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Research Article

# Effect of Interactive Invention and Traditional Lecture Instruction on Pre-Service Teachers' Interest in Cell Biology

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**Abstract**
Cell biology is an important concept in biology that helps students understand other concepts in the field. Students' interest has continued to wane over the years as a result of poor performance in the cell biology course. Therefore, this study sought to determine the impact of interactive invention and traditional instruction on student teachers' interest in cell biology. The study also aimed to investigate the effect of problem-solving ability on pre-service teachers' interest in cell biology as a moderator. Three (3) hypotheses were formulated to guide the study. A pretest-posttest control group quasi-experimental research design was employed. Four hundred and four pre-service teachers participated in the study. The study utilised all available NCE 1 pre-service biology teachers in the biology education programme in the Colleges of Education (CoEs). An instructional guide for interactive invention and conventional lecture instruction, along with a pre-service interest questionnaire ($r$ = 0.82) and a pre-service problem-solving ability test ($r$ = 0.79), were used to collect data. All instruments were validated, and their reliability was established. Data were analysed using Analysis of Covariance (ANCOVA), Estimated Marginal Means (EMM), and graphical illustrations. Findings indicate that pre-service teachers in interactive instruction had a higher post-interest mean score compared to their counterparts in traditional lecture instruction. There was no significant effect of problem-solving ability on pre-service teachers' interest. The two-way interaction effect of treatment and problem-solving ability was also not significant. Based on these findings, lecturers are encouraged to utilise interactive instruction when teaching cell biology at the College of Education.

**Keywords:** Interactive Invention Strategy, Pre-Service Teachers' Interest, Problem-Solving Ability

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## 1. INTRODUCTION

Science is defined as a process that generates and applies scientific knowledge to explain and predict the universe, thereby advancing our understanding of the universe (Akpan, 2020). Biology Education, according to Okenyi (2015), is when educational ideas are used in the process of instruction during the biology lesson; It is the conveying of biological information to pupils through teaching and learning; and it is the process of conveying biological information, abilities, and attitudes to students of any level. It provides learners with solid academic knowledge, skills, and numerous opportunities to apply that knowledge in practice. It provides learners with the opportunity to attain high academic achievement as well as the ability to apply what they have learned (Olagunju & Akpan, 2019). Cell biology deals with the study of cell structure and its functions; this encompasses the aspect of the cell, which is the functional and basic unit of life (Idodo-Umeh, 2011).

Cell biology (BIO 112) is a course taught with the following aims and objectives: to give students a proper understanding of the cell and cell theory, a brief history of the cell, comparison between animal and plant cells using their constituents. It is important that learners are able to link the processes of the cell to the real world and understand the benefits and significance of mitosis and meiosis to all living things. One of the objectives includes going to new areas for future studies, and these new areas include forensic science, microbiology, biochemistry, biotechnology, medicine, pharmacy, biomedical engineering, cytology, and so on. In the field of forensic science, the knowledge of cell biology has been used in solving murder cases, rapes, and kidnappings by using samples such as blood, hair, fingerprints, sperm, and so on to carry out a genetic test. The knowledge of cell biology will enhance the understanding of its application in curtailing these crimes. Many crime cases have gone unsolved because Forensic Science courses have not been fully utilised in the country. This need must be intensified by teaching cell biology in a way that emphasises the benefits and how it can help to curtail many societal issues.

## 2. BACKGROUND

### 2.1. Students' Interest

Curiosity is a powerful motivator; when learners lack interest, they are unable to study effectively because nothing drives them to do so. This is evident when individuals learn (Jakel, 2014; Serafin, 2016; Akpan & Olagunju, 2022). A study by Nwafor and Oka (2018) showed that girls had a greater interest in biology and related concepts than boys. Fakolade (2019) reported a link between the average interest rating and mean achievement scores in biology. Separate research by Adekunle and Femi-Adeoye (2016) found a significant relationship between students' achievement and interest in biology. Knekta et al.'s (2020) study revealed that students' interest is low at the secondary school level but may tend to increase, especially in courses related to human biology, due to their health concerns.

