

## STUDENTS' PERCEPTION OF TEACHERS' PEDAGOGICAL SKILLS AND ITS INFLUENCE ON THEIR ATTITUDE TOWARDS SCIENCE: IMPLICATION FOR SCIENCE, TECHNOLOGY AND ENGINEERING CAREERS

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### ABSTRACT

*The study assessed students' perception of teachers' pedagogical skills and its influence on attitude towards science in Owerri, Imo state. The study adopted an ex-postfacto research design using a sample of 400 senior secondary II science students. Two researcher developed instruments were used for data collection namely Students' Perception of Teachers' Pedagogical Skill Questionnaire (SPTPSQ) and Students' Attitude Towards Science Questionnaire (SATSQ). The instruments were face validated. Using Cronbach Alpha method, reliability indices of the two instruments were established. Percentages, mean and standard deviation were used to provide answers to the research questions while analysis of variance (ANOVA) was used to test the null hypotheses at 0.05 level of significance. The result of the study revealed that students perceived that science teachers have low pedagogical skills. Also, students' perception of the teachers' pedagogical skills had significant influence on their attitude towards science. This finding implicates students' career choices in science, technology and engineering at higher institutions in that their poor attitude towards science as a result of teachers' poor pedagogical skills will result to their poor attitude towards science, technology and engineering courses. Based on these findings, the researcher recommended that science teachers should endeavour to acquire appropriate pedagogical skills to enable the students develop positive attitudes towards science, technology and engineering careers at high level of education.*

**KEYWORDS:** Attitude towards Science, Students' Perception, Science, Technology and Engineering Careers, Teachers' Pedagogical Skills

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### INTRODUCTION

There has been observed decline in the students' interest and attitude towards science and mathematics related courses in the recent times (Onah et al., 2020; Ugwuanyi et al., 2019a, b; Ugwuanyi, Okeke & Asomugha, 2020; Ugwuanyi & Okeke, 2020a, b, Ugwuanyi et al., 2020a, b, c, d, e). This ugly situation may be attributed to the teaching activities of the teachers. Teaching activities produce changes in the learners by increasing the amount and quality of information, understanding of basic principles in the subject matter, inculcate abilities and positive or desirable attitude towards a subject matter. For this to be achieved the teacher must be willing and voluntarily

do the act of teaching. Hence, pedagogy is any conscious and deliberate activity by any person with the view that another person learns (Inyama, 2017). The act of teaching requires a lot of skills on the teachers' part in order to achieve the objectives of teaching. This therefore demands a deep knowledge in pedagogy through which the needed pedagogical skills are enhanced. Thus, Wengrowincz (2014) stated that pedagogy is a decision-making process in which teachers make decision regarding what and how to teach. Thus, the teacher's pedagogical knowledge will enable them in developing different ways in which the subject matter can be transformed and interpreted to the learners (Inyama, 2017). This process is referred to as pedagogical skill.

Pedagogical skills include all teaching strategies aimed at helping the teacher to make the classroom instruction effective. They are useful tools that facilitate the transformation and interpretation of subject matter while teaching. Pedagogical skills are used by science teachers to design an efficacious, rational and sequential instruction not only for understanding subject matter in science but also in advancing attitude towards science. As a result, pedagogical skills arouse curiosity in students about a topic, engage them in learning, develop their skills, sustain students on task and is useful in classroom interaction. The goal of using pedagogical skills in science classroom is to facilitate learning, motivate learners to learn and be focused during teaching and learning in the classroom. These pedagogical skills include set induction, stimulus variation, nonverbal communication, questioning, reinforcement, to mention just a few.

Set induction according to Nworgu (2009) is a preplanned action introduction used to arouse the interest of the learner capable of creating an atmosphere of curiosity in the classroom situation. In other words, set induction acts as attention inducer, directs learners towards the learning process and helps the learner to be psychologically and mentally alert for the learning to take off.

