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FLIPPED CLASSROOM APPROACH AS AN EFFECTIVE TEACHING STRATEGY IN A SCIENCE HIGH SCHOOL

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ABSTRACT

This quasi-experimental study evaluated the effectiveness of the flipped classroom approach in teaching the subject, Understanding Culture, Society, and Politics (UCSP), to science high school students at Tagbilaran City Science High School, Bohol, Philippines. The study focused on assessing student engagement, comprehension, and academic performance. A total of 30 Grade 12 students participated, with 15 students assigned to a control group taught through the traditional lecture method and 15 to an experimental group using the flipped classroom approach. The results revealed a statistically significant improvement in the posttest scores of students in the flipped classroom group compared to those in the traditional lecture group. This finding highlights the potential of flipped classrooms to enhance active learning and performance, particularly for high-performing students. Despite the limited sample size, the study underscores the value of innovative teaching strategies in interdisciplinary courses like UCSP. Future research should explore the scalability of this model to non-science high schools and diverse educational contexts.

Keywords: progressive teaching strategies, traditional lecture, quasi-experimental, pretest, posttest

INTRODUCTION

Education is universally acknowledged as the cornerstone of personal and societal development, and teaching methods significantly shape its quality and inclusivity. In the 21st century, innovative teaching strategies—such as the flipped classroom model—have emerged as transformative tools to meet the challenges of modern education (Adefuin, 2019; Adlit & Adlit, 2023). By emphasizing active learning and student-centered approaches, flipped classrooms aim to improve educational experiences across diverse disciplines. Recent meta-analyses show that this model, which shifts basic content delivery outside of class and reserves classroom time for active engagement, can lead to significant gains in academic performance and motivation (Karjanto &

Acelajado, 2022; Strelan et al., 2020). Furthermore, Understanding Culture, Society, and Politics (UCSP)—an interdisciplinary subject mandated for all senior high school students in the Philippines—exemplifies the need for such innovation, especially as traditional lecture-based methods often fall short in fostering deep conceptual understanding (Colina & Tinapay, 2023).

National and local studies further indicate an urgent need for engaging, student-centered approaches in contexts like science high schools, where students face rigorous academic demands (Obias, 2023; Zanjani et al., 2022). The flipped classroom, with historical roots in student-centered pedagogies dating back to Socratic dialogues, has gained prominence through the works of Bergmann and Sams (Bates et al., 2017). By inverting the traditional learning structure, students first engage with learning materials independently before classroom sessions, which focus on interactive and collaborative activities. This model's potential to enrich educational quality has been explored across various contexts. For instance, Gonzales (2019) found the flipped classroom effective for pre-service teachers in the Philippines, while Dayagbil et al. (2017) reported its ability to enhance academic performance, motivation, and engagement in broader educational settings. Despite its growing popularity, studies such as those by Lee and Liu (2016) and Låg et al. (2019) reveal inconclusive evidence regarding its superiority over traditional methods.

The theoretical foundation of flipped classrooms lies in constructivist principles, particularly Vygotsky's (1978) Zone of Proximal Development (ZPD) and Piaget's (1971) cognitive constructivism. These frameworks emphasize the active construction of knowledge through guided problem-solving and experiential learning (Eppard et al., 2017). The flipped model aligns with these principles by enabling students to learn at their own pace, using pre-recorded videos and classroom activities to deepen their understanding. Moreover, the model supports United Nations Sustainable Development Goal No. 4, which calls for inclusive, equitable, and quality education to promote lifelong learning opportunities.

A specific gap exists in the application of flipped classrooms to the UCSP subject within science high schools, where academically advanced students face stringent admission requirements. Despite international evidence supporting flipped learning's benefits (Strelan et al., 2020) and recent advances in active learning methodologies (Karjanto & Acelajado, 2022), few studies have explored its application in specialized contexts such as UCSP. Local studies indicate that traditional methods may not sufficiently foster the deep understanding required in such complex courses (Colina & Tinapay, 2023), highlighting an urgent need to implement and rigorously evaluate innovative teaching strategies (Obias, 2023; Zanjani et al., 2022). Previous studies have not addressed the unique dynamics of this context, nor the potential of flipped classrooms to enhance performance and satisfaction in UCSP. The study by Forsey et al. (2013) underscores the importance of flexibility, enriched content, and accountability in flipped classrooms, particularly in subjects like sociology, which parallels components of UCSP. This study aims to address this gap by evaluating the effectiveness of flipped classrooms in improving the performance of Grade 12 students at Tagbilaran City Science High School during the School Year 2022–2023.

Motivated by SDG No. 4's thrust on quality education and documented gaps in traditional instruction and supported by recent evidence on the benefits of active, flipped learning strategies (Karjanto & Acelajado, 2022), this study inquired into the score differences of the Grade 12 students of Tagbilaran City Science High School in the School Year 2022-2023 regarding the delivery of a BSED Social Studies pre-service teacher from a teacher education institution tagged by the Commission on Higher Education as a Center for Development who employed the flipped classroom method for the 3rd Quarter of the UCSP course to one classroom and the traditional teaching approach to the other classroom.