### 2.2. Interactive Invention Instruction

Ukoh (2012) stated that Interactive Invention Instruction (III) is utilised in the teaching of skills and concepts by imparting both concepts and skills by linking the teacher's explanation with pre-service teachers' practice, knowledge invention, periodic review, and feedback to impart various ideas and abilities. The Instruction has 3 phases: Phase 1 is Overview, Phase 2 is Practice, and Phase 3 is Monitoring and Evaluation.

*Overview:* Here, the lecturer shares the worksheet with them and lectures using the lecture method.

*Practice*: Here, the learners use the worksheet and answer the question using the experiment or material given to them. They also redo the already learned information.

Monitoring and Evaluation: Here, the lecturer evaluates the lesson using formative and summative means, during the lesson and at the end of the unit.

Ukoh's research on NCE physics educators in Colleges of Education (CoE) in the southwest part of the country demonstrated that the interactive invention strategy was effective and positively influenced the performance of NCE educators compared to those using conventional methods. Ogunbowale (2014) examined the effect of interactive invention and problem-based approaches on learners' performance in biology and found that the interactive invention strategy significantly improved students' performance in natural science at the secondary school level, yielding a higher achievement mean than the traditional instructional method.

### 2.3. Problem-Solving Ability

Temel (2014) describes problem-solving as a process in which a person overcomes obstacles to achieve a goal. He posited that an issue is considered a problem when the person involved lacks an idea of the way forward, and problem-solving is used when an individual has no clue about what to do. His study on pre-service teachers' perception of problem-solving showed that students had a medium level of problem-solving ability, and both problem-based learning and traditional methods had different effects on problem-solving based on their perceptions. The findings of Karademir (2019) on problem-solving skills indicated that it was above the average level. From these studies, it appears that problem-solving ability in secondary schools is at a median level. Therefore, it is necessary to assess the current state of learners' abilities to address problems in higher education.

Based on the deficiencies in pre-service teachers' interest, there is a need to investigate the effect of interactive instruction and conventional lecture instruction on pre-service teachers' interest in cell biology.

### 2.4. Hypotheses

$H_o1$: There is no significant main effect of treatment on pre-service teachers' interest in cell biology.

$H_o2$: There is no significant main effect of problem-solving ability on pre-service teachers' interest in cell biology.

$H_o3$: There is no interaction effect of treatment and problem-solving ability on pre-service teachers' interest in cell biology.

## 3. METHOD

### 3.1. Research Design

The study employed a pretest-post-test control group quasi-experimental design. This design is preferred because participants were put into an experimental and a control group. This type of research, called quasi-experimental, likens groups with diverse treatments to identify the cause-and-effect links and draws statistical conclusions from quantitative data to conclude.

### 3.2. Study Variables

This study involved three types of variables. The stimulus variables consisted of the Interactive Invention Strategy (IIS) and Traditional Lecture Instruction (TLI). Problem-solving ability was designated as the moderator variable. The response variable in this study was students' interest in cell biology.

In the southwest of Nigeria, two federal colleges of education were chosen using a purposive sampling method based on equal levels of equipment, laboratories, teaching staff, and material resources. The two federal CoEs were randomly assigned to control and experimental groups. College X and College Y are the two selected colleges. One college was taught using an interactive invention strategy, while the other employed traditional teaching methods.

### 3.3. Sample Population

All colleges of education included intact classes of biology student teachers in NCE I participating in the study, with college X having 146 pre-service teachers and college Y 124. The total number of participants from the two colleges of education was 270 pre-service teachers studying Biology education at the NCE I level in the colleges of education in the South West of Nigeria. The age of the pre-service teachers was 17.00±2.30 years, and they were 78% female and 22% male. Most students' educational background consisted of senior secondary school graduates, who had the West African Senior Secondary Certificate Examination (WASSCE) as a requirement for admission.

