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Learners' engagement in the conduct of science investigatory project and its influence to science process skills

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Abstract
Science Education relies on its core to develop scientific literacy and knowledge application. To realize this objective, learners must be given the avenue to conduct researches particularly the conduct of a Science Investigatory Projects (SIP). This descriptive-correlational study aimed to determine the Learners' Engagement in the conduct of Science Investigatory Project (SIP) and Its Influence to Science Process Skills among the Grade 8, 9, and 10 Special Program in Science, Technology and Engineering (SPSTE) learners of Tigbauan National High School, Tigbauan, Iloilo, Philippines for School Year 2020-2021.The respondents of this study were chosen using a purposive sampling technique, specifically total population sampling, in order to examine all SPSTE learners with a specific set of characteristics. This study used a researcher-made questionnaire validated by panel of experts and subjected to reliability testing. The data gathered were analyzed using frequency count, percentage and mean. For inferential statistics, the researcher used Mann-Whitney U-test, Kruskal-Wallis H-test and Spearman Rho. The result revealed that the learners' level of engagement in the conduct of Science Investigatory Project is high and their Science Process Skills is very high. It is also found out that learners' engagement in SIP has an influence on their Science Process Skills. Furthermore, the researcher recommends that to further improve the science process skills of learners, experiential learning and problem-based approach should be applied in teaching learners how to conduct Science Investigatory Project.

Keywords: learners' engagement, conduct of SIP, science process skills

Introduction

Recently, there has been a growing interest in Science Education; it is of great significance to global development as it represents one of the pinnacles of human thinking capacity. One of its main concerns is the development of scientific literacy and how this can be used in society. A central issue in the development of scientific literacy and its application contributing to the community is anchored to the practice in Academics. Educators sought an avenue in which learners can actively construct meaningful science knowledge, which is promoting research particularly the conduct of a Science Investigatory Projects (SIP).

The study of Rosaroso and Sanchez (2016) defined Science Investigatory Project as authentic tasks that science teachers implement in teaching science. Furthermore, Enteria (2016) indicated that through SIP, learners develop scientific skills that they can use in a lifetime.

This includes using scientific methods to research and test an idea, developing testable hypotheses, conducting scientific experiments, recording and reporting the results. Also, according to Yumusak (2016), Science Process Skills refers to skills that lie beneath scientific thinking and decision-making. These comprise observing, inferring, measuring, communicating, classifying, and predicting. Although considerable research has been devoted to the significance of Science Investigatory Project (SIP), the relationship between developing science process skills through the conduct of SIP has not yet been clarified thoroughly as there are only a few researchers investigating such. Hence, there is a wide gap in the knowledge needed to further verify the idea that SIP can be of help in developing the Science Process Skills of learners.

Hence, the present study aimed to determine the Learners' Engagement in the conduct of Science Investigatory Project (SIP) and Its Influence to Science Process Skills among the Grade 8, 9, and 10 Special Program in Science, Technology and Engineering (SPSTE) learners of Tigbauan National High School, Tigbauan, Iloilo, Philippines for School Year 2020-2021. This study focused on the learners' engagement in the conduct of Science Investigatory Project (SIP) and Its Influence to Science Process Skills (SPS). In this light, there is a need to appraise the learner's science process skills and the results of this study can significantly help in Science Education, likewise to the body of knowledge concerned with linking SIP.

Objectives of the Study

This study aimed to determine the Learners' Engagement in the conduct of Science Investigatory Project (SIP) and Its Influence to Science Process Skills among the Grade 8, 9, and 10 Special Program in Science, Technology and Engineering (SPSTE) learners. Specifically, it aimed to answer the following; (1) What is the level of learners' engagement in the conduct of Science Investigatory Project when they are taken as a whole and when classified according to age, sex, parents' highest educational attainment, monthly family income and grade level? (2) What is the level of learners' Science Process Skills when the respondents are grouped as a whole and when they are classified according to age, sex, parents' highest educational attainment, monthly family income and grade level? (3) Are there significant differences in the level of learners'

engagement in the conduct of Science Investigatory Project when classified according to age, sex, parents' highest educational attainment, monthly family income and grade level? (4) Are there significant differences in the level of learners' Science Process Skills when the respondents are classified according to age, sex, parents' highest educational attainment, monthly family income and grade level? (5) Does learners' engagement in the conduct of Science Investigatory Project influence the learners' Science Process Skills?

Theoretical Underpinning

This study is anchored on Kearsley and Schneiderman's Engagement Theory (2000), Kolb's Experiential Learning Theory and Republic Act 2067. Engagement Theory is a framework for science and technology-based teaching and learning. Its fundamental underlying idea is that learners must be meaningfully engaged in learning activities through interaction with others and worthwhile tasks. Meanwhile, the Experiential Learning Theory by Kolb can be defined as "the process whereby knowledge is created through the transformation of experience. Knowledge results from the combinations of grasping and transforming the experience."

Illeris (2016) claims that in the learning process of learning the content, the motivation of learners to participate actively in the learning process, and the environment that unfolds the educational process interact with each other. He believes that learning is the result of internal changes and the rendering of different meanings in his life.

In addition, experiential learning is a process through which learners develop knowledge, skills, and values from direct experiences outside a traditional academic setting. The learners being actively involved in the learning process characterize experiential learning. Reflection is a concept based on constructivism and could be described as theory about how people construct their own knowledge and understanding of the world by experiencing and then reflecting upon those experiences. Experiential learning encompasses a variety of out of classroom activities including project-based learning, internships, service learning, participation in research and other learner's creative work experiences. Well organized experiential learning may stimulate academic motivation; promote interdisciplinary learning, cultural awareness, leadership, and other professional, intellectual and personal skills. Experiential learning implies the possibility to learn from natural consequences, mistakes, and successes. KELTs is comprised of concrete experience, reflective observation, abstract conceptualization, and active experimentation. Kolb defines experiential learning as the process whereby knowledge is created through the transformation of experience. Experiences that include cognitions, environmental factors, and emotions, influence the learning process that Kolb describes as a cycle.

