OUTCOMES-BASED SCIENCE INSTRUCTION(OBSI) IN TEACHER EDUCATION INSTITUTIONS

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ABSTRACT

In the Philippines, the Commission on Higher Education (CHED) requires all higher education institutions to adopt the Outcomes-Based Education(OBE) through its CHED Memorandum 46, s. 2012. This is to cope with the qualifications and standards of 21st-century learners and to produce globally competitive professionals. The focus of this study was to assess the implementation of Outcomes-Based Science Instruction (OBSI) for Bachelor of Secondary Education major in Science students of the Teacher Education Institutions(TEI) in Batangas province. It delved into OBSI implementation which refers to learning outcomes, authentic tasks, student-centered approach, and competencies and skills. The study also determined the extent to which OBSI develop students' competencies relative to laboratory activities, portfolio, project making, research, and investigatory project. The problems encountered in the implementation of OBSI also identified. The descriptive method of research applied in the study with the questionnaire as the data gathering instrument. The OBSI in TEI was evident with refers to learning outcomes, authentic tasks, student-centered approach, and competencies and skills. It developed students' competencies in laboratory activities and investigatory project to a great extent. On the other hand, it developed students' competencies in the portfolio, project making, and research to a moderate extent. There was a significant relationship between the implementation of OBSI and the development of students' science competencies. Some problems encountered in OBSI were seldom met, primary of which is the unavailability and insufficiency of equipment, materials, and supplies needed in the laboratory. Proposed outcomes-based activities in science shall further enhance the quality of science instruction. It recommended that the OBSI in the TEI might be strengthened to maximize the students' competencies and the development of an assessment tool to measure the development of students' science competencies may be undertaken. Furthermore, future researchers may conduct studies that may be related to the current research in another research locale.

Keywords: Outcomes-Based Science Instruction, Teacher Education Institutions, Outcomes-Based Science Activities, Descriptive Method, Higher Education, Philippines

INTRODUCTION

Education is a doorway to the future. It is not just lessons in textbooks but more lessons in life. Outcomes-Based Education (OBE) is concrete evidence of the real essence of quality education and provides the measures of competencies, enhances the skills of the learners and satisfies the desired progress in the education system. In the Philippines, the educational system has started implementing OBE to produce globally competitive professionals. This is to cope with the qualifications and standards of 21st-century learners. The implementation of OBE generally required the restructuring of the entire educational system of the country. As clearly stated in the 1987 Constitution of the Philippines, Article XIV, Section 2, the state shall establish, maintain and support a complete, adequate and

integrated system of education relevant to the needs of the people. The Commission on Higher Education (CHED) is committed to developing competency-based learning standards that would comply with the existing international standards to achieve quality and enable more effective integration of the intellectual discipline, ethos, and values associated with a liberal education. CHED requires all higher education institutions in the country to adopt OBE through its CHED Memorandum 46, s. 2012. OBE was implemented nationwide, but only a handful of studies have meaningful answers to questions about its effects and relevance. OBE is mistaken as a curriculum rather than an approach or a reform to the curriculum. In response to the call for greater accountability from schools to produce graduates with expected exit competencies, excellent performance in their field of specialization and employability, as well as the province school visibility, this study looked into the teaching and learning process in science education or OBSI. With enthusiasm for quality science education, the researcher was motivated to venture into the implementation of the OBSI in the TEI in the province of Batangas, Philippines. It is believed that OBSI if strengthened with the various learning experiences of students in laboratory activities, portfolio, project making, research, and investigatory project, may help create a holistic individual who possesses the competencies which are essential in producing ideal graduates. They must apply the skills and strategies in learning, deal with problems creatively, communicate, interact and work well with people from diverse cultural backgrounds, and operate across disciplines and professional boundaries. The outcomes resulted in students who possess relevant educational experiences and who prepared for the world of work and lifelong learning.

