PROCESS AND GUIDED APPROACH TO SCIENCE AND TECHNOLOGY STUDENT-TEACHERS GAIN VARIED METHOD IN WORKSHOP APPLICATIONS: A SAMPLE STUDY OF COMPUTER-ASSISTED APPLICATION

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Abstract
The purpose of the study is to develop a new approach and assess the application for the sciences and technology student-teachers to gain, varied workshop methods in science and technology teaching. The paper also describes the computer assisted application in the subject of photosynthesis-light" developed in the context of this approach choosing the most appropriate design software called "Flash Player 10.1. The study was applied during the fall semester in the 2020-2021 and 2021 and 2022 academic year with 188 science and technology student-teachers who attended the course of Science and Technology Workshop Application – 1 at the Ekiti State University, Ado-Ekiti Faculty of Education affiliation with Emmanuel Alayande College of Education, Oyo based on action research methodology. The survey's data was analysed with SPSS 16.00 using descriptive statistics based on mean and standard deviation. The interviewing data was analysed according to common views. In the study, theimplementation process of a developed approach was explained and an example of the computer – assisted application in the subject of "Photosynthesis – Light" was described. It was concluded that the developed approach introduces the science and technology student – teachers to an efficient and reflective process to gain varied methods in workshop applications.
Keywords*:* Varied workshop methods, Science and Technology, Student teachers workshop applications, Computer-added / assisted application.

Introduction
The developments achieved in Science and technology education within the last twenty years have contributed immensely to the science and technology teaching being treated as a new field of knowledge and research (Akpmar and Bayramoglu 2018, et al. However, Science and technology education system aims at raising individuals with developed critical and creative thinking skills (Ozmen, 2019). In this process with the agency of educational institutions, the teachers should take an active role in instructing the individuals who put forward the original, useful new ideas and findings and prioritize the creativeness in all areas (Cakir Ithen, 2022; et al). Teacher efficacy is enhanced through pre-service and in-service teacher education (Stem & Wang, 2018). On the other hand, teachers' professional development cannot be described as a linear continual formulation and a defined stable process to constitute a professional perspective (Ovens, 2019; Solomon & Tresman 2019).

It is stressed that teachers should have an approach adopting the principle of continual development during the teacher process. During effective science and technology education, the workshop approaches that teachers apply during the teaching process require the teacher to be a guide facilitating the students to reach the knowledge rather than the presenter of the knowledge (Holt-Reynolds, 2021). However, student-teachers clarity that they do not implement profoundly the application activities because of the limitations of the process especially regarding time

(Saka, 2021). Therefore, having more practice teaching during pre-service teacher education has crucial importance to improve student-teachers' skills in relation to application of the varied workshop methods. On the other hand, the idea of reflection and the reflective practitioner has crucial importance on raising interest in relation to elaborate practice teaching in workshop classrooms to emerge on international profitable climax (Shaw, 2022). Therefore, student-teachers should be oriented to understanding science and technology workshop methods during their pre-service teacher education process.

Within the scope of science and technology workshop applications, the aim is to develop students' skills of the scientific process by making the abstract science concepts understandable (Karanustafaoglu, et al, 2023). It is already known that this method has several positive thinking impacts, notably, developing reasoning, critical thinking, scientific perspective, and problem-solving skills in students (Feyzioeglu, et al 2022). Hence, workshop applications constitute the focal point of science and technology teaching (Tasdelen, 2023). Considering this fact, student-teachers are required to make science and technology applications on this expected level if practicing in their professions.

The students are said to find workshop activities mere enjoyable and useful (Cerini, et al, 2022). The attention is drawn to the necessity of setting rich learning environment by the use of workshop activities (An & Bayram, 2021). Although the workshop activities in science and technology teaching have become more prominent in recent years (Thair & treagust, 2020; Watson, Pricto & Dihen, 2021), the workshop applications for science and technology teaching are not conducted at the desired level (Saka, 2021, Teo 2022). The following factors are underlined as leading causes in this situation: lack of devotion and planning for workshop applications (Backus, 2018; Booth, 2020; Hackling, Goodrum & Rennie, 2021), lack of efficient and sufficient course materials (Abraham, et al, 2019), students low readiness level, the problems related to classroom management, lack of safety measurement in workshop not taking student. Workshop application achievement into consideration in their assessment, and teachers lack of sufficient knowledge and skills concerning workshop application approaches (Furak, et al 2017). Thus, no matter how efficient a science and technology reaching curriculum is developed, or how knowledgeable the teachers as the practioners of the curriculum and as the people who will take charge in the process, the student-teachers unawareness of their roles and responsibilities in the implementation process of the developed curriculum and their inabilities in efficiently developing their skills of fulfilling these roles and responsibilities cause the deadlock of the encountered problems. It also necessitates the science and technology student-teachers in the pre-service education process to improve their skills by carrying out the practices enabling them to acquire knowledge about their aforesaid roles and responsibilities and fulfill these roles and responsibilities as they are expected to do (Saka, 2021).

