Towards Innovative and Effective Pedagogical Strategies in Art and Design Education

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ABSTRACT

The rapid evolution of the Higher Education landscape calls for innovative teaching methods, especially in fields like Art and Design. Educators are faced with the challenge of preparing their students to overcome current and future barriers. Being 'good' is no longer enough for educators; they must now strive for higher levels of excellence and creativity. This study aims to transcend traditional teaching techniques by implementing advanced pedagogical strategies rooted in contemporary educational theories and characterized by hands-on learning. The paper is structured around the examination of the impact of advanced student-centered strategies in Higher Education, specifically in the context of Art and Design. This entails the exploration of "Student as Researcher," "Sequential Skills and Knowledge Accumulation," and "Collaborative Teaching Workshops and Assessments," as well as the analysis of how these approaches influence student problem-solving skills, technical expertise, and collaborative abilities. Through interviews and focus groups with students, the study evaluates the effectiveness of collaborative teaching in workshops and assessments, offering insights into the advantages and challenges of these methods. The research-driven findings underscore the crucial role of faculty collaboration in enhancing the learning experience and improving assessment outcomes, promoting a more dynamic learning environment.

Keywords: Innovative Pedagogical Strategies Art and Design Education Student as Researcher Sequential Skills Knowledge Accumulation.

INTRODUCTION

In the current era of digital revolution, there is a need for innovative teaching methods in Art and Design education (Liu, 2021; Bitar & Davidovich, 2024). As we continue to progress into this transformative period, the traditional way of teaching will be insufficient in preparing students with the necessary creative insight and technical skills. The field of art and design education requires a shift towards a learning approach that focuses on reflection and incorporates creativity and innovation at its core (Liu, 2021; Bitar & Davidovich, 2024). It is crucial to emphasize the importance of changing pedagogical methods in order to cultivate technically skilled artists and designers who are also critical thinkers and innovators in their own practice (Costantino, 2018).

The students in the current era are considered digital natives and are expected to succeed in learning approaches that integrates digital and innovative pedagogies (Huang, 2022). Features of digital and innovative teaching pedagogies include collaboration, affordability, ease of teaching process, innovative contents, interactive, accessibility, and flexibility (Haleem et al., 2021). On the contrary, the traditional teaching approach entailed conventional practices such as using chalk/pen and whiteboards and lecturing students in class, which were not effective in fostering creative engagement and critical thinking among students (Alshehri, 2024; Sabol, 2022). This study is based on the assumption that the methods of teaching art and design are supposed to continue to transform, ensuring even more practical learning, collaboration, and use of digital technologies for the 21st-century challenges and opportunities (Greene et al., 2019).

This background sets out to identify the efficacy of contemporary pedagogic strategies within Art and Design education. This study, in particular, makes an attempt to judge the level of impact student-centered approaches, specifically "Student as Researcher," "Sequential Skills and Knowledge Accumulation," and "Collaborative

Teaching Workshops and Assessments" have on the students' involvement with creativity and development of skill. The results of this study will help in the issuance of actionable recommendations to educators who would like to improve their teaching practices in line with the improvement of their students' learning outcomes. This study can add empirical insight into the merits and challenges of implementing these innovative pedagogical strategies (Al Hashimi et al., 2019).

Statement of The Problem

Despite increasing discourse around innovative teaching methods in Art and Design education, there is limited empirical evidence evaluating the specific impact of these strategies on student outcomes such as engagement, creativity, and technical skills. Traditional approaches remain dominant in many institutions, often limiting opportunities for active and collaborative learning. This study addresses this gap by systematically analyzing how selected pedagogical strategies influence student learning, thus providing evidence to support broader integration of these methods.

The importance of this study is underscored in the research and reaches beyond academic discussion, underpinning the larger purpose of the university to prepare Art and Design students for excellence in the creative sectors (Ejsing-Duun & Skovbjerg, 2019). This study further aligns Art and Design education with the dynamic demands of the creative industries, ensuring that curriculum development, pedagogical innovation, and educational policies are formulated to be in tune with what the present digital era offers—challenges and opportunities (Ejsing-Duun & Skovbjerg, 2019).