CONCEPTUAL FRAMEWORK

OBE as the central core of this study grounded on several educational theories and philosophies. Jerome Bruner's theory of constructivism and William Spady's Outcomes-Based Education (OBE) served as the framework of the present study in the idea that OBSI equips the students with the required competencies and skills as they finish their formal education. OBSI also focus on the learning outcomes, authentic tasks, student-centered approach, and competencies and capabilities of the students. According to Bruner's Constructivism Theory (2017), instruction must be concerned with the experiences and contexts that make a student willing and able to learn. It must be structured to be easily grasped by the students and should be designed to facilitate extrapolation. This theory of constructivism highly supported outcomes-based education. William Spady (1994), the father of OBE defined it as a comprehensive approach in organizing and operating an education system that is focused on and determined by the successful demonstrations of learning sought to each student. The author underscored outcomes as a clear learning result that the students demonstrate at the end of significant learning experiences. OBE has two purposes. One is to ensure that all students equipped with the knowledge, competence, and qualities needed to be successful after they finish their formal education. Another purpose is to structure and operate schools to achieve and maximize the desired outcomes for all students. The conceptual framework of this study utilized Ralph Tyler's IPO Model. This presents the operational variables of the study through the system approach comprising the input, process, and output. The conceptual framework consists of three parts: Input, Process, and Output. The first box is the input which relates to the Outcomes-Based Science Instruction, the Competencies Developed through Outcomes-Based Science Instruction and the Problems Encountered in Outcomes-Based Science Instruction Implementation. The second box includes the process which consists of the use of a questionnaire as the data gathering instrument. The third box consists of the output which is the set of Outcomes-Based Activities. These activities were made to fit the competencies of the students in different components or areas in science instruction as a result of the analysis.

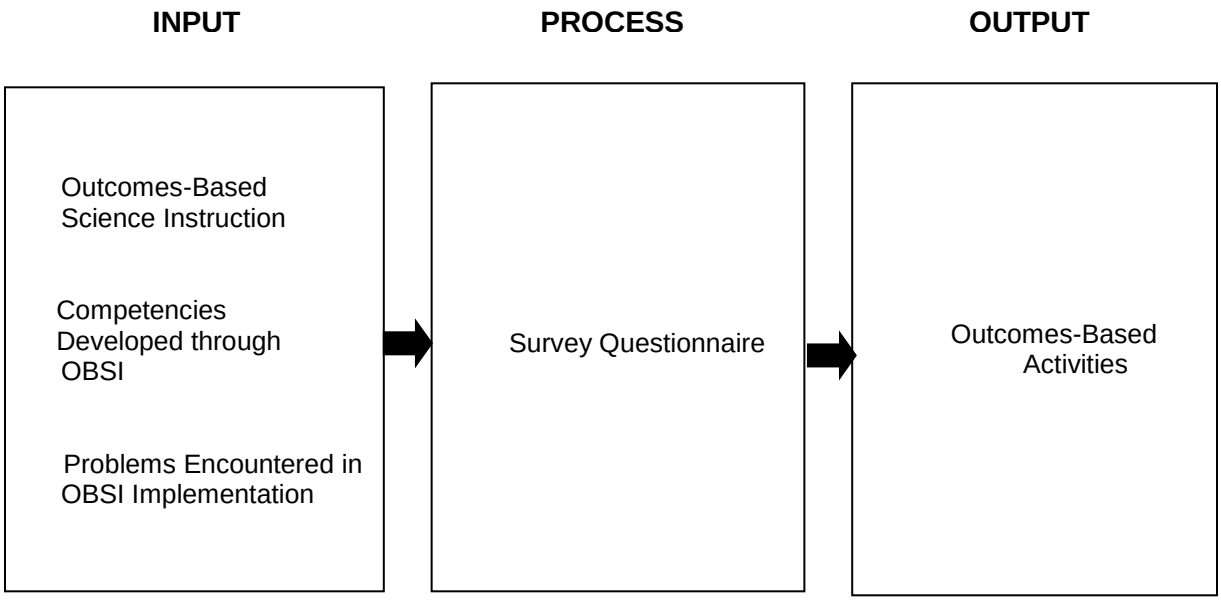

Figure 1. Research Paradigm of the OBSI in TEI

OBJECTIVES OF THE STUDY

The primary purpose of this study was to assess the implementation of Outcomes-Based Science Instruction (OBSI) in Teacher Education Institutions (TEI) offering BSEd major in science in the province of Batangas, Philippines to prepare outcomes-based science activities. Specific aims included the following: (1) to analyze how evident is the implementation of the OBSI with refers to learning outcomes, authentic tasks, student-centered approach, and competencies and skills as assessed by the department heads/science coordinators and science teachers. (2) to determine the extent of the implementation of the OBSI in developing students' science competencies relative to laboratory activities, portfolio, project making, research, and investigatory project. (3) to ascend if there is a significant relationship between the implementation of the OBSI and the development of students' science competencies. (4) to examine the problems encountered in the implementation of the OBSI (5) to develop outcomes-based activities to enhance science instruction for better learning outcomes.

