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Learners' Perceptions of the Influence of Teachers' Nonverbal Communication on Their Aspirations to Pursue STEM Courses

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Abstract
This paper reports the results of a study that investigated secondary school learners' perceptions of the influence of their science and mathematics teachers' nonverbal communication on their aspirations to pursue Science, Technology, Engineering and Mathematics (STEM) related courses in institutions of higher learning. The study further investigated if there were gender differences in learners' perceptions. The nonverbal aspects of communication focused on were teachers' actions in class and their dressing and grooming. A sample of 465 form three secondary school learners was selected using stratified simple random sampling technique, out of whom 221 were female while 244 were male from Nakuru County, Kenya. Data was collected using a secondary school learner's questionnaire. The reliability of the questionnaire was estimated using Cronbach alpha and yielded a coefficient of 0.88. The findings show that learners' perceived their teachers' nonverbal communication moderately influences their aspirations to pursue STEM. However, the perception on the influence of maintaining eye contact when asking and responding to questions and being always clean and neat were high. Therefore, science and mathematics teacher education programs should enhance pre and in service teacher awareness of the effect of their nonverbal behaviour on their learners. The Teachers Service Commission which is the national teacher regulator and employer in Kenya should ensure that the policy guidelines on teachers' dressing and grooming are straightforwardly interpreted by all teachers and properly enforced.

Keywords: Learners' Perceptions, Science Teachers, STEM Courses, Teachers' Actions, Teacher Dressing and Grooming, Teacher Nonverbal Communication

1. Introduction

1.1 Introduction to the Problem

The 21st century demands skilled human resources in Science, Technology, Engineering and Mathematics [STEM] (Milaturrahmah et al., 2017). This is because the society unquestionably depends on science and technology (Sagan, 1994). According to Colman (2020), Science encompasses the systematic study of the structure and behavior of the physical and natural world through observation and experimentation, while technology is the application of scientific knowledge for practical purposes. This indicates that one cannot have technology without prior knowledge in science. Colman argues that science is a source of tools and techniques for more efficient engineering designs and knowledge base for evaluation on feasibility of designs. Mathematics on the other hand is a discipline that provides key tools to be used in understanding science technology and engineering. Therefore evolvement in science in all its branches requires close involvement and strengthening of mathematical enterprise (Reeves, 2015; Wright & Chorin, 1999). They further add that each area of science has its own unique features however, the different areas share common features that are often mathematical in nature.

According to the National Council of Education Research and Training [N.C.E.R.T], (2000), learning of science mainly enhances the spirit of enquiry, creativity and objectivity. Further they argue that science aims to nurture the ability to explore and seek solutions to problems related to the environment and daily life. This enables learners to acquire the necessary theoretical knowledge, practical and technological skills to enter the world of work. Fadzil and Saat (2014), argue that for any country to meet global challenges STEM should be implemented in schools from an early age so as to produce knowledgeable and a competent human resource with adequate ability and creativity to lead the country forward. In the Kenyan secondary school curriculum, learners take up chemistry, physics and biology as compulsory science subjects at the lower level. However, at the upper level, they choose a minimum of two sciences with mathematics being compulsory at all levels. At the end of secondary cycle, learners sit for the Kenya Certificate of Secondary Education (K.C.S.E) examination. Their performance in the sciences and mathematics are prerequisite for admission into STEM careers in post-secondary institutions and universities.

Kenya's vision 2030 envisages the country's expectations to become a middle-income economy (Government of Kenya [G.O.K], 2007). Through this vision, the country hopes to achieve advanced levels of scientific and technological development. To achieve this, the critical role of STEM is indispensable for any meaningful social-economic development of the country. This implies that it is critical to encourage more students to take up science-related subjects and perform well to enable them proceed to STEM careers in post-secondary institutions. However, Kenya National Examination Council [KNEC] (2018 & 2019) reports indicate continuous below average performance in sciences and mathematics as shown in Table 1.