Research Questions

1. What is the level of performance of the control group (traditional lecture method) in Understanding Culture, Society and Politics in terms of:
   1.1. pretest; and
   1.2. posttest?
2. What is the level of performance of the experimental group (flipped classroom) in terms of:
   2.1. pretest; and
   2.2. posttest?
3. Is there a significant difference in the academic performance of students in UCSP when taught using a flipped classroom approach compared to a traditional lecture-based approach?

METHODS

This study employed a quasi-experimental quantitative design to evaluate the effectiveness of the flipped classroom approach in teaching the subject, Understanding Culture, Society, and Politics (UCSP), to academically high-performing students. This design is well-established in educational research for testing innovative teaching strategies (Hsiao & Chang, 2003; Tseng et al., 2022). It was deemed appropriate for the study's three research questions, which compared the performance of a control group (traditional lecture method) with an experimental group (flipped classroom approach).

Participants and Sampling. The study was conducted at Tagbilaran City Science High School (TCSHS) during the School Year 2022-2023. The inclusion criteria required participants to be Grade 12 students actively enrolled in the UCSP course, while students with more than two absences during the study period were excluded. A total of 30 students were selected using intact group sampling (Creswell, 2013), with 15 students assigned to the control group and 15 to the experimental group. This sampling method was chosen to minimize disruption to class schedules and ensure practicality, given the limited population available. While the sample size limits generalizability, it was considered adequate given the controlled conditions of the study. To address potential baseline differences, pretest scores were analyzed to confirm equivalence between groups.

Instrument Development. A researcher-made UCSP Test was developed to assess students' performance following established guidelines for instrument development (DeVellis, 2016). Content validity was established through expert review by three experienced UCSP educators, and a pilot study involving 10 students from a different cohort was conducted to refine the items and ensure clarity. Reliability testing yielded a Cronbach's alpha coefficient of 0.74, indicating satisfactory internal consistency.

Procedure and Data Collection. The flipped classroom intervention provided students with pre-recorded video materials and supplemental readings to engage with prior to in-class sessions. The flipped classroom intervention provided students with pre-recorded video materials and supplemental readings in an asynchronous format, consistent with the blended learning model (Bishop & Verleger, 2013). In-class sessions were dedicated to collaborative, problem-based activities designed to deepen students' understanding of UCSP topics. The study was anchored in a hybrid learning environment that integrated both asynchronous pre-class preparation and synchronous in-class activities. In contrast, the control group received instruction via the traditional lecture method, with all content delivered during class. The control group followed the traditional lecture method, with all instructional content delivered during class.

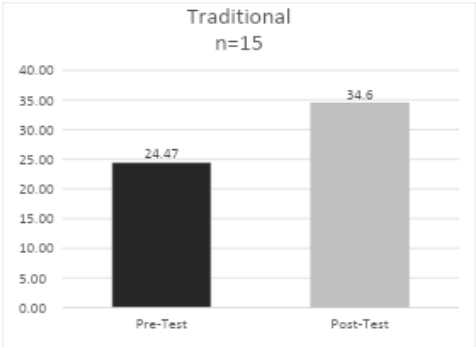
Data Analysis. The primary outcome was the difference in pretest and posttest scores between the control and experimental groups. A t-test was used to analyze these differences, a robust statistical method for comparing means in quasi-experimental research (Maryam et al., 2021; Wu et al., 2009). The null hypothesis posited no significant difference between the groups. The study also explored secondary outcomes, including variations in engagement and comprehension, based on observational data collected during the intervention.

Ethical Considerations. Informed consent was secured from all participants. Confidentiality was maintained throughout the study. Potential vulnerabilities were addressed, and a clear withdrawal strategy was transparently communicated. The chosen methods and analyses were tailored to address the research questions comprehensively, providing evidence of the flipped classroom's potential as a transformative teaching strategy for UCSP in science high schools.

RESULTS

The control group, taught using the traditional lecture method, had a mean pretest score of 24.47 and a posttest score of 34.60 (Fig. 1).

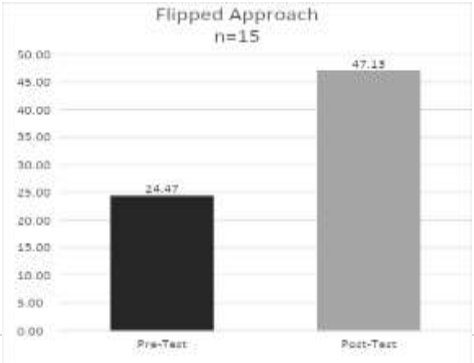
Figure 1
Mean Score in Pretest and Posttest Scores in the Control Group



n = Number of Respondents

The experimental group, which followed the flipped classroom approach, had a mean pretest score of 24.47 and a significantly higher posttest score of 47.13 (Fig. 2).