Stimulus variation in teaching and learning, the skill of variation is an exquisite display and execution of voice, gesture and movement, writing style, stimulation, attractive speaking, time-variation, scene changes etc in the teaching area (Fathima & Saravanakumar, 2012). The authors posited that students perceive teachers' effectiveness through his/her skills in stimulus variation. This perception will also facilitate their focus, keep them focused and alert, thus making the lesson, productive, effective and interesting. Blake (2016) noted that some students have short attention span and therefore lose interest after a certain period. When the teacher employs one type of teaching style, the students easily lose interest and may resort to day dreaming or fall asleep. Therefore, stimulus variation plays a vital role in the teaching and learning process in arousing and sustaining students' attention and interest, which greatly determine attitude towards learning a subject (science). This may be why Ulug, Ozden and Eryilmaz (2011) asserted that the quality of instruction students receives shape their behaviour. The ability of science teachers to do the above mentioned could also go a long way to shape students' perception about their teachers' pedagogical skills.

Non-verbal communication according Mohammad, Muhammad, Abdul and Mudassar, (2014), posited that communication is used to express our thoughts, feelings, skills knowledge and ideas which can be expressed verbally or non-verbally. Furthermore, non-verbal communication exposes when the students are frustrated and confident which is an integral part of one's attitude. These behaviours exhibited by the teacher create a psychological closeness between the teacher and the student. This closeness can allow the teacher to easily know the students' misconceptions about science subjects. This means that an observant teacher can then easily understand when students are paying attention, distracted or finding it difficult in understanding the content.

Question is any statement used to get ideas from students. Teachers' questions serve varieties of purposes, such as; to manage the classroom, to stimulate thinking and provide feedback about students' understanding, evaluate what they know, help students develop a mind-set about the content (Chin, 2007), monitor students' competences and understanding, increase thought provoking discussion, ensures a continuous involvement of students in their own learning experience and providing them with valuable feedback necessary for promoting progressive learning, (Critelli & Tritapoe, 2010). The feedback the teacher was able to get could convince him/her if the students are participating or deviating from the lesson. Based on these purposes, science teachers' concern is in helping students to become critical thinkers, problem solvers and scientifically literate individuals. Questioning skills are essential for good teaching and that is why teachers ought to use questions to ensure that students are attentive and engaged and to assess students' understanding (Sockalingam, 2011).

Reinforcement inspires the repetition of behaviour, and when given regularly, habit formation is attained. Thus, Ngwoke (2010) in supporting this statement stated that reinforcement is effective in establishing habit only when it consistently follows a correct response. Again, when a learner receives a good reinforcement, he/she will be able to repeat the behaviour for which he/she is reinforced and vice versa. Hence, an effective use of pedagogical skills that addresses students' curiosity will change their behavior and perception of the subject and the teachers' skills while teaching.

Perception be a way an individual evaluates people with whom they are familiar with (Adediwura & Tayo, 2007). Perception is an experience that involves the organization of objects, events or relationship leading to the process by which we interpret our sensory input (Eka, 2013). Students' perception is thus described as students' thoughts, beliefs and feelings about persons, situation or events (Hazari, 2014). Based on these definitions, we can now say that students' perceptions of teachers' pedagogical skills are the beliefs, thoughts and feelings students have on their teachers' pedagogical skills. It could also mean students' judgements or evaluation on their teachers' pedagogical skills. In recognition of these definitions, one can easily understand that perception could determine one's behaviour towards an object in question. Cherry (2016) is of the view that perception is our sensory experience of the world around us and involves both recognizing environmental stimuli and actions in response to these stimuli. The author further said that perception, not only create our experience of the world around us, it allows us to act within our environment. This means that in the classroom situation, experiences provided to the students while teaching such as the teachers' characteristics, actions, teaching materials and especially teaching strategies and skills creates image or schema of subject contents in the learners. These images are interpreted in the brain, and results to perception as feedback. From what students perceive, they then pass judgment, which leads to action.

Learners' views about the teacher's skill will enlighten the teacher about the best ways students learn and will want to be taught. On this note, teachers' adherence to this demand could contribute substantially to effective teaching as well as make students disassociate themselves from negative attitude towards science. This shows that students' perception is one of the major integral phases in teaching and learning plans. This therefore calls for the science teachers to acquire an adequate knowledge of students' perceptions for teaching. The science teachers' knowledge of students' thoughts about their use of the various pedagogical skill during teaching may perhaps direct them to reflect on and adjust their skills in teaching (Etuk, Afangideh & Uya, 2013). In recognition of the above statement, emphasis is now on how the students perceive the skills their teachers use in teaching science subjects (Biology, Chemistry and Physics) in secondary schools and how these skills influence attitude towards science.

