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Experiences of BSEd Science Major Students in their Outcome-based Performance Tasks

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Abstract

Background and Aims: Outcome-based education (OBE) is a recent development that emphasizes students' performance and proof of their knowledge over a set period. This study investigates the experiences of BSEd Science Major students with outcome-based performance tasks in their major courses. The research underscores the rarity of such studies, particularly in science education, motivating this study.

Materials and Methods: The study applied a qualitative case study research design and adopted a purposive sampling method to select 21 BSEd Science students from a Higher Education Institution in Zamboanga del Sur to join a one-to-one semi-structured interview. The triangulation method was also applied where two tertiary science teachers were specifically selected to strengthen the study's validity by providing additional perspectives and corroborating findings. The data collected were transcribed verbatim from audio-recorded files. The research design incorporated Merriam's (1998) categorical aggregation to analyze data, identifying patterns and themes that emerged from participants' responses.

Results: It was revealed that they have performed laboratory experiments and performance exams that require laboratory resources, collaboration skills, time management, and teacher guidance. However, they also face challenges such as limited resources, groupmate issues, limited background knowledge, and poor teacher guidance, which they deal with by being resilient and adaptable, adjusting their collaborative efforts, conducting additional research, and seeking peer guidance.

Conclusion: The findings emphasize that the BSEd Science students greatly benefit from the outcome-based education (OBE) framework. Through this, students pursue well-defined learning outcomes, engage meaningfully with the content, collaborate with peers, and develop greater confidence in their ability to succeed in their studies. Despite its demands, OBE nurtures both academic excellence and personal growth in students' development, demonstrating the transformative impact of OBE in science education.

Keywords: Assessments, Learning, OBE in Science Education, Outcome-based performance tasks, Teaching

Introduction

Education is vital for equipping students with the skills they need to live successful, meaningful lives. It entails giving learners relevant educational opportunities that foster their interests, problem-solving

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aptitude, and higher-order cognitive qualities like creativity and critical thinking. Learning science concepts quite differs from other subjects, requiring hands-on activities like experiments to grasp and retain information fully. The K-12 Curriculum Guide Science (2013) aims to help every Filipino learner understand scientific concepts and principles linked with real-life situations and gain the scientific knowledge, values, and attitudes required to evaluate and resolve everyday issues. This aim makes Outcome-Based Education (OBE) essential, for it ensures a clear idea of what students are expected to know and be able to do at the end of their learning experiences (Spady, 1994).

OBE is a recent development emphasizing students' performance and proof of their knowledge over a set period. It is a method of instruction that shifts the emphasis of education from what experts think graduates should know (teacher-focused) to what students should know and be able to do in various challenging settings (Cowan, 2012). This is not just the values and knowledge they will gain, but what learners can do with what they know. OBE is viewed as an optimistic approach because it allows all students to learn and succeed in their phases (Mangali et al., 2019). Additionally, it also promotes accountability by focusing on measurable outcomes and assessing whether they are achieved (Hamidi et al., 2024). OBE focuses on students' achievement of learning outcomes by restructuring the curriculum, delivery, and assessments, unlike content-based learning (CBL), which is widely used in Malaysia (Rhaffor et al., 2017).

However, in tertiary education, the shift from traditional instruction to outcome-based education (OBE) has become an essential issue among Higher Educational Institutions (HEIs) in the Philippines (Quinto, 2020). The most common challenges in transformative education using OBE were the class size, learner characteristics and reality expectations, teaching practice and evaluation, and student motivation (Yusof et al., 2017). Time and effort are needed to ensure a smooth-running process (Sun & Lee, 2020). It is challenging due to its time-consuming nature and the need for faculty members to adjust to its pedagogical features (Pabutawan, 2023). To effectively lead any initiative toward outcomes-based learning and participate in the institution's policy-making process, faculty members should be highly involved and supported from the outset (De Guzman et al., 2017).

Further research is needed to explore the challenges of implementing this approach, particularly from the students' perspective, to fully understand how they are impacted by this educational trend. This study delves into the experiences of Bachelor of Secondary Education (BSEd) Science Major students, addressing the gaps in faculty knowledge and the difficulties in implementing outcome-based performance assessment. Given that the significance and benefits of OBE principles require active roles played by administrators, educators, parents, teachers, and even students themselves (Abdul Karim & Yin, 2018).

Objectives

This study aims to investigate the experiences of Bachelor of Secondary Education (BSEd) Science Major students with outcome-based performance tasks in their major courses. Specifically, to determine the outcome-based performance tasks that they have performed in their major courses and the demands associated with these tasks. The study also aims to identify the challenges students encounter while completing these tasks and how they address and overcome these challenges, highlighting the strategies they employ to succeed in meeting the requirements of outcome-based performance tasks.

Literature Review

The Commission on Higher Education (CHED, 2012) supports higher education institutions in promoting a quality culture and developing mature institutions. In 2008, CHED (2012) revised the curriculum to transition from content-based to outcomes-based education (OBE) and issued Memorandum Order No. 46, Series 2012, to enhance quality assurance through OBE and typology-based quality assurance (CMO 46, 2012). Implementing the principles of OBE in classes helps educators tailor teaching materials and set learning outcomes based on student needs (Akramy, 2021). It involves defining competencies, redesigning curricula with relevant activities and assessments (Espiritu & Budhrani, 2015), and ensuring practices align with goals for effective learning and assessment (Rahayu et al., 2021).