This study was driven by four research questions aimed at increasing understanding of the impacts of innovative pedagogical strategies in Art and Design education:

RQ1: How do specific innovative pedagogical strategies, including the "Student as Researcher" approach and collaborative teaching methods, impact student engagement, learning outcomes, and motivation in Art and Design higher education?

RQ2: In the context of "Student as Researcher" and other advanced pedagogical strategies, what impacts are observed on students' creative potential and project outcomes in Art and Design? How can insights from these impacts inform the broader application of innovative teaching strategies?

RQ3: How do collaborative teaching methods, workshops, and assessments compare to traditional teaching methods in terms of influencing students' learning experiences, skill development, and creativity in Art and Design education?

RQ4: What innovative or adaptable assessment methods effectively evaluate the impact of advanced pedagogical strategies on enhancing creativity, learning outcomes, and student engagement in Art and Design education?

This research study is structured into four pivotal stages: Definition, Planning, Implementation, and Reflection. In the 'Definition' phase, the investigators thoroughly delineated the students' learning requisites, pre-existing knowledge, prospective learning outcomes, and innate capabilities. This foundational understanding paved the way for the 'Planning' stage, during which the investigators meticulously crafted and architected innovative teaching and learning activities aimed at fostering student engagement, thereby catalyzing an active learning environment. Subsequently, the 'Implementation' phase involved the actualization of these strategies, complemented by continual assessments to gauge and evaluate the progress of the plan in alignment with the student's learning achievements. The culmination of this process was the 'Reflection' stage, where the performance was meticulously analyzed in relation to the outcomes attained, facilitating the refinement of strategies as deemed necessary. A pictorial representation of these phases is illustrated in Fig. 1 below.

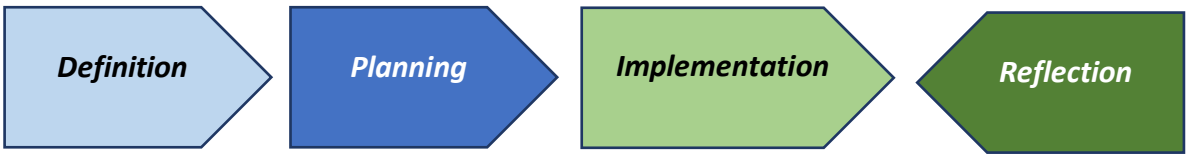

Figure 1 Demonstration of the Four Stages of the Research

The paper is structured as follows: First, we lay down a theoretical framework placing our study on innovative pedagogical strategies within the scope of modern theories of education. This will be followed by a section of literature review in which our research is located in relation to existing academia, through which the gaps our study tries to bridge are identified. Finally, in the section of methodology, an explanation of our research design and analytical approach. After which, we shall present findings on the results or outcomes realized from the implementation of the pedagogical strategies under study. These findings will be discussed and elaborated through our theoretical framework and reviewed literature in the discussion. The paper outlines practical recommendations for educators and directions for further research, setting out a course for the continued evolution of pedagogical practice in Art and Design Education.

Theoretical Framework

The theoretical framework underpinning these pedagogical strategies in Art and Design education primarily reverts to the entire spectrum of educational theories, with an emphasis laid on active student learning. These theories include constructivism, experiential learning, and social constructivism. These theories fall within the pedagogical strategies of the broader framework: "Student as Researcher" is essentially an application of experiential learning, while "Sequential Skills and Knowledge Accumulation," and "Collaborative Teaching Workshops and Assessments" are primarily based on the principles of Constructivism and Social Constructivism.

Constructivism

Constructivism is based on the assumption that learning and teaching is based on the premise that cognition is the result of mental construction (Burhanuddin et al., 2021; Efgivia et al., 2021). The premise imply that student learn by fitting new information together with what they already know (Burhanuddin et al., 2021; Efgivia et al., 2021). Based on the constructivism theory, learning in affected by the context in which the idea is taught and students' attitudes and beliefs (Burhanuddin et al., 2021; Efgivia et al., 2021). Consequently, the theory suggests that individuals construct knowledge and meaning from their experience (Burhanuddin et al., 2021; Efgivia et al., 2021).

