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### RESEARCH ARTICLE

## A STUDY OF THE ATTITUDE OF SENIOR SECONDARY SCHOOL STUDENTS TOWARDS SCIENCE PROCESS SKILLS

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#### Abstract

Science process skill (SPS) is an essential skill required in studying science and achieving the reform in Science, Technology, Engineering, and Mathematics (STEM) education in Nigeria. Science process skills are inseparable from scientific processes, such as observing, experimenting, and analyzing events. The current study's primary purpose is to assess the attitude of senior secondary school students towards science process skills. Also, to determine the teacher's pedagogical competence (TCP) in attitude towards science process skills. One hundred and sixteen senior secondary school students drawn from public and private secondary schools in Kogi State participated in the study. The participants completed self-report measures on attitude towards science process skills and perceived teacher's pedagogical competence. The findings revealed that 65.5% of the respondents expressed a negative attitude towards science process skills. Also, it was found that teacher's pedagogical competence influenced attitude towards science process skills. The findings and practical implications of the study are discussed.

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#### Introduction: -

One of the most crucial science education goals is to teach students how to get involved in inquiries. This is possible through training students on the science process skills (Hernawati et al., 2018). Science process skills are learning abilities that need to be implanted, practiced, and owned by students (Wahyuni et al., 2017). The primary purpose of science education is to provide students with science process skills (Ekici & Erdem, 2020). Science process skills are vital indicators of teaching objective achievement (Gunawan et al., 2019). In other words, students should integrate skills, knowledge, and attitudes to develop a better understanding of scientific concepts. The science process skills are skills that lie under scientific thinking and decision-making (Yumusak, 2016). Hence, instructors are expected to focus on using facts, concepts, and theories to guide students through scientific investigation. Basic science process skills include observing, connecting, inference, analysis, hypothesis, and defining variables operationally (Asy'ari et al., 2019). Although, inculcating science process skills in beginners is not a simple task for teachers (Suryanti et al., 2020).

Science process skills refer to procedural skills, experimental and investigating science habits of mind, or scientific inquiry abilities. Science process skills have been the focus of a huge volume of research in sciences education in the recent years (Arifullah et al., 2020; Duda et al., 2019; Inayah et al., 2020; Irwanto et al., 2017; Laksono et al., 2017; Langtang, 2018; Maison et al., 2020; Nuraini & Muliawan, 2020; Prabowo, 2015; Rahayu & Syarifudin,

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2019; Savitri et al., 2017; Sukarmin et al., 2018; Wardani & Djukri, 2019; Yuniarti et al., 2019). However, research examining student's attitude towards science process skills are scarce in Nigeria.

Attitudes are commonly regarded as dispositions that stand behind people's assessments and emotional feelings. Attitudes are acquired from human and societal needs and are expressions of people's intellectual processes. Attitudes toward science process skills entail positive or negative evaluation of science process skills and the overall disposition to adopt systematic skills necessary for scientific development and student's knowledge. An attitude consists of three aspects: cognitive, affective, and behavioral. The cognitive component indicates a student's knowledge about science process skills, which determines affection and response. Attitudes have been found to predict an individual's behavior, mainly when the attitude object is relevant (Fabrigar et al., 2006). Thus, students are more likely to develop a positive attitude towards science process skills when the concept is made clear. Perhaps, the teacher is an essential actor who assumes the crucial position of determining the success key of the learning process (Shelly et al., 2020). Indeed, a teacher's pedagogical competence could significantly influence a student's attitude towards a subject.

For this study's purpose, we refer to a teacher's pedagogical competence as the teacher's ability to possess content knowledge and the skill to impart learning and attract student's attention. Pedagogical competence generally involves knowledge and skill (Ningtiyas & Jailani, 2018). This means that the teacher's pedagogical proficiency could account for the variation in students' attitudes towards science process skills. Thus, the current study intends to determine secondary school students' attitudes towards the science process skills and the influence of teacher's pedagogical proficiency.

### **The present study**

The development of a positive attitude toward science is among the most critical STEM (Science, Technology, Engineering, and Mathematics) goals. Nevertheless, previous studies have examined attitudes toward science in general (Adegbola, 2019; Fasasi, 2017; Jack, 2018; Mordi, 1991; Oludipe et al., 2013; Sakariyau et al., 2016; Sofeme & Amos, 2015). Research looking at student's attitudes towards science process skills in Nigeria remains scarce. Thus, justifying the present study. Indeed, science process skills remain a crucial tool to systematic knowledge. This study aims to ascertain the attitude of secondary school students towards science process skills and ascertain the influence of teacher's competency on attitude towards science process skills among secondary school students.

### **Research question**

The primary purpose of the study is to provide the answer to the following:

1. What is the overall attitude of secondary school students towards science process skills?
2. Will a teacher's pedagogical competency influence secondary school student's attitude towards science process skills?

### **Hypothesis**

It is hypothesized that a teacher's pedagogical competency will significantly influence secondary school student's attitude towards science process skills

### **Method: -**

One hundred and sixteen (n = 116) secondary school students were pooled from science classes in both public and private secondary schools in Kogi state for the study. The students comprised males and females in senior classes with the age range of 14-18 years. A cross-sectional design was adopted.