Meanwhile, Republic Act No. 2067 or Science Act of 1958, mandates to integrate, coordinate, and intensify scientific and technological research and development and to foster invention; to provide funds therefore; and for other purposes. This is where the implementation of Science Investigatory Project was founded from.

Henceforth, the researcher concluded that experiential learning through SIP can be of great influence towards the science process skills of SPSTE learners in Tigbauan National High School.

Materials and Methods

Research Design

This study utilized a descriptive-correlation research design. According to Harcourt (2020), a descriptive correlational design measures the relationship between two or more variables, gives an indication of how one variable may predict another. Since the study focused on the learners' engagement in the conduct of Science Investigatory Project (SIP) and Its Influence to Science Process Skills among the Grade 8, 9, and 10 SPSTE learners, the researcher believed that descriptive-correlation research design is an appropriate choice.

Respondents

The respondents of this study were the Special Program in Science, Technology, and Engineering learners of Tigbauan National High School for School Year 2020-2021. The researcher used the purposive sampling technique to examine all SPSTE learners which shared particular set of characteristics. The actual distribution of respondents is shown in Table 1.

Table 1: Distribution of Respondents

Grade Level	N	%
Grade 8	35	33.33%
Grade 9	35	33.33%
Grade 10	35	33.33%
Total	**105**	**100.00**

Data Gathering Instrument

The research instrument used in this study was a researcher-modified questionnaire. It is based from the study of Veronica Q. Maranan (2017). In addition, the questionnaire focused only on the Six (6) Science Process Skills namely observing, communicating, classifying, measuring, inferring, and predicting.

The research instrument was divided into two parts. Part 1 included the profile of the respondents such as age, sex, parents' highest educational attainment, monthly family income and grade level. Meanwhile, Part 2 was the personal evaluation that is according to self-reflecting questions on self- assessment of learners' engagement on Science Investigatory Project (2A) and Science Process Skills (2B).

The researcher used Likert scale, with one as the lowest and five as the highest value in terms of the identification with the statement. The score and its corresponding responses are as follows: 5- Always; 4- Often; 3- Sometimes; 2- Rarely; and 1- Never.

Table 2: The weighted mean used to interpret the result.

Scale of Mean	Description	Interpretation
4.21-5.00	Very High	Learners' engagement with Science Investigatory Project (SIP) has a very high influence towards science process skills.
3.41-4.20	High	Learners' engagement with Science Investigatory Project (SIP) has a high influence towards science process skills.
2.61-3.40	Moderate	Learners' engagement with Science Investigatory Project (SIP) has a moderate influence towards science process skills.
1.81-2.60	Low	Learners' engagement with Science Investigatory Project (SIP) has a low influence towards science process skills.
1.0-1.80	Very Low	Learners' engagement with Science Investigatory Project (SIP) has a very low influence towards science process skills.

Research Procedure

Prior to validation and reliability testing, the researcher first inquired at the Office of the Graduate School to ask permission and approval to conduct the study.

Written letters were given to Schools Division of Iloilo Superintendent and Public Schools District Supervisor in the District of Tigbauan informing the possible respondents of the study. Then, another communication letter was sent to the School Head of Tigbauan National High School asking permission to conduct the study. Upon the approval of the permit, the researcher conducted the study proper to the respondents of the study.

Data Analysis

For the statistical analysis of the data, the following statistical tools were used: Frequency Count. This was used to determine the number of respondents who were subjected to the assessment of SPS and learners' engagement in SIP. Percentage was utilized to determine the rate index of the given variables. Mean was used to determine the level of engagement in conducting the SIP and the SPS of SPSTE learners in Tigbauan National High School for School Year 2020-2021. Mann-Whitney U-test. This was used to determine the significant difference on the level of learners' engagement in the conduct of SIP and their level of SPS when they were classified according to sex. Kruskal-Wallis H-test. This was used to determine the significant difference on the level of learners' engagement in the conduct of SIP and their level of SPS when they were classified as to age, parents' highest educational attainment, monthly family income and grade level. Spearman Rho. This was used to determine the influence of learners' engagement in SIP on their SPS.

Conclusions

This study, "Learners' Engagement in the conduct of Science Investigatory Project and Its Influence to Science Process Skills" concludes that;

The level of science process skills among the SPSTE learners of Tigbauan National High School when they were classified according to age, sex, parents' highest educational attainment, grade level and monthly family income did not differ.

The learners' level of engagement in conducting the Science Investigatory Project should be extensively improved.

SPSTE learners have a little difficulty in independent learning. Hence, the learners' ability to conduct Science Investigatory Project without teacher supervision should be encouraged so that they will gradually achieve a sense of independence in their learning process.

Only the Grade 10 learners among all year levels have not reached the apex of science process skills. Therefore, it should be improved so that they will have better academic achievement in terms of conducting Science Investigatory Project.

Learners perceived themselves to have not reached the Very High level in terms of predicting the next scenario of an experiment using logical and theoretical basis and using words or visual representations such as diagrams, graphs, etc. to describe a process or a material in an experiment. Therefore, it should be the teachers' goal to improve this area of science process skills among the SPSTE learners. The learners' engagement in the conduct of Science Investigatory Project has an influence on learners' Science Process Skills.

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