METHODOLOGY

The descriptive method of research used in the study of the OBSI in TEI in the province of Batangas, Philippines. The main instrument used in data gathering is the research-made questionnaire. It validated through the help of the thesis adviser and experts in the field of science and curriculum of the Graduate School of Batangas State University. Data collection was taken under through a series of research activities. The first step was to present a letter of request to the Deans of TEI implementing OBSI in their curriculum to conduct the study. After the approval, the researcher requested the assistance of the personnel from the human resource office of each of the TEI for the number of department heads/science coordinators and science teachers. The researcher administered the questionnaires, explained the purpose of the study, gave the respondents ample time to respond and retrieved the questionnaires. The

researcher assured confidentiality of the survey sheets since the identities are unnecessary. The respondents were 14 department heads/science coordinators and 24 science teachers of the BSEd major in Science in TEI in the province of Batangas, Philippines. The intentional sampling method used in the study. The data were analyzed and tested using the statistical tool. For a clear interpretation of the data which were gathered in this study, the researcher used weighted mean to quantify the assessment of the respondents on the OBSI in TEI, students' science competencies, the problems encountered in OBSI. The researcher also used Pearson-r to determine the significant relationship between the implementation of the outcomes-based science instruction and the development of students' science competencies as assessed by the department heads/science coordinators and science teachers.

RESULTS AND DISCUSSION

1. Assessment on the Features of OBSI

1.1 Learning Outcomes.

The item pertains to what the students can do at the end of a study of a science course. The respondents discerned that the students very evidently demonstrated an in-depth understanding of the theories, principles, and laws in science subjects. It obtained the highest weighted mean of 3.78. These data indicated that the science students showed mastery of the science subjects. Although OBE does not require mastery learning as an exclusive instructional model, many researchers consider mastery learning as an integral part of OBE beliefs and practices. This finding confirms the CHED Memorandum No.75, s2017 suggested curricula for BSEd programs aligned to OBE. The program outcomes based on BSEd demonstrate an in-depth understanding of the development of adolescent learners and exhibit a comprehensive knowledge of various learning areas in the secondary curriculum. Engaging in scholarly and research activities by maximizing opportunities for lifelong learning was moderately evident as shown in the weighted mean of 3.25. This result indicated that research exposure of the students strengthened by various programs such as research presentation, classroom-based action research, attendance to research forum and conferences. In this sense, students were given opportunities to explore other fields and become knowledgeable about phenomena, particularly societal issues. This supports the idea of KeyConet (2018) which cited that the competencies for science and technology included the essential knowledge comprises the basic principles of the natural world, fundamental scientific concepts, principles and methods, technological products and processes, as well as the impact of science and technology on the natural world. Overall, learning outcomes was very evident as revealed by the composite mean of 3.61. The results showed that the outcomes were identified and specific tasks were performed at a given level of competence in a particular situation. This supports the idea of Gruppen (2015) that learning outcomes are expressed as performance and skills than merely as knowledge and facts.

1.2 Authentic Tasks

Exploring concepts and relationships in contexts that involve real-world problems was very evident among students with a weighted mean of 3.63. This indicates that the student's little preparation is to prepare to cope with life situations and problems. This supports the view of Spady (1994), OBE focused on the learning outcomes. It also affirms Bruner's (2017) theory on constructivism which asserts that learners are capable of making their meaning. The ultimate goal of OBE is to create learning which has a lasting significance to the learners. Pursuing further researches to develop the skills in gathering, analyzing, and evaluating data was moderately evident with a weighted mean of 3.33. The findings revealed that the students in their science subjects engaged in different learning activities which may help improve their science process skills that are deemed vital in making science more practical and beneficial. This supports the idea of Calderon (2008) stating that

research is vital and essential. It is a key to progress. There can be no progress without research. Based on the result, the students display enthusiasm in research. By doing research, they can perform the science process skills needed to come up with quality research. Generally, OBSI concerning authentic tasks was very evident as revealed by a composite mean of 3.50. This indicates that the students practiced or applied their learning experience through the OBE approach in teaching to real life scenarios. This affirms the idea of Dube (2012) stating that authentic task is purposeful and engaging, puts knowledge into work, supports collaborative, constructive learning, provides multiple roles and perspective, provides an opportunity to reflect and have real-world relevance.