Table 1: *K.C.S.E Students % Mean Score in Science Subjects*

| Subject | Gender | KCSE % Mean Scores | | |
		2018	2017	2016
Mathematics	Female	24.23	23.54	18.25
	Male	28.55	27.29	23.08
	Total	26.44	24.48	20.78
Biology	Female	24.65	17.98	28.31
	Male	26.78	19.91	30.07
	Total	25.69	18.93	29.19
Chemistry	Female	25.68	22.55	22.69
	Male	28.02	25.45	24.65
	Total	26.88	24.05	23.71
Physics	Female	33.30	34.48	40.63
	Male	34.70	35.30	39.41
	Total	34.27	35.05	39.77

The results in Table 1 indicate that students' mean scores for the three years is below average. The continued below average learners' performance has prompted the Kenyan government through the Ministry of Education to

come up with measures to address the problem. One such measure started in 2004 to date is Strengthening of Mathematics and Sciences in Secondary Education (SMASSE) offered as an in-service program for secondary school science and mathematics teachers. SMASSE aims to improve learners' performance by having new approaches to teaching and at the same time enabling more learners to have a positive attitude towards sciences and mathematics (CEMASTEA, 2016). The Kenyan government through its tuition-free secondary education program is also providing science laboratory equipment and chemicals to all public schools (G.O.K, 2015a). This is meant to ensure all learner carry out practical activities to enhance learning and hence achievement. However, learners' performance has not improved and neither has the gender gap been narrowed.

All the above-mentioned initiatives have focused on improving of teaching methodologies and provision of laboratory facilities and equipment to schools with the aim of improving performance. These initiatives focus on the verbal aspects of communication ignoring the critical role that nonverbal communication plays in the teaching and learning process. However, despite the initiatives, the performance is still below average as indicated in Table 1. This shows that there could be other factors contributing to the poor performance. One of the factors could be the influence of science and mathematics teachers' nonverbal communication on learners. Hence the study sought to investigate learners' perceptions of their teachers' nonverbal communication and whether these perceptions influence their uptake of STEM courses in higher institutions of learning.

Nonverbal communication is any communication done without using words, rather it is the process of generating meaning using behavior. These include physical appearance, sounds, gestures, body movement, eye contact, facial expressions, pitch or tone of a voice, spatial distance, postures and dressing of an individual (Bunglowala & Bunglowala, 2015; Babad, 2007; Gamble & Gamble, 2002). According to Jones (2006), 55% of the first impression of a teacher's professionalism is derived from appearance, 35% from the voice and 7% from what they say. This is supported by Guerrero and Floyd (2006), who argue that more meaning is generated from nonverbal than verbal communication indicating its critical role in communication. Further, Muchemwa (2013) points out that nonverbal communication is one of the tools that is ordinary but is greatly important for teaching, instruction and classroom management.

Neill (1989) reiterates that facial and eye expressions and body movement play pivotal roles in both lesson delivery and class management. A study by Falemeh et al. (2014) found that teachers' facial expression and eye contact played a fundamental role in learners' learning of language and active class participation. Nonverbal communication influences learners' attitude towards a teacher which in turn influences their level of class participation and finally their performance in the subject (FWF Austrian Science Fund, 2016; Kashem, 2019; Verma & Chandel, 2015). This indicates that teachers' nonverbal communication plays a critical role in teaching and learning. This could influence learners' attitudes towards science and mathematics subjects and hence their performance.

Carr et al. (2009) argue that clothing has communication power, since an attire of a teacher projects an image that influences the mind and attitude of students before teaching. Therefore, a teacher's influence as a source of knowledge and as a mentor may be dependent upon how a teacher's attire is perceived. According to Slepian et al. (2015), the type of clothing and fashion a teacher wears influences largely and affects the learners' processing style that changes how objects, people and events are interpreted. They note that teachers' formal dressing like suits contribute to learners' higher cognition and abstract thinking. This makes one to feel more important and powerful leading to their thinking in the same direction. This assertion is supported by Sampson (2016) in his study on teachers' perceptions of the effect of their attire on middle school learners' behavior and learning in rural Georgia school. The study's findings indicate that teachers' perceived that their professional attire had a positive influence on learners' learning and behavior and that learners' appear to model teachers' who are professionally attired. Teachers' appearance can affect the attitude of students and also the respect they give to their teachers (Jewell, 2010).This is supported by Dasgupta (2014), who notes that student motivation is the element that leads learners' attitude towards deciding their career goal.