Attitude according to Mokoro, Wambiya & Aloka (2014), is a hypothetical construct that indicates an individual's

like or dislike towards an item. Attitude means a way individual thinks or acts towards a given subject or issue (Ezeudu, Ezeudu & Sampson, 2016). Based on these definitions, attitude could be described as an individual's reaction as a result of an evaluated behaviour, action or experience. It is a mental habit that explains how you perceive the world around you and spurs the action and behavior you take in response. Attitude is very important in school science because for anyone who wishes to achieve higher in science, must display positive attitude towards science. Attitude towards science is therefore a feeling, belief and values held about science. The feeling, belief and value one holds for an object will therefore either make one favor or disfavor the object. In other words, favouring or disfavouring an object is a step into an action and these actions are observable. In support to the statement above, Macmillan (2012) added that attitude stimulates behaviour or action. Thus, a positive attitude towards science will encourage students to study science, while negative attitude will not encourage students into studying science. Students' negative attitude towards science may therefore be since teachers are unable to satisfy the students' aspiration or goal, career, incentives and opportunities for them to appreciate science (Adodo & Gbore, 2012). Man, by nature is an independent species that can take decisions based on their beliefs. These beliefs further shape their attitude towards things with time through experiences they are exposed to. Having noted this, ensuring that students develop positive attitude towards science should be one of the teachers' priority and an unavoidable goal/step in science education

According to Johnston, (2011), attitude is learned and because of this they can be unlearned and changed but can be stable and endure through experience. This explains the statement that attitude is not born within a person but learned with time. Again, it indicates that experiences that a science teacher exposes or provides the students during learning will to a great extent influence their attitude towards science either positively or negatively. If they find their experiences positive, they will develop positive attitude and if their experiences are negative, they develop negative attitude. Furthermore, when someone's attitude changes, it can be observed by the responses the individual provides. Students have different attitude depending on how they perceive the events that evoke their reactions either positively or negatively. On this note, this stimulus can be anything that can be distinguished or considered by anyone (Rachael, 2012). This highlights the fact that experiences provided to students while delivering science lessons could evoke students' positive or negative attitude towards science. Narmadah and Chamundeswari (2013:115) therefore opined that "science teachers should try to make learning of science an enjoyable experience such that students will remember for a lifetime". Attitude towards science is also one of the major factors that determine one's desire to study science. Hence, a negative attitude is a major cause of students' shift from studying science subjects. Positive attitude towards science therefore may increase the desire to study science hence, increased enrollment in science courses. This is because attitude moderates, shapes and facilitates the choices people make with regards to objects, persons and other involvements. The importance of positive attitude towards science cannot be over-emphasized. It influences one's opinion and views concerning science, future career awareness, classroom participation etc. Having noted these facts in the literature, Sofeme and Amos (2015) maintained the idea that attitude of a learner towards science will determine the measure of the learner's attractiveness or repulsiveness to science

Positive attitude are powerful tools for studying and practicing science. Hence, several studies have been carried out to determine influencing factors of attitude towards science. Sofeme and Amos (2015) investigated students' attitude towards science subjects in senior secondary schools in Adamawa state of Nigeria. The researchers sought to know if students' age influences their attitude towards science. The result revealed that Adamawa state senior secondary school students showed positive attitude towards science subjects and were not influenced by age. In another study, Mokoro,

Wambiya and Aloka, (2014), investigated on the influence of selected social factors influencing students' attitude towards chemistry in Nyamaiya division, Nyamira country, Kenya. The results showed that there was a statistically significant influence between the teachers' characteristics and the students' attitude towards chemistry. Jegede and Awodun (2015), carried out a research with the purpose of studying the effects of out-door activities on students' attitude towards learning of physics in senior secondary school's physics in Ekiti state, Nigeria. The result of the study proved that the experimental group showed positive attitude to studying physics than the control group. Adekunle and Femi-Adeoye (2016) researched students' attitude and interest as correlates of students' academic performance in biology in senior secondary school. The finding showed that there is significant relationship in the students' attitude to Biology and students' academic performance in Biology. Hussain, Foong and Kamar, (2015) carried out a research on attitude of secondary school students towards Biology as a school subject in Birninkebbi metropolis of Nigeria. The sole aim of the study is to ascertain secondary school students' attitude towards biology. The result showed that majority of students in Kebbi have positive attitude towards biology with students indicating that adequate teaching aid and interesting practical work spurs their positive attitude towards biology