1.3 Student-centered Approach

Developing skills and career readiness was very evident, and it had a weighted mean of 3.68. The result revealed that the students possess the vital process skills and competencies in science and displayed absolute readiness to take the challenges in life. This is in parallel with the discussion of OBE in the Center of Education Innovation (2017), where students achieved high standards when given expanded opportunities. It was also mentioned that using the student-centered approach as one of the features of OBE, the desired outcomes of OBE is realized and the students display generic skills and attitudes which could lead them to career readiness. However, applying the state-of-the-art technology to improve learning outcomes got the lowest weighted mean of 3.33, and was moderately evident. The students may lack the resources to access on the computer and use different applications. They may also need to be trained in the use of state-of-the-art technology to produce a more creative science output. Akir (2012) strengthened the idea in his view of OBE structure and technology e-learning support. His study showed that there is a significant difference between OBE students aided with technology learning in comparison with non-OBE students. Therefore, the application of state-of-the-art technology to science instruction may improve learning outcomes. This was further explained by De Dios (2013) that there are some challenges in today's science teaching and such a challenge include the use of technology to improve pedagogy. Collectively, the student-centered approach was very evident as revealed by a composite mean of 3.54. This result shows that the student-centered learning approach was used to enhance the teaching and learning process in science. This supports the idea of Lucas and Corpuz (2013) that learning influenced by social interactions, interpersonal relations and communication with others. In interactive and collaborative instructional contexts, individuals have the opportunity for perspective thinking and reflective thinking that may lead to higher cognitive, social and moral development, as well as self-esteem.

1.4 Competencies and Skills

This shows the abilities of the students to do something well, which comes with knowledge, practice, and aptitude. Breaking down problems or situations logically into their essential parts and drawing reasonable conclusions based on their analysis was very evident with a weighted mean of 3.60. The result shows that in OBE, the best way to learn knowledge is by actively engaging or by exploring direct experiences. Its objective is to minimize mistakes on how to handle real-life scenarios and prepare the students to cope with life problems and to come up with logical solutions. This supports the view of Hagins (2013) that a scientifically literate person combines the basic understanding of science and its processes with reasoning and thinking skills. This can help the students solve problems logically and come up with a conclusion. Nevertheless, dealing with societal issues with effective use of writing, reading and speaking skills had a weighted mean of 3.40 and was moderately evident. The result shows that the students can express themselves in intellectual conversations especially in scientific and societal issues with effective use of writing, reading and speaking skills. This supports the idea of Bilbao (2015) that students in any teacher education program must possess the required

competencies for science and technology. Conjointly, OBSI concerning competencies and skills were very evidently viewed as a whole by the respondents as revealed by a composite mean of 3.52. This result shows that the students displayed the desired and required science skills and competencies as they finish their formal education. This supports the idea of Biggs and Tang (2007) that OBE is solely concerned on the teaching and learning and is designed for students to have the qualities needed to be successful after they finish their course. Through outcomes-based science instruction, teachers develop students' competencies and skills by allowing the students to have mastery of learning in science and by giving authentic tasks which help the students creatively express themselves in various ways. From the identified competencies, standards and outcomes, the ideal graduate of the teacher education program as the new breed of teachers are confidently multi-literate, reflective, has mastery of content, highly skilled, sensitive to scientific and societal issues, multi-cultural, innovative, highly professional and can be considered as life-long learners.

2. The Extent of the Development of Students' Science Competencies

2.1 Laboratory Activities

The items include the required competencies as they perform laboratory activities. Unveiling the basic principles of science such as observing, classifying and describing to achieve scientific literacy was developed to a great extent and had a weighted mean of 3.80. With relation to students' science competencies concerning the laboratory activities, the result shows that the students have a clear understanding of the basic principles of science to achieve scientific literacy. It is important that the students know the background and objective of the laboratory activity to come up with an accurate and precise result. This supports the discussion about Teaching Science the Process Skills (2018). It was mentioned that students have to know the basic concepts then learn the processes of doing science and display scientific attitudes to achieve scientific literacy. They are preparing to review data if circumstances change was developed to a moderate extent and obtained the weighted mean of 3.33. Students possess the science competencies to real problems in life, made logical decisions and prepared for unpredicted circumstances as revealed by the result. This supports the view of Hagins (2013) that scientists use specific methods called a scientific method to gather information, conduct questions and conduct a research study. Overall, the students' science competencies in laboratory activities were developed to a great extent as revealed by the composite mean of 3.64. Students manifest the science process skills and competencies as they perform the laboratory activities and experiments based on the results presented. This supports the idea of Levin (2012) that the laboratory activities and classes provide students hands-on experiences with the course concepts and significant opportunities to achieve the desired outcomes.

