non-formal activities have proven benefits of building and strengthening academic achievement regardless of their relation to subjects. Furthermore, the results concurred with (Moriana, Alos, Alcala, Pino, Herruzo and Ruiz 2006, 44) who found out that students involved in activities outside the school had better academic performance scores despite some activities having a remote relationship with subject.

This result agrees with (Sahin 2013, 211) who found that students who attended Science Technology Engineering and Mathematics (STEM) clubs had higher percentage of post- secondary admission in STEM related courses than the national average. Reasons advanced for this high admission from STEM club members include that students see applicability of the content they are learning in school, they are able to channel self-perception in a club into intrinsic motivation in the classroom to more fully participate in their club choices, or they may simply have a more creative environment with few restrictions on their learning and they persist in their STEM perception. Also in support of this finding is (Nwankwo and Okoye 2015, 20) who revealed that senior students in Anamba State in Nigeria testified that science club existed and functional in most secondary school in the state and had positive influence in increasing students' interest and achievement in science subjects as well as in science and technology related subjects.

Traingualtion by interview was done to find out whether science congress activities influenced students' learning and achievement in Physics in Vihiga County. Although the study sampled thirty five (n = 35) Physics teachers, only six (n = 6) were interviewed. The teachers were asked to indicate whether involving students in science congress activities influenced their learning and performance in Physics. The teachers made the following comments about the influence of science congress activities on student learning and achievement:

Question 1. Do science congress activities influence students' learning of Physics?

Teacher A responded by saying:

> *"Science congress activities assist in construction of knowledge as students explore their ideas of interest. The activities are multi-sensory and multi-disciplinary".*

Teacher B emphasized that:

> *"Science congress activities entails working on projects….therefore it enhances hands-on activities which are important for teaching and learning science and in particular Physics".*

Teacher C noted that:

> *"Science congress activities provides students with opportunities to practice science process skills. The students identify problems and try to get solutions to the problems using Physics laws and concepts. This in turn enables them learn Physics content deeply"*

Teacher D argued that:

> *"Preparation of projects during science congress competition requires students to research and plan for the exhibits and talks……this involves critical thinking which is critical for Physics learning"*

Question 2: Do science congress activities influence academic performance in Physics subject?

Teacher E stated that:

> *"Science congress activities encourage involvement of learners in conducting practical activities which promoted understanding of Physics concept henceimprovement in their academic performance"*

Teacher F argued that:

> *"Science congress activities entail competitions therefore students who win at subsequent levels of the competition general get motivated and pursue Physics further…… as such learning from the activities increases….obvious this can enhance students perform in Physics and other science subjects".*

The teachers' responses from the interview were grouped in the following emergent themes: science club activities assist students to construct new knowledge as they explore phenomena practically; science congress activities enhance hand-on activities which can enable students experience meaningful learning; the activities also encourage science process skills which are critical for understanding science concepts; they also encourage critical thinking which is important for learning Physics and since science congress activity is a competition, winners at different levels get motivated and spent more time and energy studying Physics concepts hence improved academic performance.

These findings are in agreement with (Sahin 2013, 212) who argued through after school programs, students learn how to work and communicate with their peers and teachers differently from their interaction in their regular classrooms. In agreement with results is also (Eastwell, et al 2002, 155) who noted that science competitions enable teachers and learners to utilise other learning strategies such as cooperative learning which enhance quality of education.

This study was further triangulated by use of teacher perception questionnaire to establish general factors that affect implementation of science congress activities in secondary schools. Physics teachers sampled were asked to rate Likert scale statements on finances, means of transport, time; school programmes schedules, administration, and relevancy of science congress activities to examinations and teacher knowledge of integrating the activities in classroom learning. The teachers' responses on the questionnaire were summed up and percentages of the scores computed to give teachers' perception towards the non-formal Physics activities. High percentage score indicated teacher had higher perception towards the science congress activities.

Table 6 below gives statements of perceived challenges teachers face and the respective percentage of teachers' responses per option of the Likert scale.