Attitude towards science have been a cause of concern for science teachers. The enthusiasm to engage in any field of study is fostered by the individuals' attitude towards that field of study. This idea does not exclude students who are offering sciences. The development of positive attitude in learning science is the responsibility of the teacher as well as the goal for teaching science. It is not because science teachers are teaching enough contents that will spur positive attitude in students, but the skills teachers use to present lessons or topics of science subject matters a lot in student. In as much as teachers are expected to fashion their teaching in ways that will allow students develop positive attitude willingly, students on their own think and act according to their experience during learning. Thus, students' perception of skills teachers use in teaching may be a yardstick for their development of positive attitude towards science. However, many researchers have investigated some factors that can have impact on students' attitude towards science. Such includes age, social factors, teachers' teaching methods and teachers' quality of instruction and students' performance. So far, students' perception of the teachers' pedagogical skill has not been considered as a possible influence on students' interest and attitude towards science. Thus, the problem of the study posed in question form is: what is the students' perception of teachers' pedagogical skills and how does this perception influence their attitude towards science?

Two research questions guided this stud.

- What is the level of students' perception of their teachers' pedagogical skills?
- What is the influence of students' perception of teachers' pedagogical skills have on students' attitude towards science?

A null hypothesis was formulated to guide the study:

**Ho:** The students' perception of teachers' pedagogical skills has no significant influence on students' mean attitudinal score towards science.

## **Method**

### **Research Design**

The design of the study was ex-post facto research design. This design has been used by Nworgu, Ugwuanyi and Nworgu (2013). The study was carried out in Owerri education zone 1 of Imo state, made up of 5 local government areas.

## Participants

A total of four-hundred science students constituted the sample of the study. The sample was drawn from the population of all the senior secondary two (SS 2) students in the seventy (70) schools in Owerri education zone 1 in 2015/2016 academic session with a total of four thousand one hundred and ninety-nine (4199) science students. The choice for SS2 is because they have been grouped into science classes apart from the art classes and they must have sustained interest, skills and attitude in science subjects from their previous classes. Taro Yamane (1967) guide for sample size with 95% confidence level was used to sample four hundred science students. Purposive random sampling technique was used to select two schools from each of the four LGAs making a total of 10 schools. Simple random sampling technique was used for drawing forty science students from the ten schools sampled.

## Measures and Procedure

Two instruments developed by the researcher were used for data collection for this study namely: Students' Perception of Teachers' Pedagogical Skill Questionnaire (SPTPSQ) and Students' Attitude towards Science Questionnaire (SATSQ). Students' Perception of Teachers' Pedagogical Skill Questionnaire (SPTPSQ) consist of two sections (A and B). Section A sought information on the students' demographic data while section B contains thirty-five (35) items designed to determine students' perception of teachers' pedagogical skills in the science classroom and fifteen (15) items for SATSQ designed to determine students' attitude towards science. The instruments were rated on a four-point likert scale.

## Validation, Reliability and Data Collection Procedure

The instruments were face validated by three experts. The instruments were trial tested on three schools that are not part of the study and was also tested for reliability using Cronbach Alpha reliability test and a coefficient of 0.91 for SPTPSQ and 0.80 for SATSQ was established respectively. The instruments were administered to the sampled students with the help of two research assistants who were science teachers in each of the schools selected for the study. The research assistants were enlightened on the purpose of the research. To ensure a high return of the instruments, the researcher and the research assistants waited for the students to respond to the instruments and collected them immediately.

## Ethical Consideration Statement

Ethical approval for the conduct of this research was granted by the University of Nigeria, Faculty of Education committee on research ethics. The participants were equally offered informed consent forms to fill and sign before the commencement of the data collection.

## Data Analysis

The data obtained from students' responses to the instruments were analyzed using percentage to answer research question one while mean and standard deviation was used to answer the research questions two. Analysis of variance (ANOVA) was used to test the null hypotheses (Ho) at 0.05 level of significance.