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Outcome-based assessment, as the culminating part of OBE, helps analyze how the course contributes to student achievement in the program (Alkuwaiti, 2021). It prioritizes student success, influencing assessment methods to focus on achievement rather than failure (Abdul Karim & Yin, 2018). Performance assessment, a key element of OBE, involves defining, constructing, and empirically testing stages to measure student skills accurately (Hyytinen & Toom, 2019). It encourages students to engage in their education and assessment through practical assignments (Rudner & Boston, 1994) and facilitates authentic learning experiences (Ernst et al., 2016). Performance assessment also maintains students' interest throughout task completion (Hyytinen & Toom, 2019) because it is related to real-life situations and measures higher-order thinking (Altun & Kelecioglu, 2018).

Traditional laboratory assessments often relied on lab reports, with inconsistent grading due to subjective judgments and the lack of standardized rubrics. However, the use of an OBE assessment tool called the Laboratory Sensor Performance Evaluation Course Tool (LAB-SPECT) addresses these issues by integrating rubrics to evaluate teamwork, practical skills, and ethics alongside laboratory performance (Abidin et al., 2009). Despite such innovations, the unavailability of equipment, insufficient materials, and outdated facilities remain significant barriers to implementing OBE-aligned laboratory activities (Delos Reyes, 2019). The planning, execution, and consequences of performance tasks significantly contribute to the difficulties encountered by students (Petalla & Doromal, 2021). Low self-confidence among students has been associated with poor task performance and reluctance to engage in activities (Moneva & Tribunalo, 2020).

Moreover, in laboratory contexts, creating a student-centric learning environment and adopting suitable assessment methodologies are essential to developing cognitive, affective, and psychomotor skills (Nandhitha & Roslin, 2023). However, aligning these efforts with OBE principles is often impeded by policy constraints, workload issues, and a lack of infrastructure and info-structure (Katawazai, 2021). For instance, the availability of facilities, resources, and time allotments often hinders successful curriculum revisions under OBE, which also requires significant time and expertise of the faculty (Guimba et al., 2024). Their expertise plays a critical role, yet many educators lack sufficient training in outcomes-based assessment (Lukman, 2021), leading to inconsistent application and evaluation, specifically in performance tasks (Costales, 2021). As research confirms both the benefits and challenges of OBE, this paper further examines the difficulties faced by students in transitioning to an outcome-based approach in performance assessments.

Theoretical Framework

This study is grounded in the principles of Outcome-Based Education (OBE) as developed by William Spady. OBE is built upon four foundational premises: a clear focus on outcomes, high expectations for all students, backward curriculum and instruction design, and expanded learning opportunities. These principles ensure that students engage in learning experiences designed to meet specific, measurable outcomes, promoting academic success and personal growth.

To provide a more comprehensive theoretical grounding, this study also draws on constructivism and self-determination theory, which complement and enrich the analysis of students' experiences with outcome-based performance tasks.

1.Constructivism

Constructivism posits that learners actively construct their understanding and knowledge through experiences and interactions. Learning is not a passive process but an active engagement where students build on their prior knowledge to make sense of new concepts. This aligns with OBE's emphasis on students demonstrating their understanding through performance tasks. In the context of BSED Science students, constructivism is particularly relevant as laboratory experiments and performance exams allow learners to engage directly with scientific phenomena. For example, tasks such as heat-powered turbine experiments

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or egg incubation foster deeper conceptual understanding by enabling students to apply theoretical knowledge in practical, real-world settings. This active participation helps students internalize learning outcomes and promotes critical thinking, problem-solving, and creativity.

2. Self-Determination Theory

Self-Determination Theory (SDT) focuses on the intrinsic motivation and psychological needs of learners. It identifies three core needs: autonomy, competence, and relatedness, which are essential for fostering motivation and engagement. OBE's student-centered design aligns with these principles by encouraging learners to take ownership of their educational journeys and providing opportunities to demonstrate their abilities in meaningful ways.

In this study, the experiences of BSED Science students reflect the relevance of SDT. Their adaptability, resilience, and proactive efforts—such as conducting additional research and seeking peer guidance—illustrate the role of intrinsic motivation in overcoming challenges.

- Autonomy: Students demonstrated autonomy by devising alternative solutions to resource constraints and independently managing their tasks.
- Competence: Hands-on performance tasks, such as laboratory experiments and performance exams, allowed students to build confidence and demonstrate their mastery of scientific concepts.
- Relatedness: Collaborative efforts during group tasks fostered a sense of connection and mutual support, enhancing their overall learning experience.

These elements collectively contribute to students' academic success and personal growth, underscoring the importance of intrinsic motivation in navigating the demands of outcome-based education.

Methodology

The research focuses on BSED Science Major students in a college in Zamboanga del Sur that employs outcome-based education (OBE) principles, focusing on 21 BSED Science Major students selected through purposive sampling. Furthermore, strategies were triangulated; hence, two tertiary science teachers were selected through purposive sampling with these inclusion criteria: 1. A tertiary science teacher who applies OBE to performance tasks in major courses; and 2. currently teaching at the chosen institution.

Data collection involved semi-structured interviews with six validated descriptive questions and probing sub-questions, designed to capture participants' perceptions, challenges, and strategies related to OBE tasks. Ethical guidelines were followed, including securing permissions and informed consent, and interviews were documented via audio recordings.

Data Analysis

This study utilized Merriam's model (1998) for qualitative data analysis to provide an in-depth understanding of the experiences of BSED Science students with outcome-based performance tasks. The analysis was conducted systematically, with the following steps outlining the process of coding, theme development, and interpretation:

1. *Data Familiarization*

The data collection process included semi-structured interviews, which were audio-recorded and transcribed verbatim. The researchers read and re-read the transcripts to gain a thorough understanding of the content, identifying initial patterns and notable insights.