Teachers inability to conduct science and technology teaching application efficiently is explained their inadequacy in developing their workshop application skills (Beneze, 2019). It will be possible for the teachers who have sufficient levels of knowledge and skills for the substantial workshop, inquiry-based approach and constructivist approach to choose relevant methods and techniques (Koyunlu & Dokme, 2021). Thus, they will be able to make the best of their time through effective planning. Then, following the recovery of the commonly-encountered problems in relation with classroom management, the negative attitudes towards workshop application will be changed. In describing teachers' competency, the ability to apply different

field specific teaching methods and techniques is accepted to be one of the most important skills in terms of field teaching knowledge.

Within the scope of the study bring held, the student-teachers are provided with the alternative activity development and application opportunities thanks to employing different workshop applications towards the same gain based on the workshop approaches, methods and techniques. This context, the aim is to develop a different approach intended for promoting workshop application skills towards science and technology teaching in the pre-service teacher education. For this reason, the student-teachers are intended to develop their skills of choosing the best workshop approach, methods and technique for a specific subject and obtain a wide range of methods in workshop applications.

When science and Technology student – teachers interact with their peers during workshop applications, they get experiences through collaboration for preparing their practice. Practice of collaboration could be applied by working with peers to gain varied methods in workshop applications as a group. When the science and technology student-teachers work in groups, the method tutor's role is to orientate their interaction and intervene when necessary to contribute or support their workshop application skills (Johnson & Johnson, 2023). In this process, working exceedingly contributes to their professional skills development by sharing their ideas, assumptions and ensuring mutual support observing each other practice and having best relationship with peers (Talvitie, Peltokallio & Mannisto, 2020). Veenman, Benzton, Boctsma, Dieren & Kemp, 2022). It is believed that this approach is useful in constructing the framework of science and technology student-teachers' image. Because, constructing reasonable change on framework of teacher development emerges from the teacher's own practice by adaptation of others' experimental learning regarding agreeable features (Ovens, 2019).

Science and technology student-teachers could have an opportunity to assess their own workshop applications' effectiveness, feeling more confident about themselves as a developing teacher and exploring new workshop application methods. This process could have a meaningful contribution to the science and technology student-teachers regarding cooperative learning and class wide peer tutoring.

The approach explained in this study is based on the reflections that indicate the different patterns of science and technology student-teachers' preparation for workshop applications in the extent of supportive interaction. This approach ensures the practitioners various kinds of opportunities through reflection of specific responses regarding learner participation, learner's relationships and workshop applications based on different approaches, methods and techniques. By this, we can prepare science and technology student-teachers for any, kind of conditions especially with respect to applications for different workshop methods.

Purpose of the Study

The purpose of this research work is to develop and assess a new approach to the application for science and technology student-teachers gain varied workshop methods in science and technology teaching. It also aimed at describing the computer – assisted application developed on the subject of the "Photosynthesis – light" in the context of this approach".

Methodology

This study is implemented based on action research methodology. Since it has the characteristics concerning the development of application, the implementation of a "practice oriented – action research " (Holter & Schwartz – Bar Cott, 2023). In this process survey and questionnaire techniques are used. In the execution of the research, a survey and structured interview form was

utilized as data collection means. The sample consists of 188 third angle grade science and technology student-teachers who attended the course of Science and Technology Workshop Application – 1 educated in the 2020 – 2021 and 2021 – 2022 fall education term at the Ekiti State University, Ado – Ekiti, Faculty of Education Science and Technology Teaching Programme.