From the foregoing discussion, it is evident that nonverbal communication of teachers plays a critical role in motivating learners to learn and excel in their academic performance in order for them to pursue STEM in

institutions of higher learning. However, there is minimal documentation on how learners perceive their science and mathematics teachers nonverbal communication and if it influences their aspirations to pursue STEM in institutions of higher learning. Hence this study investigated secondary school learners' perceptions of the influence of their Science and Mathematics teachers' non-verbal communication on their aspirations to pursue STEM courses and whether there are any gender differences. The study focused on two non-verbal aspects which were, teachers' actions in class and their dressing and grooming. In this study, teachers' actions in class refer to what they do and how they act in class as they interact with their students. Teachers' dressing refer to the type and nature of clothing while grooming refer to the appearance in terms cleanliness and neatness of the face, hair, clothes and shoes while within the school environment.

1.2 Objectives of the Study

The general objective of the study was to investigate secondary school learners' perceptions of the influence of their Science and Mathematics teachers' non-verbal communication on their aspirations to pursue STEM courses. Further, the study sought to find out if there are gender differences in the learners' perceptions.
    The study was guided by the following specific research objectives,

(1)   To find out secondary school learners' perceptions of the influence of their Science and Mathematics teachers' actions in class on their aspirations to pursue STEM courses.

(2)   To find out secondary school learners' perceptions of the influence of their male Science and Mathematics teachers' dressing and grooming on their aspirations to pursue STEM courses.

(3)   To find out secondary school learners' perceptions of the influence of their female Science and Mathematics teachers' dressing and grooming on their aspirations to pursue STEM courses.

1.3 Hypotheses of the Study

The study was guided by the following null specific hypotheses,
H_O1: There is no statistically significant difference in secondary school learners' perceptions of the influence of their Science and Mathematics teachers' actions in class on their aspirations to pursue STEM courses by gender.
H_O2: There is no statistically significant difference in secondary school learners' perceptions of the influence of their male Science and Mathematics teachers' dressing and grooming on their aspirations to pursue STEM courses by gender.
H_O3: There is no statistically significant difference in secondary school learners' perceptions of the influence of female Science and Mathematics teachers' dressing and grooming on their aspirations to pursue STEM courses by gender.

2. Methodology

The research employed cross-sectional descriptive survey design. This allowed for data collection at one point in time within a short period of time (Gall et al., 2007). The target population comprised of public secondary school learners from Nakuru East and West sub-counties of Nakuru County, Kenya. The accessible population comprised of form three learners since at this level they have selected at least two sciences as per the 8-4-4 curriculum requirements. A sample size of 384 is recommended for a survey where the population is large and at 95% confidence level and 5% margin error (Cochran, 1977; Kathuri & Pals, 1993). However, Goodrich and St. Pierre (1979), recommended increment of the calculated sample size by 20% to take care of attrition and non-response, giving an extra 81 respondents. Hence the sample size increased by 81 giving a total of 465. A sample size of 465 learners (221 female and 244 male) was selected using stratified simple random sampling technique based on gender and school type (single and mixed sex schools).

The secondary school students' questionnaire was used to collect data on learners' perceptions of the influence of their Science and Mathematics teachers' nonverbal communication on their aspirations to pursue STEM courses at institutions of higher learning. To take care of ethical issues, the questionnaire in its opening remarks assured

learners that the information they will provide will only be used for research purposes and their participation in the study was voluntary. They were also not required to identify themselves to ensure respondents confidentiality.

The questionnaire had two sections with section two having three parts. Section one solicited for general information. Section two-part one solicited information on learners' perceptions of the influence of their teachers' actions in class. They indicated the extent to which they felt encouraged by each specific teachers' action. Part two and three solicited information on the perception of the influence of their teachers' dressing and grooming for male and female teachers respectively. They indicated the extent to which they felt encouraged by each specific item on dressing and grooming. The perceived extent of influence ranged from a scale of 0 to 4 where a score of 4 indicated a very high extent of influence while 0 indicated no influence. The three parts had 13, 16 and 17 items respectively which were Likert type.