2. *Initial Coding*

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An open coding approach was employed to break down the data into smaller, meaningful units. Segments of text—such as phrases, sentences, or paragraphs—were assigned descriptive codes that captured the essence of participants' responses.

3. *Category Formation*

The initial codes were then grouped into broader categories based on commonalities and relationships. For instance, codes related to "insufficient laboratory equipment," "defective tools," and "limited materials" were grouped under the category "Resource Limitations." This process involved iterative refinement to ensure categories were comprehensive and distinct.

4. *Theme Development*

Categories were further synthesized into overarching themes that addressed the research objectives. The themes provided a structured representation of the data, linking specific challenges and strategies to the broader context of outcome-based performance tasks. Key themes identified included:

- Challenges in Resource Availability: Highlighting students' struggles with inadequate resources.
- Collaboration and Peer Dynamics: Exploring the impact of group work on task completion.
- Teacher Guidance and Support: Examining the role of facilitators in achieving learning outcomes.
- Resilience and Adaptability: Showcasing students' ability to overcome obstacles through creative problem-solving and research.

5. *Interpretation*

The final step involved integrating the themes into a coherent narrative that aligned with the theoretical framework and research objectives. The findings were interpreted about existing literature, offering a richer understanding of the students' experiences and the implications for practice.

In addition to Merriam's model, the analysis incorporated the constant comparative method to continuously refine codes and themes as new data were analyzed. This iterative approach ensured that the findings were grounded in the data and responsive to emerging patterns. By providing a detailed account of the coding process and thematic development, this study ensures transparency and rigor in its qualitative analysis. This approach highlights the nuanced experiences of BSED Science students and the complex interplay of challenges, strategies, and outcomes in an outcome-based education framework.

Results

The categories that emerged from the participants' responses were presented and organized according to the sub-questions posed in the statement of the problem of the study. In addition, the quoted comments below the paragraphs were short excerpts from the interview transcripts, which the researchers had carefully selected to present exemplars for the categories. Each participant is given codes to maintain confidentiality. They are P1, P2, P3, P4, P5, P6, P7, P8, P9, P10, P11, P12, P13, P14, P15, P16, P17, P18, P19, P20, and P21, as well as T1 and T2 used for the triangulation.

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Table 1. Outcome-based performance tasks of BSED Science students

Themes	Responses
Laboratory Experiments	*"There is a lot of outcome-based learning in Physics, for example, with heat-powered turbine experiments, wherein the objectives were clear for us that we needed to do after we created the turbine model."- P1.* *"Experiments in chemistry and physics truly test your understanding of the lesson. After experimenting, we answer an activity sheet and synthesize ideas based on what we discovered during the experiment." - P7.* *"Experiments helped us understand the lessons because we were directly involved in our learning process, especially when we incubated eggs and closely monitored the stages of development before hatching into chicks." - P9.* *"Aside from that, if the subject includes a laboratory component, of course, there will be laboratory work."* - T1 *"Before, I used to do projects, but now, due to the not-so-good economy and the financial aspects of my parents, what I do instead is to conduct experiments."* - T2.
Performance Exams	*"When we created the solar system model in Astronomy in groups, it served as our performance exam. It seems like everything we learned about planets, solar systems, and other celestial objects needs to be presented in a model, which serves to demonstrate our understanding of the subject by the end, since it is also our final." - P2* *"That is when our teachers let us do a performance exam with an output that can be passed after it is done, instead of just paper and pen. We are provided with guidelines that outline what we should do, helping us understand what is expected of us and what tasks we need to complete." - P6.*

The participants revealed that most of their outcome-based performance tasks are laboratory experiments and performance exams in their major courses. The teachers were also asked about the outcome-based performance tasks they have created for their science major students, and corroborated with the responses of the participants. Experiments are a unique combination of acting and observing, aiming to predict predictable outcomes in scientific research (Hansson, 2015). It is designed with clear objectives that align closely with what students are expected to learn. Experiments are essential for doing and learning science (Paul et al., 2016) and are viewed positively by students as their performance-based assessment (Villacrusis, 2021). By simulating real-world applications of knowledge, laboratory experiments reinforce theoretical understanding and prepare students to apply their learning in practical contexts, embodying the essence of OBE. Meanwhile, performance tasks are essential in higher education, especially considering the complexity and depth of the learning goals set for students (Braun, 2019). It assesses how well students can use what they have learned in real-life situations. Compared to traditional paper-and-pencil tests, performance tasks lead to higher scores and increased learning motivation (Hancock, 2007). Well-designed performance assessments can effectively measure students' knowledge and abilities (Badrinarayan, 2022) and monitor students' science skill performance (Kruit et al., 2018).