Figure 2
Mean Score in Pretest and Posttest Scores in the Control Group



n = Number of Respondents

The t-test analysis, as shown in Table 1, confirmed that the improvement difference between the two groups was statistically significant ($p < 0.05$), indicating that the flipped classroom approach yielded a considerably higher gain in student performance. Detailed pretest analysis further confirmed baseline equivalence. This indicates that the flipped classroom approach led to greater improvements in student performance compared to the traditional lecture method. Detailed analysis of pretest equivalence confirmed comparable baseline performance, validating the intervention's impact.

Table 1
Summary of Student Performance

Group	Pretest Score	Posttest Score	Improvement
Control Group	24.47	34.60	+10.13
Experimental Group	24.47	47.13	+22.66

DISCUSSION

The findings of this study substantiate the flipped classroom as a transformative teaching methodology, particularly in fostering higher-order cognitive skills and improving academic performance in the subject, Understanding Culture, Society, and Politics (UCSP), among science high school students. The significant improvement in posttest scores observed in the experimental group validates the theoretical alignment of the flipped classroom with constructivist learning principles, including Vygotsky's (1978) Zone of Proximal Development (ZPD) and Piaget's (1971) cognitive constructivism. These frameworks emphasize the active construction of knowledge through self-directed exploration and guided problem-solving, a process central to the flipped classroom model.

Theoretical Implications. The integration of digital tools and collaborative in-class activities situates this study within a socio-constructivist paradigm, emphasizing the mediational role of technology in creating participatory learning environments. The model also aligns with Sweller's (2011) Cognitive Load Theory, which posits that distributing learning tasks across pre-class and in-class phases reduces extraneous cognitive load. This enables students to dedicate more resources to deep, germane learning processes, particularly relevant in interdisciplinary subjects like UCSP. Furthermore, the autonomy and self-regulation encouraged by the flipped classroom resonate with Deci and Ryan's (2000) Self-Determination Theory, fostering intrinsic motivation and competence development in high-performing learners.

Contributions to the Literature. This study extends the growing body of evidence supporting flipped classrooms, aligning with research by Gonzales (2019) and Dayagbil et al. (2017), which demonstrated the approach's effectiveness across various disciplines. By focusing on academically advanced science high school students, this study addresses a critical gap in the literature, exploring the flipped classroom's potential to amplify critical thinking, engagement, and interdisciplinary understanding within a homogeneous, high-achieving cohort.

However, the results should be interpreted with caution, as alternative explanations warrant consideration. Variations in teacher delivery, disparities in prior knowledge, and differing levels of technological fluency among students may have influenced outcomes. While pretest equivalence mitigates some concerns, the lack of random assignment underscores the need for future research designs that incorporate randomization, standardized teacher training, and longitudinal analyses to validate findings and explore sustained impacts.

Broader Implications. The flipped classroom's scalability and adaptability are of particular relevance to the Philippine educational context, characterized by diverse learner needs and resource constraints. Forsey et al. (2013) emphasize the importance of flexibility and enriched content, both of which were integral to the intervention in this study. These elements align with the Sustainable Development Goal No. 4, which advocates for inclusive, equitable, and quality education. As UCSP is a subject which integrates historical thinking skills, this is also a step in innovating teaching in historical thinking (Gentallan & Pandan, 2024; Pandan et al., 2023; Pandan, 2024).

At the policy level, the findings highlight the necessity of embedding flipped classroom methodologies into national education frameworks. Policymakers should prioritize investments in teacher training and resource development to ensure the successful implementation of student-centered pedagogies. Institutions, in turn, must provide infrastructure and professional development programs that equip educators with the skills needed to design, curate, and deliver flipped classroom content effectively.

Recommendations for Future Research. To establish the generalizability of this model, future research should replicate this study in non-science high schools and under-resourced settings. Exploring its impact across diverse socioeconomic and cultural contexts would provide critical insights into its broader applicability, such as juxtaposing flipped classroom to the Fiesta Teaching Model (Moral & Pandan, 2024). Additionally, comparative studies could assess the flipped classroom alongside other innovative teaching methodologies, such as gamified learning or project-based approaches, to identify synergies and optimize pedagogical outcomes.

Finally, this study contributes to critical discussions in the sociology of education, challenging traditional hierarchies in classroom dynamics. By repositioning students as active co-constructors of knowledge, the flipped classroom exemplifies a shift towards egalitarian, participatory educational models, resonating with Freire's principles of critical pedagogy (Correa, 2015). This philosophical shift underscores the transformative potential of the flipped classroom in redefining education for the 21st century.

In light of these findings, the researchers contend that the flipped classroom model not only aligns with contemporary theoretical frameworks but also offers practical benefits in enhancing student engagement and learning outcomes. From a theoretical perspective, it advances our understanding of socio-constructivist and cognitive load principles. Practically, it provides a viable model for improving academic performance in high-achieving cohorts. Policy-wise, these results advocate for the integration of flipped classroom methodologies into national education frameworks, alongside investments in teacher training and digital infrastructure.

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CONFLICT OF INTEREST

The researchers declare no conflict of interest.

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