The Questionnaire was validated for content by 5 experts in education and psychology from XXX. The instrument was then piloted in two secondary schools of the neighboring Njoro Sub County. Cronbach's alpha was used to estimate the reliability of the instrument. This yielded a reliability coefficient of 0.88. This was within the accepted threshold of at least 0.7 (Gall et al., 2007). The questionnaire was self-administered to the sampled learners to ensure a higher return rate.

3. Results

The first objective of the study was to find out secondary school learners' perceptions of the influence of their Science and Mathematics teachers actions in class on their aspirations to pursue STEM courses. Learners indicated their perceived extent to which the teacher actions encouraged them to pursue STEM courses in higher education institutions. Further analysis was done to establish if gender differences in learners' perceptions existed. The results are presented in Table 2.

Table 2: *Mean and SD of the Perceived Extent to which Teachers' Actions in Class Encourage Learners to Pursue STEM Courses by Gender*

When my science or mathematics teacher,	Female N= 221		Male N=244		Total N=465	
	Mean	SD	Mean	SD	Mean	SD
Smiles at me while accepting my ideas	1.96	1.22	1.92	1.00	1.94	1.12
Frowns while disapproving my ideas	0.72	1.10	0.87	1.24	0.80	1.17
Maintains eye contact while asking me questions	2.85	1.28	2.74	1.19	2.80	1.23
Maintains eye contact when I respond to questions	2.79	1.25	2.60	1.17	2.69	1.21
Varies his/her tone while teaching	2.08	1.34	2.13	1.24	2.10	1.29
Varies his/her pace of talk when teaching	1.83	1.30	1.97	1.18	1.91	1.23
Moves away when rejecting my ideas	0.45	1.00	0.61	1.06	0.53	1.03
Moves towards me when I am responding to a question	2.03	1.46	2.03	1.37	2.03	1.41
Nods his/her head up and down when accepting my response/ideas.	2.40	1.48	2.11	1.43	2.25	1.46
Shakes his/her head sideways when rejecting my response/ideas.	1.13	1.35	1.38	1.36	1.26	1.36
Varies his/her gestures while teaching	2.59	1.30	2.30	1.18	2.44	1.24
Body language when giving directions encourages my	2.98	1.34	2.73	1.19	2.86	1.27

participation in seeking clarifications						
Index	**1.91**	**0.60**	**1.87**	**0.55**	**1.89**	**0.57**

The results in Table 2 indicate that learners perceive that teachers actions in class does influence their aspirations to pursue STEM courses though moderate (M = 1.89). In addition, the overall mean for female learners (M= 1.91) is higher than their male counterparts (M= 1.87). This implies that the perceptions on the extent of influence of teachers' actions in class on female learners' aspirations to pursue STEM is higher than that of male learners. The results also show that the overall mean for the items 'maintaining of eye contact when asking and responding to questions' is high (M = 2.80 and 2.69 respectively) Female learners had higher means on the two items compared to male learners (M = 2.85 and 2.79 for females and 2.74 and 2.60 for male learners respectively).

Further, items 'moving away when rejecting learners' ideas' and 'frowning while disapproving their responses' had the lowest means of 0.53 and 0.80 respectively. Both male and female learners had their lowest means on the two items (Female =0.45 and 0.72, males= 0.61 and 0.87 respectively). Similarly, female learners mean scores on the same items were lower than for male learners. This indicates that perceptions on the extent of influence to pursue STEM courses by majority of learners on these teachers' actions is minimal. This points to learners being discouraged by these specific teachers' actions with more effect on female learners.