2.2 Portfolio

The items show the required competencies as the students make organized and goal-driven documentation of growth. Accessing resources like technology and other materials were developed to a great extent as revealed by a weighted mean of 3.58. The results show that the students were provided with resources such as books, technology and other materials which are vital to both learning and delivering new information in science. It also revealed that teachers delivered ways to integrate these skills into science education. This affirms the idea on KeyConet (2018) that the skills include the ability to use and handle technological tools and other materials which are essential in the creation of a portfolio. However, presenting the output in digital archives, blogs, or websites obtained the lowest weighted mean of 3.03 and was developed to a moderate extent. The result shows that students have limited resources and technical skills to present a portfolio in digital form. This supports

the study of Wyngaarden (2008) which showed that educational facilities not accessible to students were also unavailable to students which include computer laboratory and the internet. This may be the reason why the item was found the weakest. Collectively, the students' science competencies in a portfolio were developed to a moderate extent which was revealed by the composite mean of 3.44. The result shows that students need more discussion, guidance, outcomes-based activities, and exercises to produce a quality portfolio. This supports the idea of Kniep and Zoochia (2009) that student portfolio should be strategic and carefully assembled. Students should be informed by clear, specific learning outcomes to come up with a quality portfolio.

2.3 Project Making

Based on the result, using available materials and other resources in the environment got the highest mean of 3.68 and was developed to a great extent. The result shows that the students demonstrated resourcefulness in using available materials which can be reused and recycled to produce relevant output. However, the use of technology in project making for science instruction got the lowest weighted mean of 3.23 and was developed to a moderate extent. One of the best tools to creatively and interestingly present output in science is through the use of technology. The result shows that the students' access to computer and technology may be limited. This supports the study of Wyngaarden (2008) that facilities such as internet and computer laboratory should be made by the students to encourage and enhance self-directed learning. All the respondents agreed that they observe the items in project making to a moderate extent as revealed by a composite mean of 3.43. The items which were found weak can be considered in the preparation of the outcomes-based activities. This supports the idea of a science project that it is a carefully planned educational activity which resources such as time, people, money, equipment, and facilities are taken considerations.

2.4 Research

Displaying ethical practice garnered the weighted mean of 3.60 and was developed to a great extent. The item got the highest rank which showed that the students as researchers displayed the values and attitudes in conducting a scientific study. The idea of ethical practice supports the idea of Hagins (2013) emphasizing that ethical issues must be addressed by the society based on the values it holds essential. Utilizing the appropriate and standardized tools obtained a weighted mean of 3.35 and was developed to a moderate extent. Students show that they made use of suitable material and tools to do their research study. In general, the data revealed that students' science competencies in the research were developed to a moderate extent as revealed by a composite mean of 3.45. Based on the findings in this part of the study, most of the items were observed to be developed on a moderate extent, which reveals that emphasis should be given in this part of science activity. This can be considered in the preparation of outcomes-based science activities to enhance the teaching and learning process in science. This supports the idea of Calderon and Gonzales (2008) that in the government, education, trade, and commerce, research is vital; therefore, the methods and techniques must be taught and learned in graduate as well as in undergraduate educational work.

2.5 Investigatory Project

It can be gleaned from the findings that among students' competencies, verifying the results by using science tools and equipment and exploring other means or a variety of learning tasks to increase the knowledge and skills got the highest weighted mean of 3.60 and were developed to a great extent. This shows that the students can manipulate the tools, equipment and other materials in the laboratory which made them prepared to do investigatory projects. This affirms the idea of Doyle (2017) stating that technical skills are the abilities and knowledge needed to perform specific tasks. They are

practical and often relate to mechanical, information technology, mathematical, or scientific task. To verify results by using science tools and equipment, the students should possess the technical abilities. However, sourcing out innovatively appropriate equipment and materials had the lowest weighted mean of 3.38 and were developed to a moderate extent. The result shows that the students may have limited generative knowledge of science tools and equipment. The science laboratories may lack the needed materials to perform the investigatory project.