## Result

**Research Question One:** What is the level of students' perception of the teachers' pedagogical skills?

**Table 1: Percentage analysis of the level of students' perception of teachers' pedagogical skills**

Teachers' Pedagogical Skills	Frequency	Percent (%)
High level	128	32.0

	Average level	99	24.8
	Low level	173	43.3
	<b>Total</b>	<b>400</b>	<b>100.0</b>

Table 1 shows the percentage analysis of students' perception of teachers' pedagogical skills. It reveals that 128 students which is 32.0% of 400 students perceived that teachers had high level of pedagogical skills, 99 students which is 24.8% of 400 students perceived that teachers had average level of pedagogical skills while 173 students which is 43.3% of 400 students perceived that teachers had low level of pedagogical skills. This indicates that the high percentage of students perceived that teachers in the schools used for the study had low level of pedagogical skills.

**Research Question Two:** What is the influence of the students' perception of teachers' pedagogical skills on students' attitude towards science?

**Table 2: Mean and standard deviation analysis of the influence of students' perception of teachers' pedagogical skills on their attitude to science**

Teachers' Pedagogical Skills	N	Mean	Std. Deviation
High level	128	59.57	8.76
Average level	99	48.66	7.45
Low level	173	35.27	9.33

Table 2 shows that students who perceived that teachers had high level of pedagogical skills had mean attitude score of 59.57 with a standard deviation of 8.76, students who perceived that teachers had average level of pedagogical skills had mean attitude score of 48.66 with a standard deviation of 7.45 while the students who perceived that teachers had low level of pedagogical skills had mean attitude score of 35.27 with a standard deviation of 9.33. This means that the students who perceived that teachers had high level of pedagogical skills had the highest mean attitude to science than the others, followed by the students who perceived that teachers had average level of pedagogical skills.

**Ho:** The students' perception of teachers' pedagogical skills has no significant influence on students' mean attitudinal score towards science.

**Table 3: Analysis of variance of the influence of students' perception of teachers' pedagogical skills on their attitude to science**

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	432.940	2	216.470	28.444	.000
Within Groups	3021.450	397	7.611		
<b>Total</b>	<b>30646.390</b>	<b>399</b>			

Table 3 shows that students' perception of teachers' pedagogical skills had a significant influence on students' mean attitudinal score towards science,  $F(2, 397) = 28.444, p < .05$ . Since the probability value of 0.000 is less than the 0.05 level of significance, the null hypothesis was rejected.

**Table 4: Post Hoc Multiple comparison tests for the significant influence of students' perception of teachers' pedagogical skills on their attitude towards science**

(I) Levels	(J) Levels	Mean Difference (I-J)	Std. Error	Sig.
High level	Average level	1.91	1.16	.263
	Low level	5.69	1.01	.001

Average level	High level	-1.91	1.16	.263
	Low level	-2.60	1.09	.062
Low level	High level	-5.69	1.01	.001
	Average level	2.60	1.09	.062

Table 4 shows that high level pedagogical skills in comparison with average level pedagogical skills had mean difference of 1.91 with standard error of 1.16, high level in comparison with low level had mean difference of 5.69 with standard error of 1.01, average level in comparison with high level had mean difference of -1.91 with standard error of 1.16, average level in comparison with low level had mean difference of -2.60 with standard error of 1.09, low level in comparison with high level had mean difference of -5.69 with standard error of 1.01 while low level in comparison with average level had mean difference of 2.60 with a standard error of 1.09. This shows that high level pedagogical skills in comparison with low level pedagogical skills had the highest positive mean difference than the others. This indicates that the mean attitude score of students who perceived that teachers had high level of pedagogical skills contributed most to the significant influence of students' perception of teachers' pedagogical skills on their attitude to science.

## DISCUSSION OF RESULTS

The findings of this study revealed generally that teachers in the schools have low level of pedagogical skills. The analysis revealed that majority of the students, that is 173 students representing 43% perceived that teachers in the school have low level of teachers' pedagogical skills. The reason could be attributed to teachers' inability to develop repertoire of pedagogical skills necessary for effective teaching or it could be the teachers' inability to take the pedagogical skills as crucial in the teaching process. The finding of this study validates the claims of Ajaja (2009) that pedagogical skills science teachers ought to display while teaching are not put into practice. That is why Kyriakon (2007) opined that developing a repertoire of pedagogical skill as a teacher will help extend the teachers' knowledge such as when and how to apply the pedagogical skill that will be observable in the classroom. Kyriacou was basing on the assumption that the complex teaching act can be broken down into specific skills that the teacher can develop and easily use effectively in the classroom. A close look at the activities of the teachers' pedagogical skills shows that they are indispensable tool for effective teaching. However, Ike (2003) had earlier noted that teachers that went through micro teaching in colleges of education or Faculties of Education in Universities are capable of developing and using the teachers' pedagogical skills.