Further, t-test statistics were computed to establish if the mean differences between the female and male learners were statistically significant. The results indicate that there were statistically significant gender differences in the following items ; 'The science teacher nods his/her head up and down when accepting my response/ideas'(t(454)= 2.131 p< .05), 'The science teacher varies his/her gestures while teaching'(t(432)= 2.434, p<.05) and 'The science teachers' body language when responding to questions/inquiries'(t(447)= 2.099 p<.05). The statistically significant gender differences were all in favor of females. Item on 'The science teacher shakes his/her head sideways when rejecting my response/ideas' was statistically significant (t (449) = 1.964 p< .05) in favor of male learners. The gender difference in all the other items including the overall mean on teacher actions in class were not statistically significant. This indicates that the perception on the extent of influence in the specific teacher actions were similar for both male and female learners.

The second objective of the study was to find out secondary school learners' perceptions of the influence of their Male Science and Mathematics teachers' dressing and grooming on their aspirations to pursue STEM courses. Learners indicated their perceived extent to which the specific items on dressing and grooming encouraged them to pursue STEM courses in higher education institutions. Further analysis was done to establish if gender differences in learners' perceptions existed. The results are presented in Table 3.

Table 3: *Mean and SD of the Perceived Extent to which Male Science Teachers' Dressing and Grooming Encourage Learners to Pursue STEM Courses by Gender*

	Female N=221		Male N=244		Total N=465	
When my male science or mathematics teacher,	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**
Dress formally (puts on a suit and tie)	1.77	1.37	1.36	1.37	1.57	1.39
Wears sports shoes when teaching	0.49	1.04	0.30	0.86	0.39	0.95
Clothes are always wrinkled	0.44	1.03	0.57	1.12	0.50	1.08
Clothes are always pressed	2.12	1.56	1.71	1.56	1.91	1.57
Hair is well-groomed	3.09	1.27	3.23	1.07	3.16	1.17
Matches suit, tie and shoes	1.75	1.55	1.58	1.43	1.67	1.49
Wears cologne/perfume	1.37	1.42	1.17	1.23	1.26	1.33
Puts on laboratory coat even when not in class	2.21	1.57	1.81	1.58	2.00	1.58
Puts on a clean laboratory coat	3.24	1.14	3.09	1.27	3.16	1.21
Puts on a pressed laboratory coat	1.72	1.64	1.44	1.43	1.58	1.54
Wears very tight clothes	0.57	1.14	0.61	1.17	0.59	1.15
Is always neat	3.36	1.06	3.26	1.15	3.31	1.11

Is always clean	3.36	1.07	3.33	1.12	3.35	1.09
Comes to class drunk	0.12	0.59	0.18	0.73	0.15	0.67
Smells alcohol	0.14	0.65	0.22	0.81	0.18	0.73
Smells of cigarettes/other substances	0.09	0.56	0.12	0.62	0.11	0.59
Index	**1.55**	**0.45**	**1.43**	**0.47**	**1.49**	**0.46**

The results in Table 3 indicate that learners perceive that male teachers dressing and grooming does influence their aspirations to pursue STEM courses though moderate (M= 1.49). In addition, female learners have a higher mean (M= 1.55) than male learners (M= 1.43). This means that the perception on the extent of influence of male teachers dressing and grooming on female learners aspirations to pursue STEM courses is higher than that of male learners. The results also indicate that being clean followed by neat, well- groomed hair and putting on a clean laboratory coat had the highest means (M= 3.35,3.31, 3.16 and 3.16 respectively). The same trend is observed for each gender. These results show that both male and female learners are positively influenced by these male teachers' aspects of dressing and grooming. Smelling of cigarettes and other substances, alcohol, going to class drunk had the lowest means (M= 0.11, 0.18 and 0.15 respectively). This shows that the perception of the extent of influence of these aspects of male teachers' dressing and grooming is low.

To determine whether there were statistically significant gender differences in learners' perceptions, t-test was calculated. The results indicate that there were statistically significant gender differences in the overall mean t (456) = 2.778, p < .05 in favor of female learners. This shows that the perception of female learners on the extent of influence of male teachers' dressing and grooming's to pursue STEM courses is higher than that of male learners.