Development of Measurement Tool
Before the implementation process of the approach or executed, the student-teachers were asked to state their expectations by taking the objectives of the course into account. During the execution process of the approach, the student-teachers were asked to prepare a log of experience gained with the behaviours of professional skills. The items are formed with the expressions of expectations before the application and learned behaviours about the implementation process are arranged by the frequency of expression of public opinions. The developed survey was applied to 45 student-teachers in the scope of the pilot study and reliability analysis were implemented in SPSS 16.00 programme. In this analysis, 95% confidence interval taken and discriminate validity of the survey consists of 19 items by subtracting non- destructive 4 items was calculated as Cronbach's Alpha value of 0.93. The Alpha value which is greater than 0.70 shows the reliability of survey (Tavsancil, 2021). A likert study 5 – rating measurement was used in the development survey (totally: 5, greatly: 4, partly: 3, few: 2, any, 1). This survey was used as a measurement tool to determine the level of skills acquired before the application and professional skills acquired in the process of teaching of the course based on the approach applied in Science and Technology Workshop Application – 1 course.

In this process, on the other hand, within the scope of the approach a workshop scale approach, methods and techniques used by the student-teachers were put in an order and on the other hand, before and after application of the likert style 5 – rated measure of opinions about the level of implementation (complete 5, to a large extent: 4, partly: 3, very little: 2, any = 1) was used. Obtained survey data was analyzed on the basis of the mean and standard deviation with descriptive statistical methods using SPSS 16.00 package program. Interview data was analyzed on the basis of the student-teachers' common opinions about the application being implemented on the processes before and after the application of the developed approach.

Developed Approach and Implementation Process
Within the scope of the approach developed in the study, student-teachers were grouped and they carried out various applications based on different workshop approaches, methods and techniques considering that they have the same gains. The efficiency and applicability level of the applications in this process was observed and it was aimed that the student-teachers' skills in terms of various, workshop methods should be developed. Science and Technology student-teachers in this process, have designed approaches, demonstration methods,5E model, the POE method, worksheets, simple teaching tools and computer-assisted experiment activities on the basis of induction, deduction and research. Thus, it is argued that science and technology student-teachers would gain a wealth of method and techniques in science and technology workshop applications. If properly followed to the letter, it will assist the students to be more skillful, experience and mastery their areas of discipline.

In the first phase of the study, a survey developed to determine their views about the level of effectiveness of the approach, was applied to 188 student-teachers in the sample during the processes, before and after the science and technology workshop Application – 1 course. In the second stage, before and after the application of the developed approach, the student-teachers

were asked to mark the chart prepared by considering the levels of the student-teachers' ability to apply the methods of workshop applications related to science and technology teaching. In the third phase, student – teachers were asked to state their opinions in written format about the approach applied to the extent of "positive aspects", "negative aspects" and "suggestions for better application".

The following stages / steps were followed in the process of implementation of this approach: -

- The instructor conducting the course used the first 4 weeks of the theoretical and practical part of the course in order to make the necessary explanations about the workshop methods to develop the student-teachers' skills to gain a wealth of methods in workshop applications.
- In this process, the principles of application of workshop methods, advantages and weaknesses were pointed out.
- After the required disclosures were completed in practical courses in the first four weeks of the period all the lessons were used as the application process.
- In the application part of Science and Technology workshop Application – 1 course; gains in science and technology curriculum (2-3gain) were given to the student-teachers in the extend of grade level-unit-subject-gain with 3 members in groups consecutively.
- Student-teachers in their presentations in this process used overhead projector or projection devices by preparing a one-page word document in the computer environment and transferring this into acetate.
- Student-teachers were informed about the criteria used to assess the applications carried out by the student-teachers. This observation scale was created by integrating the principles of the approach with the criteria in Teaching Practice Assessment form (Appendi Table 1). In the use of this form, the criteria contained in Teaching Practice Assessment form (YOK, 2018) were considered as; Deficient (D = 2point), Acceptable (A = 3point), Well – trained (W = 5point).
- In this form of the assessment, the size of the presentation was considered 60% of the level, and the size of the plan was considered 40% of the level.
- Activity plans prepared by the student-teachers of their choice and application of the principles of the method steps of the workshop were asked to indicate in the box to italic. Principles stated in this case contribute to increase the consistency level of the chosen method with the activity plans the student-teachers prepared.