3. A Relationship between OBSI Implementation and Development of Students' Science Competencies

3.1 Laboratory Activities

Table 1. OBSI Implementation and Development of Students' Science Competencies in Laboratory Activities

Variable	r_c	p – value	Decision on H_0	Interpretation
Learning Outcomes	0.668	0.000	Reject	Significant
Authentic Tasks	0.610	0.000	Reject	Significant
Student-Centered Approach	0.748	0.000	Reject	Significant
Competencies and Skills	0.681	0.000	Reject	Significant

$\alpha = 0.05$

As revealed in the table, the r-values of learning outcomes, authentic tasks, student-centered approach, and competence and skills relative to laboratory activities were 0.668, 0.610, 0.748 and 0.681, respectively, and the p-values were all 0.000 which was less than the tabular value of 0.05. The implementation of OBSI showed a significant relationship to the development of students' science competencies relative to laboratory activities.

3.2 Portfolio

Table 2. OBSI Implementation and Development of Students' Science Competencies in Portfolio

Variable	r_c	p – value	Decision on H_0	Interpretation
Learning Outcomes	0.542	0.000	Reject	Significant
Authentic Tasks	0.735	0.000	Reject	Significant
Student-Centered Approach	0.694	0.000	Reject	Significant
Competencies and Skills	0.610	0.000	Reject	Significant

$\alpha = 0.05$

The results showed that learning outcomes, authentic task, student-centered approach, and competencies and skills relative to a portfolio had a computed r-value of 0.542, 0.735, 0.694 and 0.610, respectively. These had the p-value 0.000 which was less than the tabular value of 0.05. The implementation of OBSI showed a significant relationship to the development of students' science competencies relative to a portfolio.

3.3 Project Making

Table 3. OBSI Implementation and Development of Students' Science Competencies in Project Making

Variable	r_c	p – value	Decision on H_0	Interpretation
Learning Outcomes	0.643	0.000	Reject	Significant
Authentic Tasks	0.707	0.000	Reject	Significant
Student-Centered Approach	0.699	0.000	Reject	Significant
Competencies and Skills	0.700	0.000	Reject	Significant

$\alpha = 0.05$

Based on the results, the computed p-values of learning outcomes, authentic tasks, student-centered approach, and competence and skills relative to project making were all 0.000 which was lesser than the tabular value of 0.05 and the observed r-values were 0.643, 0.707, 0.699 and 0.700, respectively. Thus, the implementation of OBSI shows a significant relationship to the development of students' science competencies relative to the project making.

3.4 Research

Table 4. OBSI Implementation and Development of Students' Science Competencies in Research

Variable	r_c	p – value	Decision on H_0	Interpretation
Learning Outcomes	0.613	0.000	Reject	Significant
Authentic Tasks	0.670	0.000	Reject	Significant
Student-Centered Approach	0.743	0.000	Reject	Significant
Competencies and Skills	0.735	0.000	Reject	Significant

$\alpha = 0.05$

As revealed in the results, the computed p-values of learning outcomes, authentic tasks, student-centered approach, and competence and skills in the research were all 0.000 which was lesser than the tabular value of 0.05 and the r-values were 0.613, 0.670, 0.743 and 0.735 respectively. Thus, the implementation of OBSI shows a significant relationship to the development of students' science competencies in research.

3.5 Investigatory Project

Table 5. OBSI Implementation and Development of Students' Science Competencies in Investigatory Project

Variable	r_c	p – value	Decision on H_0	Interpretation
Learning Outcomes	0.593	0.000	Reject	Significant
Authentic Tasks	0.664	0.000	Reject	Significant
Student-Centered Approach	0.717	0.000	Reject	Significant
Competencies and Skills	0.711	0.000	Reject	Significant

$\alpha = 0.05$

As revealed in the computation, the computed p-values of learning outcomes, authentic tasks, student-centered approach, and competence and skills concerning an investigatory project were all 0.000 which was lesser than the tabular value of 0.05 and had the r-values of 0.593, 0.664, 0.717 and 0.711 respectively. Thus, the implementation of OBSI shows a significant relationship to the development of students' science competencies regarding the investigatory project. The findings revealed that the implementation of OBSI shows a significant relationship to the development of students' science competencies concerning laboratory activities, portfolio, project making, research, and investigatory project. Therefore, the null hypothesis was rejected. The result may be attributed to the fact that OBSI plays an essential role in the teaching and learning process of the students. It focused on what is essential to know, to value and to do to achieve the level of competence. This confirms the idea of Biggs and Tang (2007) that OBE was designed for students to display the qualities needed to be successful after they exit in the educational system. OBE is a convenient and practical way of maintaining a standard and improving teaching.