The performance of students in BIO 112, titled Cell Biology at NCE level 1, informed the choice of the contents. It could be seen that the students' performance seems to be inconsistent year after year. The content chosen is some of the topics taught in the Biology Education course, with the course code BIO 112, Cell Biology, which is one of the courses in the minimum standard by NCCE, and is offered by NCE I student teachers in Nigerian CoEs. The concepts utilised include:

a. Cell and cell theory
b. Cell Organelles
c. Physical processes of the cell and
d. Cell division

**3.4. Instrumentation**

3.4.1. Stimulus Variables

*3.4.1.1. Interactive Instructional Strategy (IIS)*

This approach was developed by Ukoh (2012) and was adapted for this study. The strategy has the following phases and activities. It has 3 phases and 7 activities.

Phase 1: Presentation

Activity 1: Here, the lecturer distributes the worksheets to the students and introduces the lesson.

Activity 2: The overview of the lesson: here, the lecturer gives an overview of the lesson, stating the why, how, when, and where of the lesson.

Phase 2: Practice

Activity 1: Guided Practice: Here, the students practice and are divided into groups of 8 to enhance competence by completing the task

Activity 2: Students' Continuous Practice: Students are allowed to reinforce what they have already learnt before, thereby reinforcing their mastery of the content.

Activity 3: Periodic Review: students ask questions to get reviews on learned concepts to reinforce concepts and skills.

Phase 3: Monitoring and Evaluation:

Activity 1: Daily Assessment: students' worksheets are assessed to offer corrections and instructions where needed.

Activity 2: Summative Assessment: Each worksheet is checked every week to offer feedback to sustain learning.

In summary, the strategy has both the lecturer's and the student teachers' activities. The learners were given the worksheets, and an introduction was given. Thereafter, the overview of the lecture is given by the lecturer on the topic to be learned. Students are then guided to practice using the worksheets in groups of 8, and then continue to practice using the worksheets for mastery. This helps in repeating known concepts before the lecturer gives a periodic review, and then daily evaluation is done for both formative and weekly summative evaluations.

*3.4.1.2. Traditional Lecture Instruction (TLI)*

The conventional lecture instruction has to do with the use of the lecture method as the control strategy for teaching students in college. This strategy involves the teachers dominating the activity in the class, with the students having little or nothing to do in the classroom. The method has the following steps to help guide the teachers during teaching and learning. The lecturer introduces the lecture.

1. The lecturer goes through the content of the lesson
2. The lecturer gives examples and uses of the concept
3. Students write down the lecture notes
4. The lecturer gives a window for questions from the class
5. The lecturer gives classwork
6. The lecturer assigns marks to the student's work.
7. The lecturer gives an assignment.

3.4.2. Response Variable

*3.4.2.1. Pre-service Teachers' Interest in Cell Biology*

The instrument Pre-service Teachers' Interest in Cell Biology Questionnaire (PTICBQ) is adapted from Yulinda and Ilma's (2018) question grid, which was designed to assess pre-service teachers' interest in cell biology. The PTICB has two parts, called parts A and B; part A was designed to get the demographic information of the pre-service teachers. Section B is made up of (24) items, placed on a Likert Scale of four points: SA = Strongly Agree (4), A = Agree (3), D = Disagree (2), SD = Strongly Disagree (1). Negative items were reverse-scored.

Thirty-three (33) items were first created, and to verify these items, three specialist lecturers from the science education department were consulted for professional opinions on the validity (content/face) of the instrument using the following standards: language level, difficulty, and applicability. Their suggestions and recommendations were effective. Final adjustments were made by my supervisors to produce the final copy. After that, 30 N.C.E. I pre-service teachers who were not used for the main study were chosen and given the remaining 30 items. Using Cronbach's Alpha statistics, an instrument's reliability index was determined, and it came out to be 0.82. The surviving 24 items were then used for the study.