Development Stages of the Computer-Assisted POE Application

To see the software included in the study design, the "flash player 10.1. software was preferred because of features such as standardized file structure, the fast, small footprint files, interaction functions and case of use. In the process of developing Application in Computer – Assisted POE, the following steps were conducted by the student-teachers:

- By researching literature about computer-assisted education, POE method and workshop application on science and technology teaching, current studies and developed teaching materials.
- A variety of textbooks appropriate to the curriculum were used in the process of the development of activities by considering the gains as a result of the groupings made in the process of the application of the course.
- Features of an appropriate and effective interface in terms of visual design were determined.

- As an animation and design program for the objective of the study "Flash Player 10-1" were selected and the required animations, steps, texts, images and shapes were design for the packet program to be prepared.
- Interface was prepared on "Flash Player 10-1" program and texts were placed into the interface.
- Buttons required to ensure the interactive use of the execution process of the activity were prepared and activated.
  - To reflect the execution process of the activity – Play (>)
  - To stop the execution process of activity – pause (II)
  - To replay the execution process of activity – replay (replay)
  - To reflect the POE phases in the material – POE's phases
  - To watch the related animation after the explanation with POE's **phases – continue (>)**
  - To reflect the instructions in the execution process of the experiment activity – **New instruction**
  - To close the animation – **close the animation (x)**

In addition, the meanings of the relevant icons were included on the icons in the screen display of the activity. The activity material was put into the final form by taking the recommendations of the instructor and making the necessary corrections (Sample screenshot of the experiment area relevant to the developed material are given in Appendix figure 1 – 9).

Survey Findings

The data obtained from the survey and the interviews conducted in the scope of the study were arranged and presented in accordance with the aim of the research as follows:

As a result of the survey conducted to determine the science and technology student-teachers' views on the approach developed within the scope of the study, the teachers' gains concerning pre and post application process especially concentrated on the following skills based on the aim of the study: explaining the advantages and limitations related to the approaches, methods and techniques by observing the applications of the activities developed for different workshop approaches intended for the same gains (2.69-4.14), observing whether the methods recover each other's defects by different workshop approaches (2.52-3.92); observing the contributions of applying different workshop approaches, methods and techniques to building a sufficient interaction with students in the execution of workshop applications (2.76-4.03); developing skills related to the scientific process (2.55-3.81); setting an effective learning-teaching environment by considering different approaches methods and techniques in science and technology workshop applications (2.71-3.94); preparing and applying a testing apparatus based on different workshop approaches, methods and techniques considering the same gains (2.71-4.01) developing and suing simple tools and equipment (2.87-4.11); reinforcing the fundamentals and application principles of different workshop approaches, methods and techniques (2.01-3.93); choosing efficient workshop approaches, methods and techniques for the same gains (2.72-3.95), developing activities pertinent to different workshop approaches, methods and techniques considering the same gains (2.59 – 3.82)-Appendix Table below:
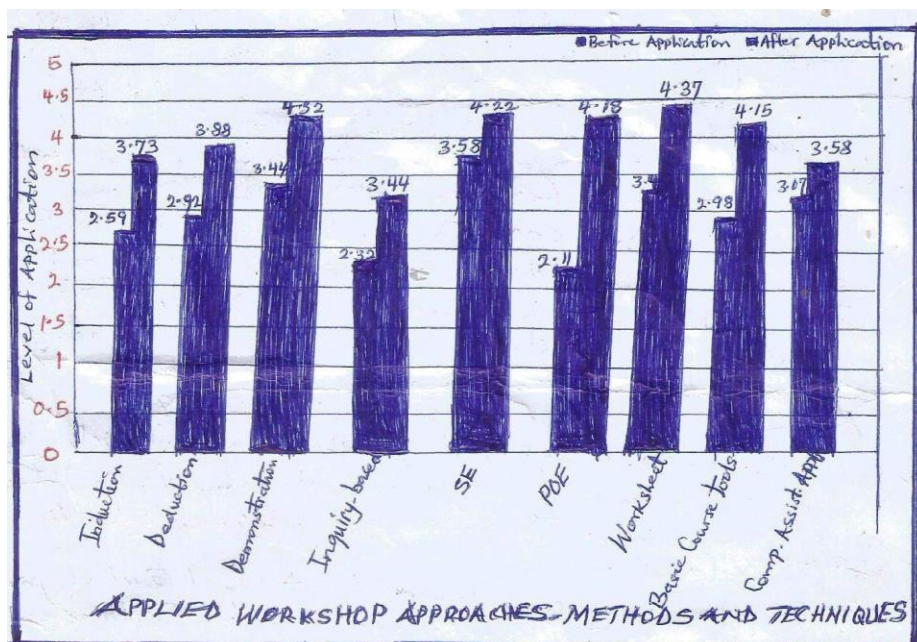
Table 1: *Student – teachers' application level of different workshop approaches, methods and techniques concerning the pre and application processes of the developed approach.*