Statistically significant gender differences was observed in the following items; Dresses formally (puts on a suit and tie) (t (444=3.123, p<.05), Wears sports shoes when teaching (t (443) = 2.129, p<.05), Clothes are always pressed (t (419) =2.688, p<.05) and Puts on laboratory coat even when not in class (t (442) = 2.717, p<.05). These gender differences were all in favor of female learners. This shows that these aspects of male teachers 'dressing and grooming's extent of influence on female learners to pursue STEM courses is higher than that of male learners.

The third objective of the study was to find out secondary school learners' perceptions of the influence of their Female Science and Mathematics teachers dressing and grooming on their aspirations to pursue STEM courses. Learners indicated their perceived extent to which the specific items on dressing and grooming encouraged them to pursue STEM courses in higher education institutions. Further analysis was done to establish if gender differences in learners' perceptions existed. The results are presented in Table 4.

Table 4: *Mean and SD of the Perceived Extent to which Female Science Teachers' Dressing and Grooming Encourage Learners to Pursue STEM Courses by Gender*

When my female science or mathematics teachers	Female N=221		Male N=244		Total N=465	
	Mean	**SD**	**Mean**	**SD**	**Mean**	**SD**
Dresses formally	2.85	1.24	2.64	1.35	2.74	1.30
Wears sports shoes/sandals when teaching	0.46	1.09	0.54	1.02	0.50	1.05
Clothes are always wrinkled	0.39	0.95	0.49	1.04	0.44	0.99
Clothes are always pressed	2.06	1.62	1.88	1.51	1.97	1.56
Hair is well-groomed	3.25	1.07	3.15	1.11	3.20	1.09
Matches clothes with shoes	2.27	1.35	2.25	1.40	2.27	1.38
Wears perfumes	1.71	1.35	1.84	1.42	1.77	1.38
Puts on Laboratory coat even when not in class	2.07	1.58	1.57	1.54	1.82	1.58
Puts on a clean laboratory coat	3.08	1.31	3.00	1.20	3.04	1.25
Puts on a pressed laboratory coat	1.84	1.69	1.66	1.47	1.76	1.58
Wears very tight clothes	0.79	1.25	1.03	1.41	0.91	1.34
Wears very short clothes	0.90	1.39	0.97	1.41	0.93	1.40

Is always clean	3.48	0.93	3.30	1.04	3.39	0.99
Is always neat	3.39	1.08	3.45	0.94	3.42	1.00
Comes to class drunk	0.05	0.40	0.14	0.70	0.10	0.57
Smells alcohol	0.05	0.40	0.11	0.57	0.08	0.49
Smells cigarettes/other substances	0.06	0.42	0.04	0.39	0.05	0.40
Index	**1.61**	**0.48**	**1.58**	**0.46**	**1.60**	**0.47**

Table 4 results indicate that learners perceive that female teachers dressing and grooming does influence their aspirations to pursue STEM courses though moderate (M=1.60). Likewise, male and female learners overall mean is also moderate with that of female being higher than that of male learners (M =1.61 and M = 1.58, respectively). This shows that the perception on the extent of influence of female teachers dressing and grooming on learners aspirations to pursue STEM courses is moderate. Further, the results indicate that the following items had the highest means; being neat (M = 3.42), clean (M = 3.39), well-groomed hair (M = 3.20) and putting on a clean laboratory coat (M = 3.04). This indicates that the perception on the extent of influence of these three aspects of female teachers dressing and grooming have a greater influence on learners' aspirations to pursue STEM courses. The same aspects of dressing and grooming had the highest means for both male and female learners with an exception of the item 'always neat' being higher among male learners.

Table 4 results also show that the following items had the lowest overall mean and also for both male and female learners; 'coming to class drunk' and 'smelling of cigarettes and other substances' have the lowest mean scores. This indicates that the perception on the extent of influence of these aspects of female teachers dressing and grooming is extremely low among all learners.

Further, t-tests were calculated to determine if there were any statistically significant gender differences in the mean perceptions scores. The results indicate that there was a statistically significant difference in only one item which was 'putting on a lab coat even when not in class' (t=3.363 p=0.001)) in favor of female learners. This implies that when female teachers put on a laboratory coat even when not in class makes them similar in appearance bringing out the concept of uniformity. Hence the issue of differences in dressing is covered up by the laboratory coat. However, the overall mean difference and all the other specific items means were not statistically significant. This indicates similar perception on the extent of influence in both male and female learners.