### **Measures: -**

#### **Attitude towards SPS:**

Attitude towards science process skills was measured with a scale designed to assess students' positive or negative evaluation of science process skills. The scale consists of 10 items that measure attitudes and feelings about SPS with demographic information. Items were rated on a 5-point Likert-type scale (1 = Never, 5 = Always). A higher score on this scale indicates a positive attitude. The instrument was validated following a pilot study, and .78 Cronbach's alpha was obtained.

### Procedure

With heads of schools and teacher's assistants, science students from senior classes were recruited for the study. The participants were mainly pooled from the classrooms. A total of 142 students were asked to participate in a survey to better understand their feelings about science process skills. In all, 124 students out of the 142 assembled consented to take part in the study. Thus, the scales were administered to the students. One hundred and twenty-four (124) copies of the questionnaire administered were completed and retrieved on the spot. However, only the adequately filled questionnaires (i.e., 116) were subjected to statistical analysis. The remaining 8 copies were rejected due to improper completion.

### Result: -

**Table 1:** -Table showing the percentage score of the respondents on the attitude of towards science process skills.

	Frequency	Percent
Positive attitude	40	34.5
Negative attitude	76	65.5
Total	116	100

The above table shows that most of the respondents (65.5%) expressed a negative attitude towards science process skills, while (34.5%) indicated a positive attitude towards science process skills. This outcome provides an answer to the study question by revealing that secondary school students' overall attitude towards science process skills is negative.

To test the hypothesis that a teacher's pedagogical competency will significantly influence secondary school student's attitude towards science process skills. A simple regression analysis was conducted. The investigation revealed that teacher's pedagogical competence statistically significantly influenced the participant's attitude towards science process skill,  $F(1,114) = 279.754, P < .05$ . With  $R^2$  of .668, the result indicated that teacher's pedagogical competence accounted for 66.8% of the variation in student's attitude towards science process skills. Thus, our expectation that teachers' pedagogical competence will significantly influence students' attitudes towards science process skills was supported.

**Table 2:** -Table showing the simple regression results on the influence of teacher's pedagogical competence on students' attitudes towards science process skills.

Model	B	SEB	$\beta$	$R^2$	t	Sig.
(Constant)	.431	.084			5.119	.000
TPC	.784	.051	.819	.668	15.241	.000

Dependent Variable: attitude towards science process skill

### Discussion: -

The current study aimed to determine the attitude of secondary school students towards science process skills. The percentage score outcome revealed that most of the students (65.5%) expressed a negative attitude towards science process skills. The finding means that most secondary school education students in Nigeria are not adequately informed about science process skills. This assertion is based on the components of attitude, which implies that attitude is composed of cognitive, affective, and behavioral components. The cognitive component comprised knowledge. The affective component represents like or dislikes, while the behavioral component denotes response. Thus, inadequate knowledge about science process skills triggers the emotional state of acceptance or rejection and determines response towards science process skills. The probable explanation of secondary school students' unfavorable attitude towards science process skills could be attributed to the assertion that students are not exposed adequately to science practical activities (Indiege et al., 2017). A recent study (Chinyere, 2020) reported a correlation between attitude and science process skills, thus, indicating the relevance of assessing student's attitude towards the concept.

Furthermore, it was hypothesized that teachers' pedagogical competence would significantly influence students' attitudes towards science process skills. The simple regression model's result established a statistically significant influence of teacher's pedagogical competence on the respondent's attitude towards science process skills. The result revealed that teacher's pedagogical competence accounted for 66.8% variation in the respondent's attitude towards science process skills. Therefore, the result affirmed the assumption of the study. The result is aligned with a

previous study (Fauth et al., 2019), which found that teacher competence (pedagogical content knowledge and teaching enthusiasm) was positively related to students' interest.

Meanwhile, teacher's pedagogic competence has been implicated in student motivation (Saggaf et al., 2018). Additionally, (Florence 2019) found that teachers' pedagogical competence significantly influenced students' attitudes to basic science. This study suggests more elaborate enlightenment relating to science process skills at the secondary school level. Accordingly, research suggests that teachers provide exciting lessons in science classes to develop science process skills (Mirana, 2019).

### **Limitations, strengths, and future directions**

It is pertinent to report some of the limitations encountered in the study. For instance, the small sample size posed a limitation to the current study's generalizability. In addition, the data used for the study was solely self-report, thereby raising the issue of common method variance. This study contributes to the science process skills literature by exposing the unfavorable attitude of secondary school students in Nigeria towards science process skills as well as identifying teacher's pedagogical competence as a factor that accounts for the variation in attitude towards science process skills. Moreover, to the best of our knowledge, no study has attempted to examine the role of teacher's pedagogical proficiency on attitude towards science process skills in the Nigerian context. Future researchers should endeavor to utilize data from more comprehensive sources and extend the population parameter to the tertiary level.

### **Practical implication**

In our view, the present result is capable of providing valuable data for the ongoing reforms in Science, Technology, Engineering and Mathematics (STEM) Education and other education stakeholders in Nigerian in achieving their various objectives relating to science education.

### **Conclusion:-**

This study focuses on assessing the attitude of secondary school students towards science process skills revealed a more negative attitude than positive attitude regarding science process skills. In addition, it was found that a teacher's pedagogical competence is a factor that determine student's attitude towards science process skills.

### **Ethical considerations**

The study tried to adhere to the research ethics in the process. For instance, the respondents were fully aware of the study's purpose, and their involvement was made voluntary. Hence, they were advised to withdraw from the study whenever they wish to. In addition, their personal information was never requested.

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