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Table 2. Demands of BSED Science in performing outcome-based performance tasks

Themes	Responses
Laboratory Resources	*"What is most needed is the area because the room is too crowded for experiments... it is better to perform tasks like experiments if it is spacious so that it is not crowded, like in the laboratory."* - *P2* *"Lab gown, gloves, you need to be safe when experimenting. The procedure also lets us know how to make the experiment."* - *P3.* *"Since it is science, it is the laboratory equipment…Then, the feasibility of materials must be reached within the given time because it is difficult to deliver them on this day. There must also be a procedure because I might do something first that should not be done first, then I will have to redo it all over again."* -*P21.* *"Availability of the resources, for example, I ask them to do the final task wherein they need to integrate the ICT or technology, so they need resources like a laptop."* - T1 *"Hopefully, we have materials in the laboratory because they also pay for the laboratory."* - T2.
Collaboration Skills	*"For example, it is an experiment that needs manpower, and then one of them is not functioning, we will order him to record the time, then he will not be able to time it properly, the performance will be affected."* -*P1.* *"If it is manpower, some may slack off and do nothing. Assign specific tasks to each member. You bring this and do this so everyone can work harmoniously to perform the tasks with your classmates, ensuring the task is performed."* - *P8.* *"First, in terms of colleagues or yourself, it is cooperation. You cannot even perform activities like these outcome-based ones if you do not cooperate, like you do not want to perform."* - *P11.*
Time Allocation	*"Sometimes our tasks pile up, and we're unsure where to start, so it's crucial to set proper time management. We need to know when the deadline is or how many hours we have to complete it, whether we can finish it or not."* - *P1.* *"The time given by the teachers should not clash; what will happen if everything overlaps? We may not be able to do the work."* - *P4.* *"Time... because if there is no proper time given, then our instructor will rush us because we cannot do it, but it is not a standard due to the lack of time. Whatever comes to mind first is what we will end up using."* - *P15.*
Teacher's Guidance	*"While doing the activities, someone should watch over me. Especially for individual activities, I need guidance because sometimes we handle harmful substances."* - *P19.* *"Guidance from the teacher…Without guidance, we will not be able to perform well, and we will not see the desired outcome. So, there should be guidance from the teacher."* - *P20.* *"There really should be a teacher who can facilitate, or a knowledgeable teacher, because it is difficult if the teacher lacks knowledge or mastery. Students will be confused about whether they're doing things correctly or not, so it's good if the teacher knows the expected outcome."* - *P21.*

The participants mentioned experimenting with a laboratory facility and a laboratory activity sheet that contains the objectives, a list of materials, procedures, observations, and questions regarding the experiment. Appropriate laboratory apparatus and experiment materials can promote critical, creative, and

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analytical thinking, improving learning outcomes (Kamarudin, 2018) as they engage students and promote active learning (Duban et al., 2019). Laboratory instruction sheets are essential for laboratory work as they increase student satisfaction (Lal et al., 2020). One of the primary goals of OBE is to design and manage schools in a manner that facilitates and optimizes the achievement of desired outcomes for all students. This educational approach is founded on the premise that schools can influence the conditions vital to successful learning. This implies that schools must proactively equip themselves with the necessary resources and cultivate an environment conducive to meeting the diverse learning needs of their students.

Another demand shared by the participants is collaboration. The participants revealed the importance of effective collaboration, especially in tasks requiring manpower. One member's failure to function properly can significantly impact the overall performance. There should be a mutual willingness to perform and collaborate in group performances. According to Spady (1994), the workplace needs people with high communication, collaboration, interpersonal, and leadership skills. Since OBE aspires to train students in various challenging settings with what they know, collaboration skills are important for students to achieve meaningful results in real life (Hidayati, 2019). Collaborative skills include asking friends or teachers for help when confused, speaking or arguing, appreciating and respecting others' opinions, and working together to solve problems (Verawati et al., 2020). These skills help students understand the results and build confidence (Zakiah et al., 2020). It allows them to interact productively with diverse classmates and be effective teammates (Canelas et al., 2017).

However, collaboration can still be weakened if there's not enough. The pressure to complete an experiment within the allotted time greatly influences students' perceptions of the value of doing labs (Deacon & Hajek, 2011). They need to allocate time to monitor the progress of tasks, especially since this is not the only task that the students will do. Knowing deadlines and calculating the time needed for each step is important for completing tasks successfully. It helps meet deadlines and facilitates thorough planning and execution, especially in experiments with critical timing and procedure. Without proper time, tasks may be rushed or conducted at inappropriate times, leading to suboptimal outcomes. In the context of OBE, the first dimension of opportunity refers to how schools redefine and reorganize teaching time, learning time, and eligibility criteria to enhance educational outcomes. This dimension focuses on expanding these elements' duration, frequency, and timing to better support student learning and achievement. Allocating time effectively in OBE means recognizing that students learn at different speeds and in different ways. Some may need more practice or extra help, while others may move ahead faster. Teachers can adjust their teaching to meet these individual needs, ensuring every student gets the support they need to succeed.

The participants also revealed that they needed guidance from their teachers during experiments. They might encounter problems, and their desired outcomes may not be achieved if no knowledgeable teacher can effectively facilitate their activities. There must be a teacher who will ensure that they understand what they are doing. In OBE, teachers play a vital role by guiding students toward specific learning goals. They ensure that what students learn in class directly relates to these goals. Teachers set clear expectations and provide support, helping students understand what they need to achieve and how their progress will be measured. Classroom teachers value open-ended, inquiry-based experiments but acknowledge the need for safety measures and teacher supervision in science laboratory practices (Duban et al., 2019). It is found that teacher guidance positively relates to student collaboration (Leeuwen & Janssen, 2019). Their interventions in small group work can effectively help students overcome problems (Hofmann & Mercer, 2016). They can also demonstrate it to develop the efficiency and learning of students in laboratory experiments (Nadelson, 2015).