4. Problems Encountered in OBSI Implementation

It was revealed that unavailability and insufficiency of equipment, materials, and supplies needed in the laboratory were moderately met with a weighted mean of 2.88. Based on the result, the needed equipment and supplies for students' activities and experiment were insufficient or lacking. The research about the problems encountered in OBSI, it was cited that some of the difficulties depicted were physical facilities, laboratory facilities, insufficient means and materials for laboratory work. Likewise, unestablished institution's outcomes-based teaching and learning delivery system was moderately met with a weighted mean of 2.65. Based on the findings, the Institutional Intended Learning Outcomes were unclear. It is what the graduates of the university or college are supposed to be able to do. This supports the idea of Bunga, et al. (2016) that learning outcomes in OBE are constructively aligned in the learning program. Collectively, the problems encountered in the implementation of OBE in the TEIs are revealed to be seldom met with a composite mean of 2.49. It indicated that the problems could be considered to enhance and to improve the OBSI. This could be used as a basis for the preparation of the outcomes-based activities for the students. This supports the purpose of the study of Wyngaarden (2008) to explore the teaching strategies if in compliance with OBE. Based on the problems identified, suggestions were made for the enhancement of the OBSI implementation.

5. Proposed Outcomes-Based Activities

Outcomes-Based Education (OBE) means focusing and organizing a school's instructional efforts around the clearly defined outcomes, and it envisioned all students to demonstrate when they venture into the real-world as they leave the school. OBSI requires efficient use of multiple instructional and assessment strategies to efficiently go over students' competencies. The outcomes-based science activities are intended for science students of various Higher Education Institutions. The content is based on the assessed competencies of students in areas like laboratory activity, portfolio, project making, research, and investigatory project. The activities are mostly focused on the competencies which were found weak and needed enhancement. The lowest items among the variables were engaging research activities, applying the state-of-the-art technology, dealing with societal issues, preparing data in changing circumstances, presenting outputs in digital forms, and utilizing appropriate tools. The problem encountered the most in the implementation of OBSI was insufficient equipment and materials needed in the laboratory. With the proposed outcomes-based activities, science students will be prepared as they pursue their teaching careers.

Outcomes-Based Science Activities

Outcomes-based science activities were made significantly to enhance teaching and learning in science. These are what the students are expected to do at the end of a science class, lecture, project or program. The activities were intended to identify in which areas or activities in science such as laboratory activities, portfolio, project making, research, and investigatory project are more likely to manifest the evidence or degree of strengths and weaknesses. The weak competencies as revealed from the data analyzed and the problems met were strong bases in coming up with outcomes-based science activities. In this sense, department heads/science coordinators and science teachers are given opportunities to improve the areas such as learning outcomes, authentic tasks, student-centered approach, and competencies and skills to address where the students are found weak. The proposed outcomes-based science activities prepared by the researcher are entitled Socio-Scientific Issues, Life is a Journey: A Field Exposure in Science, Cell! You're Under Arrest, Blood Pressure, Ecosystem in a Jar, Work in Progress, ExSci-Thing! Exploring Scientific Thing, Create Your Own Garden, Pedagogies in Science Teaching and Green Novation.

CONCLUSIONS

Based on the findings of the study, the following conclusions were drawn:

1. The Outcomes-Based Science Instruction in Teacher Education Institutions is very evident regarding learning outcomes, authentic tasks, student-centered approach, and competencies and skills.
2. The OBSI develops students' science competencies in laboratory and investigatory project to a great extent while it develops their competencies in a portfolio, project making, and research to a moderate extent.
3. The implementation of the OBSI shows a significant relationship to the development of students' science competencies regarding laboratory activities, portfolio, project making, research, and investigatory project.
4. The unavailability and insufficiency of equipment, materials, and supplies needed in the laboratory are among the problems met in the implementation of OBSI.
5. The proposed outcomes-based activities in science may further enhance the quality of science instruction.

RECOMMENDATIONS

In light of the findings and conclusions from this study, the following recommendations were endorsed.

1. The academic chairpersons or science coordinators may review the Outcomes-Based Science Activities before the implementation in the Teacher Education Institutions.
2. An assessment tool or instrument may be developed to enhance the utilization of outcomes-based activities.
3. Future researchers may conduct related studies in another research locale to substantiate the current investigation.

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