3.4.3. Moderator Variable

*3.4.3.1. Pre-service Teachers' Problem-solving Ability*

Pre-Service Teachers Cell Biology Problem-solving Ability Test (PTCBPAT) is a researcher-developed instrument following the four steps of Ashmore, Frazer, and Casey's 1979 problem-solving model, which includes problem definition, information selection appropriately, information combination, and evaluation to measure students' problem-solving ability in related concepts in cell biology for its development. The instruments are categorised into two aspects.

Section A includes respondents' demographics. Section B includes four different problem scenarios designed to assess problem-solving skills in cell biology-related concepts. The test is divided into two parts: the first presents the scenario outlining the problem, while the second involves questions on how the individual would identify and resolve the problem. This includes selecting relevant information, devising a plan to address the issue, and evaluating the solution to determine if the problem has been solved. Scenario 1 describes a gardener who faces space constraints but wants to plant two citrus fruits in the same spot using grafting. Scenario 2 depicts an accident scene where a motorbike and a car have collided, resulting in a broken bone and bleeding in the affected area. Scenario 3 involves a man peeling an orange and accidentally injuring his finger, prompting him to find a solution for controlling the bleeding. Scenario 4 narrates children pushing nails into a mango tree trunk, causing a blocked vascular bundle. The model used is based on the approach developed by researchers employing the four phases of Ashmore et al. (1979). The questions are divided into four sections: problem definition, appropriate information selection, merging various pieces of information, and evaluation.

### 3.5. Scoring of PTCBPAT

Each student is allowed to earn a maximum of 122 points. Students who received a score of 0 to 61 were placed in the low problem-solving ability group, while those who had a score of 62 or more were placed in the high problem-solving ability group. The scoring is as follows:

i. Being able to state the problem ........................................... 2 marks for each point
ii. Stating the pieces of information ........................................ 2 marks for each point
iii. Coming up with a plan and solving the problem.............. 2 marks for each point
iv. Evaluating the solution appropriately................................. 2 marks for each point

Three expert lecturers in the Science and Technology Education Department were given the Pre-Service Teachers Cell Biology Problem-solving Ability Test (PTCBPAT) for validation in order to ascertain the suitability, language level, and the instrument's overall validity (face and content). Following that, corrections were made based on their academic feedback. The instrument was eventually verified by an evaluation expert from the Institute of Education. The expert examined the instrument to determine the readability, context, and appropriateness and decided that it was appropriate. I also gave the document to my boss, who read it and made the last adjustments. PTCBPAT was given to 30 student teachers who were not part of the study. The reliability measure used was the split-half analysis, and a coefficient of 0.79 was achieved.

### 3.6. Research Procedure

Data collection was divided into five phases: 2 weeks for visitation, 2 weeks for training for research assistants, 1 week for pre-treatment, 8 weeks for treatment, and 1 week for post-treatment, making a total of 14 weeks for the research duration.

### 3.7. Procedure for Data Analysis

The Pre-test scores were the covariates and analysed using inferential statistics such as Analysis of Covariance (ANCOVA), and if significant main effects existed, Estimated Marginal Means (EMM) were utilised. To explain significant differences, the Bonferroni Post-hoc Analysis was used. Graphs were used to explain significant interaction effects.

## 4. RESULTS

### $H_o1$: There is no significant main effect of treatment on pre-service teachers' interest in cell biology

Table 1 shows that there existed a significant effect of treatment on the interest in cell biology of pre-service teachers ($F_{(2, 269)} = .025$; $p>0.05$, partial $\eta^2 = 0.999$). The outcome is 99.9%. According to this, the treatment's significant main effect accounts for 99.9% of the total difference in pre-service teachers' post-interest in cell biology teaching and learning in this model. So, hypothesis 1b was rejected.