Table 6: Percentage and Mean Score of Teachers' Responses to Perceived Challenges for involving Students in Science Congress Activities

Perceived Challenges	Percentage (%) responses					Mean Score
	SA	A	U	D	SD	
1.I lack knowledge to integrate science congress activities in classroom learning	0.0	3.8	9.4	39.6	47.2	4.30
2.The school administration is supportive	7.5	28.3	13.2	34.0	17.0	3.25
3.I lack time for science congress activities	7.5	37.7	3.8	34.0	17.0	3.15
4.National examinations lack Science Congress activities questions	18.9	32.1	13.2	30.0	7.0	2.72
5.I lack means of transport to take students for the science congress activities,	20.8	35.8	7.5	26.4	9.4	2.68
6.The school schedule is tight,	17.0	45.3	7.5	20.8	9.4	2.60
7.I experience financial constrains to undertake science congress activities,	24.5	54.7	5.7	9.4	5.7	2.17

Source: Researcher.

SA-Strongly Agree, A-Agree, U-Undecided, D-Disagree, SD-Strongly Disagree

Table 6 shows that over 85 per cent i.e. (39.6 plus 47.2) (M = 4.30) of the total teacher population believed that they knew how to integrate science congress activities in their teaching while less than 13 per cent agreed or were undecided about integration of the activities in classroom teaching. The results therefore show that a majority of teachers who participated in the study had the necessary skills and techniques for applying the science congress activities in the classroom. School administrators were reported not to be in support for science congress activities by over 60 per cent of the teachers, however, slightly over than 35 per cent of the teachers indicated that their school administration were supportive while over 10 per cent of the teachers were undecided.

Over fifty (50) per cent (18.7 plus 32.1) of the teachers disagreed that science congress activities are not set in national examinations while 37 per cent agreed that the activities are set. These findings indicated that though science congress activities are not part of the conventional school curricular, they are captured in the examinations and therefore they are an avenue for learning and teaching of Physics. Even though a number of secondary schools sampled for the study owned school buses, still well over 55 per cent of the teachers (M = 2.66) reported that they lacked means of transport for undertaking science congress activities.

Only, thirty five per cent of the teachers noted that transportation means to take students to sites was not a hindrance at all. This implies that academic trips are generally given less priority by many school administrators and managers when planning for learning and teaching activities in their school calendars.

Half of the teachers in the study (M = 3.15) disagreed that lack of time was an impediment to carrying out science congress activities, though over 60 per cent of the teachers contradicted by a saying tight school schedule hindered the activities. From Table 6 more than 80 per cent of the teachers (M = 2.17) agreed that funding of science congress activities in most secondary schools was a big challenge.

These finding concur with (Sarker and Frazier 2008, 32) who found that teachers had insufficient knowledge to integrate non-formal activities into classroom, teachers were unfamiliar with local resources available, lack of time to organize the activities and failure of schools administrators to allow for science congress activities impended use of activities in teaching and learning. Other factors cited to hinder implementation of science congress activities are: lack of funds, non-examination of such activities and the teacher's inability to manage groups of students outside the school.

Also in agreement with the finding is (Dilon et al 2006, 110) who noted that lack of teacher confidence in teaching outdoors, insufficient of time, financial resources and support from school administration affect negatively the use of this effective teaching method. In agreement with teacher's revealed challenges to implementing Non-formal Activities in schools (Brehrendt *et al* 2014, 242) who noted that the following are barriers to successful science competition activities: transportation; teacher training and experience; scheduling the activities; teacher's ability to prepare for trip; minimal administrators support for activities and inflexibility in the school curriculum.

The finding that tight school schedules greatly affect implementation of science congress activities could be explained by the fact that current 8.4.4 system has been cited as being examination oriented and has led to neglect of some aspects of the curriculum which are necessary for modelling an all-round individual. Further, the finding that financial constrains restrict implementation of non-formal activities could be explained by the fact that, though the government provides financial capitation for running secondary schools and has banned payment of extra levies, sufficient resources are not alocated to cater for science congress activiies.

The study was further triangulated by interview to get more insights on teachers' perceptions about science congress activities in Secondary school of Vihiga County. The teachers interviewed were Physics teachers, Physics head of subject and science club patrons teaching Physics. The teachers were asked to indicate benefits of involving students in science congress activities.