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Table 3. Challenges in performing outcome-based performance tasks

Themes	Responses
Limited Resources	*"Some materials are hard to find... Some materials have defects or are not the right ones."* - *P7.* *"The materials and apparatus are incomplete, and some equipment does not work. If we push through with the experiment forcefully, we will not be able to perform well because of the shortage."* - *P10.* *"The apparatus is insufficient because of the laboratory's limitations. The facilities aren't complete, so we must search for what is lacking."* - *P11.* *"In addition to the shortage of materials, we removed experiments that truly required materials. Another issue is the microscope; we used a flashlight to illuminate the specimens because we conducted experiments at night, and it was too dark to see clearly."* - *P21.* *"Sometimes, we lack materials in the lab."* - T2.
Poor Group-mate Performance	*"Being grouped with irresponsible classmates."* - *P5* *"There is a lack of manpower from my groupmates."* - *P8* *"It is a considerable challenge when your partner does not actively engage during the experiment period. While I took charge of everything, my partner seemed nonchalant, merely acknowledging what I was saying. If I did not initiate communication, she would not either... she did not show any initiative to start a conversation or offer suggestions. She lacked proper communication and collaboration, and she was not taking responsibility."* - *P11.* *"It is even more frustrating when they sometimes do not acknowledge your messages during group meetings or chats, leaving you to do everything alone. It is during those moments when my realization of the challenge truly sinks in – having a partner who does not contribute at all."* - *P12.*
Limited Background Knowledge	*"It was all new to me when I started the experiment; I did not have any prior knowledge about it."* - *P3.* *"I did not understand how to comply with the activity."* - *P6* *"One of the factors that hindered us is that we did not fully understand the topic beforehand, and we only grasped it after experimenting."* - *P13* *"I am not really very knowledgeable."* - *P16* *"Handling the microscope and magnifier is challenging, especially after I broke a glass slide and coverslip last time. So, my challenges involve struggling to handle laboratory equipment, difficulty understanding instructions, and not knowing how to execute them properly."* - *P19*
Poor Guidance from the Teacher	*"I am lacking guidance. We are simply given a topic, and then it is up to us to handle everything. We end up facilitating our classmates, but sometimes even the facilitators do not fully grasp the topic, making it really challenging to perform well."* - *P6.* *"The facilitators were not well-prepared, and they did not explain anything; they simply instructed us to read the material."* - *P8.*

The participants revealed their struggles with inadequate and defective materials and delays in acquiring necessary resources, which directly hindered their ability to achieve learning outcomes. These shortages lead to suboptimal experimental conditions, diminishing the quality of performance tasks. These limitations undermine equitable access to educational opportunities and impede the adaptability and innovation that OBE encourages in teaching practices. OBE focuses on equipping students with the knowledge and skills needed for successful performance, necessitating adequate materials and equipment.

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Engaging learners directly with the materials necessary to comprehend scientific concepts and hone their scientific skills offers them the chance to connect with and reinforce the theoretical concepts taught in class (Hadji Abas & Marasigan, 2020). Within the OBE framework, ensuring that students have access to the necessary resources is crucial for achieving the intended educational goals.

The participants are also challenged in collaborating with unresponsive or irresponsible group mates. Such behaviors have been experienced by the participants that hinder the smooth execution of activities, result in imbalanced work distribution, and create frustration and inefficiency within the group. In OBE, effective group work is important for developing teamwork, communication, and problem-solving skills. Introducing cooperative learning in science classrooms can lead to frustration and dissatisfaction among some students. This method can hinder progress due to confusion and significant time spent determining individual roles within the group (Ott et al., 2018; Medaille & Usinger, 2018). Additional frustrations arise from group grading issues, including social loafing, free riding, and the 'sucker' effect (Sridharan et al., 2018). The workload is a crucial determinant of attitudes toward group work, with heavier workloads generally leading to a worse experience for those involved (Bhardwaj, 2020). Additionally, the frustration and inefficiency caused by poor group dynamics can negatively impact students' motivation and overall learning experience, further hindering their ability to meet OBE's objectives.

Many participants express being unfamiliar with the experiment or activity, which hinders their ability to comply or proceed effectively. This lack of knowledge often stems from insufficient understanding of the topic beforehand, leading to difficulties grasping the experiment's concepts or instructions. Additionally, some participants admit to feeling generally uninformed or inexperienced, particularly when handling laboratory equipment like microscopes. It underscores the importance of comprehensive pre-experiment preparation and explicit instruction to support students in navigating unfamiliar tasks successfully. OBE emphasizes achieving specific learning outcomes through a comprehensive understanding and application of knowledge. Students vary widely in their backgrounds, bringing diverse pre-existing knowledge, beliefs, skills, and attitudes to the classroom, influencing how they receive, understand, and organize new information. This highlights the importance of scaffolding and instructional support in addressing knowledge gaps and promoting meaningful learning experiences in laboratory settings (Johnson et al., 2008). OBE relies on students being adequately prepared to apply their knowledge in practical settings, but insufficient understanding can lead to improper task execution and hinder the learning process.

The participants also express a lack of guidance and preparedness among facilitators, leading to challenges in understanding and performing tasks effectively. This becomes overwhelming, especially when teachers struggle to understand the topic or are unprepared, leaving them and their classmates without adequate support or clear explanations. These instances underscore the importance of well-prepared and knowledgeable facilitators to facilitate learning effectively and mitigate challenges in task performance. Central to OBE is the role of facilitators in guiding students through these activities, ensuring clarity of objectives, and providing necessary support to facilitate learning. When facilitators are well-prepared and knowledgeable, they can effectively guide students in understanding complex concepts, navigating tasks, and collaborating with peers to achieve learning goals. When students do not understand the feedback provided or do not receive proper help or guidance, they cannot reach their full learning potential (Taber, 2018). The guidance allows students to achieve tasks independently that they could not have accomplished (Tsourlidaki et al., 2015).