**Table 1.** ANCOVA of Post-Interest by Treatment and Problem-Solving Ability

| Source | Type III Sum of Squares | df | Mean Square | F | Sig. | Partial Eta Squared |
|---|---|---|---|---|---|---|
| Intercept | 6086.789 | 1 | 6086.789 | 159.062 | .000 | .375 |
| | 10153.907 | 265.346 | 38.267[a] | | | |
| Pretest Interest | 4276.343 | 1 | 4276.343 | 110.378 | .000 | .294 |
| | 10266.806 | 265 | 38.743[b] | | | |
| Treatment | 4466.763 | 1 | 4466.763 | 668.753 | .025* | .999 |
| | 6.606 | .989 | 6.679[c] | | | |
| Problem-Solving Ability | 2.120 | 1 | 2.120 | .307 | .673 | .222 |
| | 7.431 | 1.075 | 6.913[d] | | | |
| Treatment * Problem-Solving Ability | 6.710 | 1 | 6.710 | .173 | .678 | .001 |
| | 10266.806 | 265 | 38.743[b] | | | |

R Squared = 0.38; *indicates the level of significance at $p<0.05$

The EMM was used to explain the effect and difference in the treatment groups, and the result is highlighted in Table 2. This was done to investigate the size of the significant effect across treatment groups.

**Table 2.** The EMM for Post-Interest by Treatment and Control groups

| Treatment | Mean | Std. Error | 95% Confidence Interval | |
|---|---|---|---|---|
| | | | Lower Bound | Upper Bound |
| Interactive Invention | 82.815[a] | .532 | 81.768 | 83.862 |
| Control | 74.472[a] | .567 | 73.356 | 75.587 |

Table 2 showed that the Traditional Lecture Instruction (TLI) control group (74.47) had the lowest adjusted mean score in post-interest in cell biology. The pre-service teachers taught with the Interactive

Invention Strategy (IIS) experimental group had the better post mean score in student teachers' interest in cell biology (82.82). It is represented as IIS>TLI. The Bonferroni post-hoc analysis is used to identify which group is responsible for this significant main effect of treatment across groups, as shown in Table 3.

**Table 3.** Bonferroni Post-Hoc Analysis of Post-Interest by Treatment and Control Groups

| (I) Treatment | (J) Treatment | Mean Difference (I-J) | Std. Error | Sig.[b] | 95% Confidence Interval for Difference[b] | |
|---|---|---|---|---|---|---|
| | | | | | Lower Bound | Upper Bound |
| Interactive Invention | Control | 8.343* | .777 | .000 | 6.813 | 9.873 |
| Control | Interactive Invention | -8.343* | .777 | .000 | -9.873 | -6.813 |

*. This connotes a significant difference at the 0.05 level.

According to Table 3, the post-interest means scores of pre-service teachers who learnt through the Interactive Invention Strategy (IIS) differ significantly from those taught through the Traditional lecture Instruction (TLI). This demonstrates that the significant difference in the Experimental group (Interactive Invention Strategy) and the Traditional Lecture Instruction group, as measured by learners' post-interest in cell biology, is not the result of differences amongst the experimental and control group themselves, but rather amongst the groups (control and treatment).

**Hypothesis 2:** There is no significant main effect of problem-solving ability on pre-service teachers' interest in cell biology.

According to Table 1, the mean impact of problem-solving ability on student teachers' interest in cell biology is not statistically significant ($F_{(2, 269)} = .673$; $p>0.05$, partial $\eta^2 = 0.222$). As a result, hypothesis 2b was not rejected. This suggests that pre-service teachers' interest in cell biology is unaffected by their capacity to solve problems.

**Hypothesis 3:** There is no significant interaction effect of treatment and problem-solving ability on student teachers' interest in cell biology.