4. Discussion

The results presented in Table 2 have shown that the perception on the influence of teachers' actions in class on learners' aspirations to pursue STEM courses in institutions of higher learning is present but moderate (M=1.89). The same trend was observed in both male and female learners with the perception on the extent of influence being higher in females though not statistically significant. However, the following specific teacher actions had a higher perception on the extent of influence; Body language when giving directions encourages my participation in seeking clarifications, Maintains eye contact while asking me questions and Maintains eye contact when I respond to questions. The findings are supported by Neil (1989) who reiterates that facial and eye expressions and body movement play pivotal roles in both lesson delivery and class management. Body language has the power to transfer the attitudes and feelings of people to others and can be more effective than verbal language (Bambaeeroo & Shokrpour, 2017; Farhangi, 1995). A project supported by the FWF Austrian Science Fund and headed by Bernd Hackle, explored the implication of nonverbal communication during classroom interaction found that teachers' body language gives them credibility and define whether the learning process will be nurtured or not (FWF Austrian Science Fund, 2016). This is supported by Guerrero and Floyd (2006), who posit that more weight is put on one's nonverbal communication when determining a person's credibility, while eye contact indicate a willingness to communicate or learn (Grubaugh, 1989). Lack of eye contact might show lack of teachers' interest in the learners' questions and responses thereby negatively influencing their attitudes towards the subject and in the long run their aspirations to pursue STEM. Montague et al. (2013), found that doctors who make a lot of eye contact were viewed better. This is further supported by a study by Falemeh et al. (2014), who found that teachers' facial expression and eye contact played a fundamental role in learners' learning of language and active class participation. Verma, and Chandel (2015) noted that teachers' eye contact with learners reduces their academic

anxiety hence encouraging active participation in classroom activities. This indicates that the teachers 'nonverbal communication plays a critical role in teaching and learning and could influence learners' attitude towards science and mathematics and hence their performance.

The items 'moving away when rejecting learners' ideas and 'frowning while disapproving their responses' had the lowest extent of influence on learners' aspirations to pursue STEM. The same trend was observed for both female and male learners. However, it was lowest for female learners and the difference was statistically significant in favor of females. This implies that this teacher action negatively affect the students and more so the female learners. According to Richard and Mc Crokey's (2004), some particular body signals are significant to women while others are only significant to men. This indicates that such teacher actions should be avoided in class.

The results indicate that the learners perceived influence of male and female teachers dressing and grooming's on their aspirations to pursue STEM is present and moderate with that of female learners being higher. However, the mean differences were statistically significant in the case of male teachers dressing and grooming in favor of female learners. This implies that the perception on male teachers' dressing and grooming influence on female learners is higher than in their male counterparts. However, according to Slabbert (2019) findings, there were no gender differences in learners' perceptions of their lecturers' attire.

Some aspects of teacher dressing and grooming had very high perception on the extent of influence but were not statistically different for both male and female learners. These aspects were being clean, neat, having well-groomed hair and putting on a clean laboratory coat. This shows that both male and female learners had similar perception on the extent of influence in the named aspects. These findings are in agreement with those of Smith and Larry (2015), who found that grooming and dress ranked highest in terms of contributing to effective delivery of information to an audience. Yang (2017), argues that the teachers' appearance is the first impression to students. He further posits that, students preferences of subjects always begin with the good will and admiration of teachers. According to the Teachers Service Commission teachers' code of conduct and ethics regulations (Government of Kenya, 2015b), a teacher should maintain a neat and decent standard of dressing which befits the dignity and image of the teaching service. Further, a teacher should ensure their appearance and personal hygiene is not offensive to workmates and those they serve.