Constructivism, assumes that learners progressively build their perception and knowledge of the world through the experience of reflecting on their experience (Piaget, 1976). Applied to "Student as Researcher," that is a supportive insight to the theory in which students actually learn best when they are active participants in the research since they get to explore the concepts and make new insights from knowledge application. Through inquiry-based learning, it opens up a pathway that allows students to become co-constructors of knowledge, which yields a deep, personally meaningful understanding of the principles of artistic and design practice.

Experiential Learning

According to Kolb (1984), the experiential learning theory is a summation that highlights how experience comprises the varied processes in the learning process, which can be made simple and elaborately defined through four stages: concrete experience, reflective observation, abstract conceptualization, and active experimentation. "Sequential Skills and Knowledge Accumulation" is based on the inductive teaching and learning theory that students iteratively grow in their ability, knowledge, and understanding through experiences based on projects. This approach allows students to apply directly that learning to novel and complex situations, so that it contributes to the ongoing progress of their technical capacities and conceptual understanding. The theorist, Kolb (1984), identified six characteristics of experiential learning, including (a)

learning is best conceive as a process rather than outcome, (b) all learning is relearning, (c) effective learning requires the resolution of the conflicts between dialectally opposed modes of adaptation to the world, (d) learning is a holistic process of adaptation, (e) learning is a synergistic outcome of the transaction between an individual and the environment, and (f) learning is a process of creating knowledge (Passarelli & Kolb, 2023).

Social Constructivism

Peer-to-peer teaching is underpinned by the social constructivism and Vygotsky's zone of proximal development (Rasa et al., 2024). Based on the Vygotsky's theory, combining students with more experienced and capable peers enhance their learning when they are alone (Rasa et al., 2024). Social Constructivism theory aligns with constructivism but adds the role of culture and social context to the roles of the learner in the construction of knowledge (Vygotsky, 1978). "Collaborative Teaching Workshops and Assessments" derive from this theory; in this, it exposes the environment where students learn from others. They work with other students to improve their learning and social behavior. Collaborative workshops and appraisals bring students into contact with other students and staff who work in a variety of ways, enriching learning experiences and encouraging the kind of community of practice relevant to professional collaborative working in art and design.

Social constructivism emphasizes the importance of collaboration, contact, and group work to attain effective learning outcomes (Saleem et al., 2021). Applied in education, social constructivism emphasizes on teaching strategies that involves student participation, sharing, and discussion (Saleem et al., 2021). The teaching strategies under social constructivism entails several interactive tactics and groupings such as whole class discussions, small groups discussions, and pairing students to focus on some specific topics (Saleem et al., 2021). These teaching strategies enables students to share ideas and brainstorm to find cause and effect links, gain new information, and address problems (Saleem et al., 2021).

Rationale

It is therefore sensible that these educational theories would be included as part of the Art and Design pedagogic approaches because of the urge to be able to raise graduates who are creative and adaptable, while at the same time being technically competent. Where constructivism underpins the development of independent, critical thinking, the experiential learning process, through its cyclic learning process, supports the development of theory into practice. Social constructivism underpins the development of collaboration skills and the social learning perspective that is essential within the creative industry. All these theories combined set the base for pedagogical strategies that help improve learning outcomes while preparing at the same time students for the readiness of complexities and requirements for collaboration with the fields of art and design. In pedagogical strategies attuned to these theoretical frameworks, an approach to Art and Design education that fosters an engaging, reflective, and collaborative learning environment is indeed at the heart of what truly champions the holistic development of students. It ensures that the learners who are turned out of school are indeed released with what it takes—the right skills, knowledge, and mindset to do excellent work out there in the industry.

LITERATURE REVIEW

This literature review synthesizes key studies in the area, integrating contemporary educational trends with the traditional focus on creativity, technical skills, and critical thinking.

Recent scholarship emphasizes the importance of hands-on, project-based learning environments in fostering creativity and innovation (Sawyer, 2018). The adoption of "Sequential Skills and Knowledge Accumulation" strategies supports this by building student competencies progressively, though empirical research validating these approaches remains sparse. Collaboration in learning, particularly through "Collaborative Teaching Workshops and Assessments," has been shown to enrich the learning experience, with Greene, Freed, & Sawyer (2019) highlighting its positive impact on creative performance. Yet, the systematic integration of collaborative practices in Art and Design curricula requires further exploration.