According to Table 1, there is no significant interaction effect of treatment and problem-solving ability that might affect pre-service teachers' interest in cell biology ($F_{(2, 269)} = 0.678$; $p>0.05$, partial $\eta^2 = 0.001$). Thus, hypothesis 4b was not rejected. This suggests that treatment and problem-solving ability could not cause a significant interaction effect on student teachers' interest in cell biology.

## 5. DISCUSSION

### 5.1. Main Effect of Treatment on Student Teachers' Interest in Cell Biology

The results showed a significant main effect of treatment on pre-service teachers' interest in cell biology. It also indicated that the control group, TLI, had the lowest post-interest score, whereas the pre-service teachers taught with IIS, the experimental group, achieved a better post-interest in cell biology. The effectiveness of the interactive invention strategy over traditional Lecture Instruction in enhancing pre-service teachers' post-interest scores in cell biology could be because the strategy includes materials that maintained their interest in the subject. Specifically, pre-service teachers in the interactive invention strategy utilised a worksheet, which meant they interacted with the materials as well as with others within their group. Continuous practice of the concepts already learnt led to revisiting the material, which kept them engaged in the cell biology course.

According to constructivist theorist Jerome Bruner, the intelligent mind develops through an experience that functions as a coding process, which enables an individual to go beyond what was given as data to make new and potentially successful guesses (Bruner, 1960). Learners must thus learn specific techniques to recognise recurring patterns in their environment as they grow. The key principle of Bruner's theoretical framework is a process where learners are actively engaged in learning and are encouraged to produce new concepts or ideas by drawing on previous knowledge or existing information. They are expected to have a cognitive framework to select and adapt the information presented before forming wise guesses and passing judgment. In terms of instruction, the instructor is expected to motivate learners to discover new ideas or concepts independently. Active discussion between learners and the teacher is ideal (often called Socratic learning). It is the instructor's responsibility to adapt the information to suit the learner's current level of understanding. For a pre-service teacher to perform effectively, he or she must be interested in what is being taught. The experimental strategy, known as interactive invention instruction, employs a hands-on and activity-based approach that involves learners actively in the learning process. This active participation could have helped increase students' interest in the concept of cell biology presented by the lecturer.

Presently, there have been calls for the usual teacher-dominated classrooms to learner-dominated learning environments where learners are responsible for what they learn while the instructor serves as the facilitator or guide (Derer & Berkant, 2019). An interactive invention strategy is the introductory method to developing intellectual skills. The strategy's objective is to encourage learners to decipher ways to solve various issues. The essence is to stimulate the learners in a way that can improve their ability to solve different problems through brainstorming using their various worksheets and puzzles (Meyer et al., 2014). These activities could be what helped increase their interest in cell biology.

This result supports research on improving learners' attitudes by teaching using a puzzle approach in biology in Wukari. The outcomes demonstrate that the puzzle-based learning method was able to significantly change learners' attitudes (Umoru et al., 2016). Similarly, Ukoh (2022) found that attitude and performance improved when learners were taught using an interactive invention approach in some electromagnetic topics. The result also supports Alqawasmi et al.'s (2024) research, which revealed positive attitudes among physics students towards the use of the Interactive Board (IB) as an educational instrument.

### 5.2. Main Effect of Problem-solving Ability on Student Teachers' Interest in Cell Biology

The results showed that problem-solving skills have no significant main effect on student teachers' interest in cell biology. This suggests that student teachers' interest in cell biology is unaffected by their ability to handle problems. This finding means that problem-solving ability did not cause an effect on interest in cell biology. The problem-solving ability test was characterised by solving cell biology-related problems, and this problem did not directly cause an effect on student teachers' interest in cell biology. This indicates that no aspect of the problem-solving ability test caused an effect on student teachers' interest in cell biology. The problem-solving ability as a psychological cognitive variable is, by nature, independent of a particular content. They used their problem-solving skills to factor in their responses when given worksheets to complete, but the content provided by the strategies brought about the improvement; therefore, this had no impact on their interest in cell biology. The findings disagree with Nnorom's (2019) research on the impact of problem-solving instructions on biology performance in secondary schools. Findings showed that learners taught with problem-based solving techniques had improved performance over those in the traditional approach. The results also disagree with a study on problem-solving teaching on learners' performance and practical skills abilities in future elementary teachers. The findings indicated a significant difference between the treatment groups (control and experimental) in terms of academic performance and science process skills (Saputro et al., 2019).