Table 4. Dealing with the challenges in performing outcome-based performance tasks

Themes	Responses
Being Resilient and Adaptable	*"You should be able to create a Plan A and Plan B... You need to be prepared and dare to perform, whatever happens." - P1.* *"When I can not get the performance task done in just one way of thinking, I will look for another way. I will try YouTube and explore different ways to experiment. Think*

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Themes	Responses
	innovatively and be creative." - *P5* *"I look for alternative activities related to the topic that are easier to find materials for."* - *P7* *"I personally handle it by finding solutions. For example, if there is a shortage of materials, I look for similar materials."* - *P14* *"They look for alternatives because most students are also quite innovative."* - T2.
Adjusting to Collaborate	*"Then, if collaboration is necessary, I just adapt accordingly."* - *P3* *"I adjust as needed, especially during collaborative tasks. If there is an error, we take it slow and make adjustments to perfect the activity."* - *P7* *"If it is a group task, and I know the members well, I take the initiative to assign tasks to them."* - *P11*
Doing More Research	*"After performing the experiments, we searched online. Even though we already know the results, we still search to understand better how it works or why we got that result."* - *P13.* *"I seek help from the internet, watch videos on how to do it, like tutorials, that is what I follow... If there is a performance announced a day before, I search how to do it, ask for tips online, so on the day of the experiment, I will not bother my classmates with my questions."* - *P19.* *"I research what I do not understand... If there is a performance like this, I research beforehand so I will not struggle."* - *P20.*
Seeking Guidance from Peers	*"I seek advice and ask for help from friends on how to deal with it because they might understand."* - *P4.* *"I really do not feel ashamed to ask for help from the instructor or my classmates; they are there to assist."* - *P15.* *"First, what I do is seek or inquire from my peers, for example, if there is an instruction I do not understand, because sometimes I feel embarrassed to approach the instructor directly, so I just go to my classmates, ask for clarification, or follow what they are doing."* - *P19.* *"I pose questions to others, particularly to the teacher or my classmates, to seek assistance."* - *P20.*

Nevertheless, the participants still showed enthusiasm in dealing with these challenges in performing outcome-based performance tasks, such as being resilient and adaptable. This ensures preparedness and resilience in the face of difficulties, as supported by the response of T2. Recent emphasis has been placed on developing multiple strategies to boost resilience and adaptability. Outcome-Based Education (OBE) supports this by focusing on practical skill development and effective knowledge application. Proactive coping strategies, such as exploring alternative solutions and anticipating challenges, are vital for navigating uncertainty and achieving learning goals (Masten & Barnes, 2018). In everyday life, addressing problems requires generating solutions and thinking critically about options (Toraman et al., 2020). OBE aligns with this by encouraging practical application and adaptability, helping students develop resilience and enhance their learning outcomes through proactive problem-solving and flexible planning.

The participants emphasized the need to adjust group collaboration and accommodate different circumstances, especially in group settings where cooperation is vital. This collaborative effort involves working together as a cohesive team, leveraging each other's strengths and expertise to overcome challenges and accomplish tasks efficiently. The principles of adjusting to collaborate are closely aligned with OBE, which emphasizes attaining specific learning outcomes through student-centered learning experiences.

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OBE values collaborative learning and interpersonal skills, considering them essential for achieving desired educational outcomes. Collaborative learning hinges on team members' interaction and joint efforts in constructing knowledge together (Vuopala et al., 2015). By fostering adaptability in teamwork, students are better prepared to meet the collaborative demands of OBE.

Additionally, the participants frequently use research as a primary strategy to clarify uncertainties, gain deeper insights, and anticipate future steps. By seeking information from various sources, including the internet and instructional videos, participants equip themselves with the necessary knowledge to perform tasks more effectively and independently. This proactive research habit ensures they are well-prepared, minimizes reliance on peers during collaborative tasks, and ultimately leads to better task execution and learning outcomes. Conducting additional research is vital for expanding knowledge and addressing gaps in understanding. In educational settings, students often encounter complex concepts and tasks that necessitate further exploration. Research as a strategy ensures students are not just passively receiving information but actively engaging in their learning process. It supports students' prior learning and helps them draw on their knowledge to address new learning situations (Seery et al., 2018). Students can foster independent learning and critical thinking skills by accessing information beyond the classroom (Hattie, 2008). This engagement is crucial for developing critical thinking and problem-solving skills essential to OBE. Students take ownership of their learning journey, achieving the intended learning outcomes more effectively. The emphasis on doing more research underlines the importance of self-directed learning in OBE. Thus, prior research experience improves student performance (Beheshtian et al., 2023).

Despite having the opportunity to depend on research, the participants collectively emphasize seeking peer support and advice to overcome challenges and ensure accurate task execution. OBE emphasizes collaborative learning and peer support as essential for achieving desired educational outcomes. Social relationships with peers and teachers are pivotal in students' stress levels and learning outcomes, acting as resources supporting learning and mitigating stress (Wentzel et al., 2017). When students feel helpless in stressful situations and exhibit low abilities to cope with stressors, their chances of experiencing increased stress are high. Peer support involves giving and receiving help from someone with similar demographics or social aspects, characterized by empathy, encouragement, and support within a reciprocal relationship (Shalaby & Agyapong, 2020). This collaborative approach aligns with OBE's goal of developing well-rounded individuals who can navigate complex problems through mutual support and shared knowledge.