Furthermore, for students to indicate that teachers in their school have low pedagogical skills, they must have noticed that students' characteristics that should be enhanced through the teachers' display of pedagogical skills are not obtained. For instance, findings from the study by Naz, Khan, Khan, Daraz, and Mujtaba, (2013), revealed that questioning have significant effect on students' communication in the classroom; Muhammad, Muhammad, Abdul and Mudassar (2014) found that non-verbal communication enhances performance and motivation towards learning; Johnston (2008) found that set induction have effect on students' knowledge, attitude and engagement level in learning; while Fathima and Saravanakumar (2012) noted that stimulus variation skills enhances achievement. Hence, when teachers use pedagogical skills, these changes are achieved in the students. The students may not be seeing these outcomes in themselves. Thus, this may have contributed to their low perception of their teachers' pedagogical skills.

Data in table 2 indicate that students who perceived that teachers have high level of pedagogical skill had highest mean attitude towards science score than others in average and low perception. This finding is in line with Etuk, Afagideh and Uya, (2013) that a teacher who is rated high on the indices of pedagogical skills used while teaching influences students' attitude towards science. The outcome was based on the fact that when teachers displays their expertise in



teaching through their pedagogical skill it will give the teachers confidence and redirect students towards studying deeper. Thus, the attitude of the students is dependent on how the teacher teaches and how they display and manage their teaching skills. However, Ezeudu, Ezeudu and Sampson (2016), asserts that attitude is connected to the way one thinks. The responses they provided during this study according to their perception depicts that the teachers' pedagogical skills have significant influence on their attitude towards science. Although findings from different studies identified factors that influence positive attitude toward science such as Sofeme and Amos (2015) who identified age, Mokoro, Namsiya and Aloka (2014) identified teacher characteristics while Jegede and Awodum (2015) said that outdoor activities spurs positive attitude towards science. Following the above findings, studies from Etuk, Afangideh and Uya (2013), validates the findings of this study that when students' perception of their teachers' characteristics which includes their use of pedagogical skills is low, their attitude towards science becomes low. In a similar study, Inyama, Nwagbo and Ugwuanyi (2020) found that students' perception of the teachers' pedagogical skills has significant influence on interest in science. This therefore indicates that students' high perception of teachers' pedagogical skills results to positive attitude towards science.

## **CONCLUSIONS**

Students perceived that science teachers' pedagogical skills in teaching science subjects in schools are low this could be as a result of science teachers' inability to develop repertoire of skills necessary for teaching in science classes and so they find it difficult to utilize or practice the pedagogical skills while teaching. Again, students' perception of teachers' pedagogical skills influences students' attitude towards science. This shows that the influence teachers' pedagogical skills have on students' attitude towards science is as a result of students' high perception of their teacher' pedagogical skills in the school. Therefore, the result indicates that the attitude students have towards science is determined by the level of their perception of the teachers' pedagogical skills.

### **Educational Implication of the Study**

The findings of this study have implications for the students/learners and teachers having provided empirical evidence for the influence of students' perception of teachers' pedagogical skills on attitude towards science.

- Learners are the major determinants of what interest them or not and so teachers must take into cognizance learners' perception while planning to teach.
- Teachers must have firsthand knowledge of the learners' perception of their teaching as this knowledge will enable them to develop, and align their teaching skills to what will spur positive attitude towards science
- Based on these, the following are recommended that:
- Science teachers should endeavour to acquire appropriate pedagogical skills to enable the students develop positive attitudes towards science, technology and engineering careers at high level of education
- Science teachers should plan their teaching considering students' perception that will enhance positive attitude towards studying science. By doing so, they will be able to adjust their skills where they noticed that they are deficient.
- School board, the ministry of Education and other stakeholders in Education should from time to time organize in-service training, seminars, workshops and conferences. This will enable science teachers to acquire and update

their skills and other pedagogical competencies with respect to helping students develop desirable attitude towards science.

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