The teacher's typical comments on science congress activities were as follows:

Question 3. What are the benefits of involving secondary school learners in science congress activities?

Teacher A said:

> *"Science congress activities it involves students working in pairs to present exhibits and talks and that in itself fosters cooperative learning. Since students present their projects and exhibits during competitions….this improves their communication and presentation skills"*

Teacher B observed:

> *"Science congress activities involve travelling to different locations during the competitions……..travel motivates students since they see new places and meet new people".*

Question 4. Are science congress activities well supported by schools administration?

Teacher C said:

> *"Science congress activities receive overwhelming support from school administration…. the activities are included in the school calendar… therefore school administrator fund them promptly…."*

Teacher D noted that:

> *"Secondary schools pay an annual fee to support the activities at zonal level, sub-county level, county level and regional level…. funds are available for the activities"*

Question 5. What can be done to improve science congress activities in secondary schools?

Teacher E noted:

> *"Newly employed teachers lack necessary skills to support students in preparing science congress projects therefore the need to in service them"*

Teacher F said:

> *"The science congress activities need to be benchmarked with Olympiads competitions practiced in the industrialized countries by Ministry of education officials and science club patrons… this will ensure our students are exposed to recent developments in the field of science and technology".*

The teachers' responses from the interview were analysed and the following themes emerged as benefits to teaching and learning process of Physics in secondary schools the accrued from science congress activities: the activities reinforced

cooperative style of teaching and learning; improved students' communication and presentation skills; by developing science congress projects and exhibits for competition, students' skills of innovation and creativity improve and through travel students visit new places as well as meet people of different cultures. The teachers observed that science congress activities can be improved by benchmarking Olympiads practiced in the developed countries. In agreement with this finding is (Fensham 1996, 170) argued that pedagogically, an important aspect of teaching through science congress activities is fostering active construction of knowledge by student. This is because science congress activities generally promote cooperative and learner centred teaching and learning aspects of quality instructional processes.

3. CONCLUSION

Since there was no significant difference between mean scores of participants and non-participants of science congress activities on Physics achievement test (PAT), there is need to re-examine science congress activities with a view of enriching the activities so as to supplement Physics learning and teaching in schools. The fact that both participants and non-participants performed poorly on PAT was attributed to lack of skills, content and concepts by learners to handle questions Physics.

Participants in science congress activities registered relatively high perception mean scores than non-participants. There was also a significant positive Pearson coefficient correlation between participants' perception mean scores and achievement in Physics. As a result it is concluded that science congress activities improved students' perception of Physics.

4. RECOMMENDATIONS

The study found out that science congress activities significantly correlated with achievement in Physics. Therefore, there is need to enhance the activities is secondary schools to maximally benefit students. Ministry of education science and technology should start a "science- month" for all schools. During the event every school children, be given an opportunity to listen to a popular science talk or watch a science film or exhibit, read a biography of a scientist or encouraged to make some innovations or carryout and experiments.

In order to maximize the benefits of science congress activities, there is need for Kenya Institute of Curriculum Development (KICD) to in co-operate the activities fully in the school syllabus as methods of teaching and learning Physics. The syllabus could suggest to the teachers how to use the activities step by step manner.

The study established that teachers highly regarded science congress activities as contributing to teaching and learning of Physics in secondary schools. In that regard, there is need to continuously train of teacher on science congress activities to enable them acquaint themselves with new innovations in the area. This could be done through seminars, workshops and in-service training.

There is need for formation of Science Teacher Associations at national, county and sub-county level aimed at promoting quality teaching of science through science congress activities. The associations will provide a forum for sharing research findings about integration of non-formal activities in teaching and learning among teachers, the government, media, universities, research bodies and the industry.

Teacher training Universities and Colleges should train both pre-service and in-service trainees on how to utilize congress science activities in their teaching. The training should focus on how the trainees can in co-operate the activities in their daily teaching since they assist in conceptualization of concepts as opposed to chalk and talk teaching approaches.

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