Discussion

1. Interpretation of Results

The findings of this study provide valuable insights into the experiences of Bachelor of Secondary Education (BSED) Science major students with outcome-based performance tasks. Laboratory experiments and performance exams emerged as significant tools for fostering the practical application of theoretical knowledge. These tasks encouraged students to develop critical skills such as collaboration, time management, and adaptability. For example, participants described activities like heat-powered turbine experiments and solar system model creation as effective in reinforcing scientific concepts, aligning with previous studies emphasizing the value of hands-on, experiential learning (Hansson, 2015; Villacrusis, 2021).

However, challenges such as limited resources, ineffective group dynamics, and insufficient teacher guidance hindered students from fully achieving intended outcomes. These findings corroborate research by Hadji Abas and Marasigan (2020), who noted the detrimental effects of inadequate resources on educational outcomes. Additionally, the difficulties reported in managing group collaboration resonate with studies highlighting the negative impacts of poor group dynamics on task completion (Vuopala et al., 2015; Bhardwaj, 2020). A notable discrepancy arises in the role of teacher guidance. While previous research

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(Taber, 2018) emphasizes the necessity of effective teacher facilitation in ensuring task success, some participants in this study highlighted instances where inadequate teacher preparedness led to confusion and suboptimal outcomes. This finding suggests that inconsistencies in teacher training and support may contribute to these challenges, underscoring the need for targeted professional development programs.

2. Implications

The results highlight the necessity of allocating sufficient resources to ensure the availability of laboratory apparatus and materials, which directly affect the quality of learning experiences. Enhancing teacher training programs is equally critical to bridging facilitation gaps and improving task comprehension. Strategies such as promoting peer collaboration, implementing differentiated instruction, and providing clear guidelines can help address challenges related to group dynamics and limited background knowledge (Wentzel et al., 2017; Spady, 1994). By addressing these areas, policymakers and educators can create learning environments that nurture both academic success and personal growth.

3. Limitations

This study has several limitations that may influence the interpretation and generalizability of its findings. These include the following:

- ***Sample Size and Contextual Specificity***

The study was conducted with a small sample size of 21 participants from a single higher education institution. Although their narratives provide rich and detailed accounts, the context-specific nature of this sample limits the ability to generalize the findings to other institutions, especially those with different educational environments, resource availability, or pedagogical approaches. Expanding the participant pool in future research could help paint a more representative picture of students' experiences in various settings.

- ***Qualitative Design and Limited Triangulation***

The study relied on thematic analysis and triangulation to ensure credibility. However, only two tertiary science teachers participated in the triangulation process. This limited number of external voices may not fully capture the diversity of perspectives needed to validate and enrich the findings further. Future research could address this by involving a broader range of stakeholders, such as administrators, more faculty members, or even parents, to offer a more holistic validation.

- ***Social Desirability and Response Bias***

As the interviews were conducted in a semi-structured format, social desirability bias may have played a role. Students might have been inclined to frame their experiences in ways they perceived to be favorable or acceptable. This bias is a common limitation in qualitative studies and warrants cautious interpretation of the findings.

- ***External Factors Not Addressed***

This study did not delve into external factors that might significantly shape students' experiences and performance. Variables such as socioeconomic status, parental involvement, and individual differences in prior knowledge or learning styles were beyond the scope of this research. Yet, these factors could play a crucial role in how students navigate outcome-based performance tasks, particularly in resource-constrained or highly competitive environments.

Conclusion

This study highlights the multifaceted experiences of BSEd Science major students with outcome-based performance tasks, revealing both the benefits and challenges of this educational approach. Students demonstrated growth in critical skills such as collaboration, problem-solving, and adaptability through hands-on tasks like laboratory experiments and performance exams. These activities provided valuable opportunities to integrate theoretical knowledge with practical application, reflecting the core principles of outcome-based education (OBE).

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However, challenges such as resource limitations, group dynamics issues, and inconsistent teacher guidance hindered students from fully achieving their learning outcomes. Addressing these concerns requires actionable steps, including improving access to laboratory resources, fostering effective collaboration in group settings, and enhancing teacher training to ensure consistent and supportive guidance. These recommendations are essential to creating a learning environment where students can thrive.

Future research should explore broader educational contexts, incorporating diverse student populations and quantitative methodologies to validate and expand upon these findings. Investigating the impact of external factors, such as socioeconomic conditions and varying institutional resources, would provide deeper insights into how OBE can be optimized across different settings.

Beyond the specific context of this study, the findings underscore the transformative potential of OBE in shaping competent, resilient, and well-prepared individuals. By addressing the identified challenges and refining implementation strategies, educational institutions can enhance the efficacy of OBE, empowering students to succeed academically and professionally in an increasingly complex world.

Knowledge Contribution

The research findings provided an in-depth exploration of the experiences of Bachelor of Secondary Education (BSED) Science major students in performing outcome-based performance tasks. Here's a summary of the key findings and their implications for science education and broader academic practices:

1. Nature of Outcome-Based Performance Tasks

1.1 Laboratory Experiments: These tasks integrate theoretical concepts with practical applications, fostering a deeper understanding of scientific principles. Students highlighted activities such as heat-powered turbine experiments, cheek cell observation, and egg incubation, all of which align with the objectives of outcome-based education (OBE). Laboratory experiments promote critical thinking and hands-on learning, essential for mastering science concepts (Hansson, 2015; Villacrusis, 2021).