In the context of the implemented approach, science and technology student-teachers' development at the highest level is in POE (2.11-4.18), basic course tools (2.98 -4.15) and an induction approach (2.59-3.73), while their development at the lowest level is in computer assisted application (3.07-3.58), 5E (3.58-4.22), and demonstration (3.44-4.32), methods in turns. Also, the highest average values at the end of the application belong to worksheet (4.37), demonstration (4.32), and 5E model (4.22) – Figure 1.

Questionnaire Findings

The views of 45 student-teachers about the conducted application, chose randomly from the sample were organized by categorizing them under three titles: "positive aspects", "negative aspects" and "suggestions for improving the quality of the conducted application".

Positive Aspects

- Taking an active role in the application of the course;
- Following the choice of method, carrying out the application eagerly and in a motivated manner;
- Gaining the skills toward developing and applying alternative workshop approaches, methods and techniques,
- Developing the skill to choose the best workshop approach method and technique for the subject,
- Reinforcing the attention to the course and learning the workshop methods and techniques more effectively by taking an active role;
- Developing the skill to write a qualified activity report according with workshop and techniques,
- Understanding the advantages and disadvantages of workshop methods and techniques in detail,
- Using the limited time period in the application efficiently

- Gaining experience toward providing students' active participation
- Developing the ability to explain,
- Building a positive competitive environment by referring to investigation,
- Formulating its original teaching style since it enables teaching practices,
- Perceiving the significance of activating students,
- Having experience about the positive effects of computer – assisted applications,

Negative Aspects

- Boundedness of activity application time with 20 minutes,
- Observing the fact that not all subjects can be presented by means of all the workshop methods and techniques since some subjects take longer time,
- The existence of a boring application when the appropriate workshop method and technique cannot be chosen,
- Teacher's being more active than students in some methods,
- The lack of the opportunity to have different applications of the methods and techniques these are suitable for the gains.

Suggestions for Improving the Quality of the Conducted Application

In order to carry out the application more efficiently and realistic an application with the student in a real classroom environment at the chosen schools can be conducted.

- The students' insufficiencies can be explained through one to one interaction instead of motivating and criticizing them by grades,
- More opportunities towards different workshop methods and techniques can be provided by increasing its weekly course hours.
- More experience in the execution of the workshop approaches, methods and techniques can be secured before teaching practice
- Much time can be allocated since the application period is limited.
- To conduct these kinds of courses which are student centered, the applications having similar qualifications must be carried out starting from first year of the university.

Discussion and Conclusions

While science and technology student-teachers were developing activity, plans based on the different workshop approaches, methods and techniques in the implementation process of the developed application within the study, they had discussions among themselves based on causal relationships. It was assessed that these discussions would contribute to the development of their professional skills foe the principles and application of the different workshop would increase their knowledge and understanding of the courses.

In the study, the student-teachers also found the opportunity to identify their problems with workshop applications. Therefore, they will have the chance to overcome the inabilities in applying different workshop methods in practice. The students are expected to think over their inabilities and make their own decisions to overcome these insufficiencies. Again, the student-teachers remarked that they acquired experience with the positive effects of computer-assisted applications and that they developed their skills of using simple tools and equipment on everyday life as course materials.

As for the negative aspects of the application mentioned by the student-teachers in the interview, especially the following points were indicated: boundedess of activity application time with 20-25 minutes, the existence of a boring application when the appropriate workshop method and technique cannot be chosen, the lack of the opportunity to have different applications of the

methods and techniques etc (Tllema, 2021). It is concluded that science and technology student-teachers would practice workshop teaching in advance of actual practice in schools to take part in the workshop courses in front of their peers during pre-service teacher education. So, the identified limitations could be minimized to a reasonable degree by recognizing and inquiring after a lack of experiences and science and technology student-teachers will gain conscious by applying this approach. The study suggested the process of pre-service teacher education where priority be giving to different workshop approaches, methods and techniques in application of courses concerning science and technology teaching, the instructors must aim at developing student –teacher's skills in this field at the expected level through ensuring they gain sufficient experiences.

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