The aspects of dressing formally, putting on pressed clothes and lab coat even when not in class by male science teachers had a statistically significant influence in favor of female learners. Phillips and Smith (1992), found that students' perceptions of teachers attributes are affected by teachers' attire. Further, they found that casual clothing was perceived by students to express teacher friendliness, fairness and interestingness while moderate attire expressed teachers' friendliness, organization, interestingness, understanding and discipline. Learners perceived that teacher organization, knowledge and disciplinary skills were conveyed by teachers' conservative dress. However the learners' perceptions did not differ by gender. This argument is supported by Slapian et al. (2015), who note that although formal clothing is associated with more professionalism, it enhances social distance. This can lead to teacher becoming less approachable hence making learners shy away from them. This indicates the need for teachers to adopt moderate formal dressing.

The findings are further, supported by Morris et al. (1996) study, which found that female students associated more formal dress with increased ratings of instructor competence. However, a study by Joseph (2017) also found no statistically significant differences in secondary students' perceptions of their teachers' professional attire. Kashem (2019) found that teachers' dressing had significant and direct effect on both student attitude and learning. He further notes that students give more respect to a teacher who appears in formal attire. Therefore this implies that if students have a positive outlook of a teacher they will tend to respect him/her and develop positive attitudes towards him/her. Manombe (2009) points out that the dress of a teacher is associated with a person's character, dedication, mood and behavior.

The perceived influence of some aspects such as going to class drunk and smelling of alcohol, cigarettes and other substances was very low. According to Rukundo and Magambo (2013), excessive teacher use of alcohol leads to job inefficiency that causes learners to lose confidence and respect for the teacher. Consequently, the learners

develop negative attitudes leading to poor academic performance. This indicates that for teachers to be good role models, they should avoid excessive use of these substances that causes them to smell even when not immediately used especially within the school environment.

## 5.	Conclusions and Recommendations

In conclusion, the perception on the extent of influence of teacher actions in class on learners' aspirations to pursue STEM courses in institutions of higher learning is moderate. However, teacher actions like maintaining eye contact with learners, accepting their responses through nodding and walking towards them should be highly encouraged. Teacher actions that show disapproval of learners' responses by walking away and shaking of head sideways should be discouraged. This indicate rejection that lead to development of negative attitudes towards the teacher and subject hence poor academic performance. This implies that for teachers to encourage more learners to pursue STEM, they need to be aware of the impact of their actions in class and practice more of actions that influences learners positively in their teaching. Therefore, Science and Mathematics teacher education programs should enhance pre and in service teacher awareness of the effect of their nonverbal behavior on their learners.

On teachers' dressing and grooming, learners perceptions on the extent of their influence to pursue STEM was also moderate. However being neat, clean, well-groomed hair and putting on a clean laboratory coat had a higher influence on learners and hence should be encouraged among teachers. Smelling of alcohol, cigarettes and other substances had no positive influence on learners and hence should be highly discouraged. From the findings, there was significant gender differences in learner perceptions of male science teachers dressing and grooming in favor of females. In particular the difference was noted in the aspect of dressing formally. This could be an indication of female learners' keenness on their male teachers dressing. More studies need to be conducted to establish the reasons behind this finding. The Teachers Service Commission that acts as a regulator and employer of teachers in Kenya should come up with clear policies on teachers' dressing and grooming. The policies should communicate clearly to all teachers to allow for proper interpretation, implementation and enforcement.

## 6.	Limitations and Recommendations for Further Study

One of the limitation of the study is on the sample used. The sample used was drawn from public secondary school learners in Nakuru East and West Sub Counties of Nakuru County which are mainly urban and highly cosmopolitan. This implies that the findings of the study can only be generalized to counties and schools that have similar characteristics. Therefore, there is need to investigate the influence of culture on the extent of learners perceptions between learners brought up in cosmopolitan areas and those brought up in rural areas and whether the effect of culture has been diluted in urban or highly cosmopolitan areas. According to Matsumoto and Hwang (2013); Weisbuch and Ambady (2009), culture influences nonverbal behavior.

The study examined perceptions rather than actual behavior, therefore students might not accurately recall the degree to which teachers used certain nonverbal behaviors especially if they rated them a year or more ago. However, this study has likely taped into how students think a best or worst teacher communicates. Future studies should employ innovative procedures to find unprejudiced measures of communicative behavior and see how they relate with perceptions of teaching effectiveness.

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