1.2 Performance Exams: Students engaged in tasks such as building solar system models and delivering instructional presentations, which assessed their ability to synthesize and present knowledge. These exams encourage higher-order thinking and practical application of learned material (Badrinarayan, 2022; Braun, 2019).

2. Challenges Encountered

2.1 Resource Limitations: Inadequate and defective laboratory materials hindered task execution, emphasizing the need for sufficient resources to support educational outcomes (Hadji Abas & Marasigan, 2020).

2.2 Group Collaboration Issues: Inequitable task distribution and inactive group members posed significant challenges, highlighting the importance of fostering collaboration skills for effective teamwork (Vuopala et al., 2015; Bhardwaj, 2020).

2.3 Knowledge Gaps: Insufficient background knowledge limited students' ability to perform experiments effectively, underscoring the need for robust pre-task preparation and instructional support (Johnson et al., 2008).

2.4 Teacher Guidance: Inadequate facilitation and preparedness of instructors created barriers to understanding and achieving task objectives, reinforcing the necessity of teacher training in OBE methodologies (Leeuwen & Janssen, 2019).

3. Strategies for Overcoming Challenges

3.1 Adaptability and Resilience: Students demonstrated resourcefulness by creating contingency plans, seeking alternative methods, and leveraging available resources to meet task requirements (Masten & Barnes, 2018).

3.2 Research and Peer Guidance: Conducting independent research and seeking support from

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classmates enabled students to clarify uncertainties and enhance task execution (Seery et al., 2018; Wentzel et al., 2017).

3.3 Collaboration Adjustments: Assigning specific roles and fostering a collaborative environment helped mitigate group dynamic issues, enhancing collective task performance (Verawati et al., 2020).

4. Implications for Science Education

4.1 Curriculum Enhancement: The integration of outcome-based tasks aligns with modern educational standards, requiring curriculum designs that prioritize hands-on, experiential learning opportunities.

4.2 Resource Optimization: Addressing resource limitations, such as laboratory equipment and materials, is essential for achieving desired learning outcomes.

4.3 Teacher Development: Continuous professional development for educators ensures they are equipped to guide students effectively in an outcome-based learning environment.

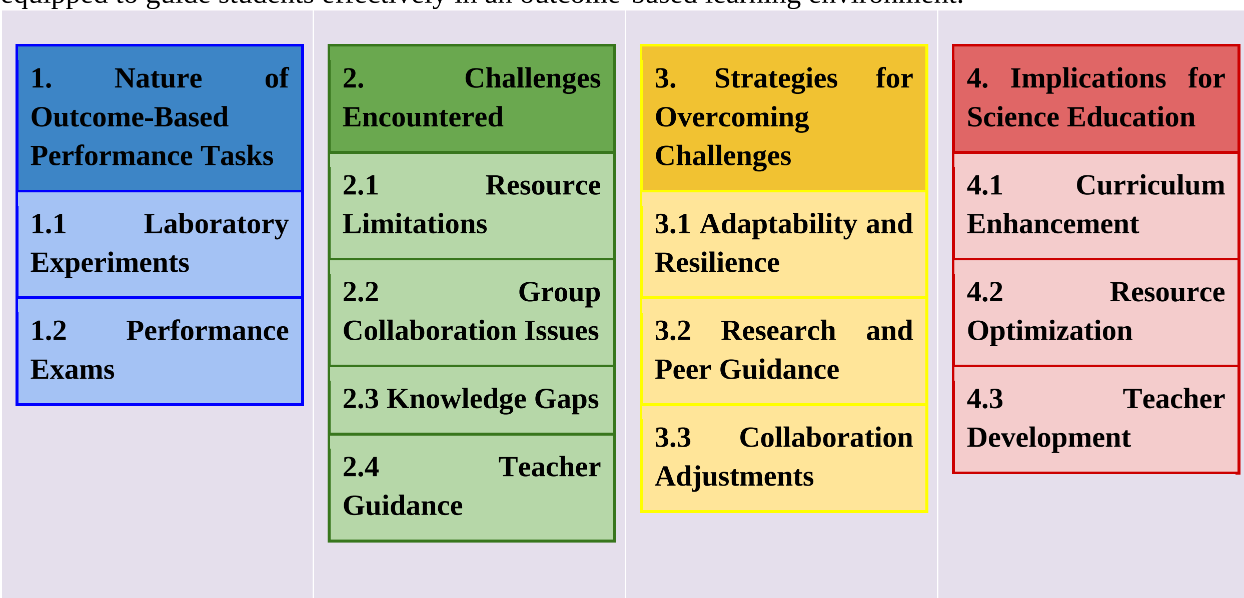

Figure 1: Knowledge Contribution

Recommendation

Based on the findings, the researcher endorses the following recommendations:

1. Allocate sufficient resources to ensure educational facilities, especially laboratories, are well-equipped and conducive to outcome-based learning experiences.

2. Enhance teacher training programs to be conducted every semester, equipping educators with the necessary skills and knowledge to effectively facilitate OBE, emphasizing the importance of clear communication and student engagement in these training sessions.

3. Implement a systemic approach to regularly assess and address the needs of students and educators, ensuring that the learning environment effectively supports OBE's goals.

4. Future researchers could explore the impact of multiple intelligences on OBE performance. This investigation could involve studying how different types of intelligence, such as linguistic, logical-mathematical, spatial, bodily-kinesthetic, musical, interpersonal, intrapersonal, and naturalistic intelligence, influence students' abilities to engage with and excel in OBE tasks.

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