The findings of Usman and Sule's (2017) study on the effect of the problem-solving approach on physics learners' attitude and performance in Jos North are in direct opposition to the conclusions of this study. The findings indicate that, following treatment, male learners' performance levels with their attitudes were much better than those of females. The finding does not align with Smitha and Manoj's (2018) research, which shows that there is a link between problem-solving ability and academic performance in biology. It does not align with the findings of Jayanthi and Tholappan (2017), whose study shows a relation between performance and problem-solving ability. The finding disagrees with the research of Kaur and Kaur (2021) on the effect of a cooperative approach on learners' academic performance in mathematics with respect to their problem-solving ability. Results show that there is a variation in the performance of learners concerning their problem-solving ability in mathematics. It further shows the impact of problem-solving ability on the learners' achievement in mathematics. It agrees with the research of Sung (2017) on the visual propensity and problem-solving on pupils' performance. It utilised two hundred and twenty-three respondents. It was a survey design. Findings indicate that there was no influence of problem-solving ability on pupils' performance in the study.

### 5.3. Interactive Impact of Treatment and Problem-solving Ability on Student Teachers' Interest in Cell Biology

The findings revealed that no interaction effect existed between treatment and problem-solving ability on student teachers' interest in cell biology. This suggests that there is no interaction between treatment and the ability to solve problems and pre-service teachers' interest in cell biology. This demonstrates that the treatment (IIS and TLI) had no impact on pre-service teachers' interest in cell biology when combined with high and low problem-solving ability. The psychological variable problem-solving ability, when combined with the treatment, suggests that it was insufficient to have an interaction effect on student teachers' interest in cell biology because it is independent of the subject matter of cell biology. Malik et al.'s (2010) study on the impact of a problem-solving method of instruction on eighth-grade learners' attitudes towards science shows the opposite, that in contrast to the participants in the lecture method (control group), the findings showed that pupils in the treatment group had a favourable attitude towards learning science.

## 6. CONCLUSION AND RECOMMENDATION

In conclusion, the interactive invention strategy had a better mean interest score than its counterpart in the traditional lecture instruction in Cell biology. This means that the interactive invention strategy improved pre-service teachers' interest in cell biology. This was possible because the strategy had a worksheet that they had to complete and thereafter repeat the practice; these kept them interested and grounded in each of the concepts taught. The findings further showed that problem-solving ability did not significantly affect student teachers' interest in Cell Biology. It further confirms that the interaction of treatment and problem-solving had no significant impact on student teachers' interest in cell biology. The findings from the study led to the following recommendations and there are:

1. Lecturers should employ the use of an interactive invention strategy to teach the Cell Biology course at the college level.
2. Other variables, like mental ability and gender, should be used as moderator variables.
3. The interactive invention strategy should be used to teach other courses at the colleges of education.
4. The problem-solving ability of the learners does not affect the effect of the interactive invention strategy.

This study has several limitations. The Colleges of Education involved in the research resumed academic activities at different times, which prolonged the overall duration of the study. In addition, some students who participated in the earlier stages were transferred to other departments during the screening process, resulting in a reduced sample size. Future studies are encouraged to address these limitations by extending the investigation to private Colleges of Education and to institutions located in other geographical zones. Moreover, subsequent research may incorporate moderating variables such as self-efficacy, practical skills, and gender to provide a more comprehensive understanding of the phenomena under investigation.

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