The incorporation of digital tools and resources in education has been advocated by Beetham and Sharpe (2013), who argued for more engaging and interactive learning experiences through technology. They also stress the need for redefining pedagogy in digital contexts, proposing 'Design for Learning' as a creative approach to planning educational activities, crucial for effective pedagogy in Art and Design.

Student as Researcher

The student-researcher method is a teaching approach that promotes independent thought, critical thinking, creativity, engagement, and research abilities in students by having students take on the role of researchers (Daryanes et al., 2023; Cabral & Huet, 2011). This method assists with the development of critical abilities in students, including decision-making, problem-solving, and information assessment (Daryanes et al., 2023; Rabeea Mahdi et al., 2020). Because students are in charge of creating research topics, carrying out studies, and presenting their findings, it also promotes independence. Students who use this method to create original research projects and investigate areas of interest also become more creative (Almulla et al., 2023). Because they are more likely to be driven to study, it raises engagement. It additionally encourages the development of critical research abilities like data analysis, academic writing, and information literacy, all of which are important for both professional growth and academic success (Daryanes et al., 2023; Rabeea Mahdi et al., 2020). The student-researcher approach encourages cooperation between students, instructors, and outside specialists, establishing a supportive learning environment. In addition, student as researcher approach provides students with practical experience, nurture their creativity, and problem-solving abilities (Huang & Xu, 2024).

The student as researcher model encourage deep engagement with content and active contribution to knowledge creation, aligns with modern educational philosophies (Huang & Xu, 2024; Leng, 2020). Student as Researcher model supports constructivist and experiential learning theories, promoting participatory and inquiry-based learning experiences that are increasingly valued in Art and Design education (Huang & Xu, 2024).

Research is necessary for design students to understand user needs, guide design choices, spot patterns and trends, inspire creativity, evaluate design solutions, take on challenging issues, develop empathy, and improve communication abilities (Carbon, 2019). By better understanding the demands, preferences, and behaviors of their intended audience, designers can produce more efficient and user-focused solutions with the use of research. In order to ensure that designers stay up-to-date and produce designs that appeal to modern audiences, it also assists in identifying new trends and patterns in technology, design, and user behavior. Designers can find their designs' advantages and disadvantages and make the required adjustments by testing their creations on actual users (Rabeea Mahdi et al., 2020). Research gives designers the knowledge and resources they need to solve complicated issues; it develops empathy by helping them comprehend the requirements, concerns, and viewpoints of their target audience; and it improves communication skills by assisting in the gathering, analysis, and effective distribution of information. Overall, research is an essential part of the design process, allowing designers to produce user-centered, inventive, and effective solutions.

Sequential Skills and Knowledge Accumulation

The sequential skills and knowledge accumulation strategy in education is a systematic approach that divides learning objectives into smaller, sequential segments (Ai et al., 2023; Barthakur et al., 2022; Lin et al., 2022). The sequential skills and knowledge accumulation helps students build a solid foundation of knowledge and abilities by progressively raising the degree of difficulty and complexity of assignments. In addition, sequential skills and knowledge accumulation method helps students retain information over time and gets them ready for success in both academic and real-world settings in the future (Gebauer et al., 2012). Considering that the sequential skills and knowledge accumulation offer an organized and structured approach to learning, this approach play an important role in education because they enable students to fully understand one idea before going on to the next. As students apply their knowledge logically and methodically, they also help in the development of critical thinking and problem-solving skills. Studies have indicated that implementing a step-by-step method for instruction and learning can improve students' comprehension and application of

information (Goulet-Lyle et al., 2020). Sequential skill development also encourages achievement in academic settings, critical thinking, and problem-solving.

Educators can apply the collected information in the classroom by adopting tactics including connecting the dots, structuring the learning process, using real-world examples, and offering practice opportunities. These techniques support students in laying a solid conceptual basis in a variety of academic areas. Organizing study materials, reviewing, and revising frequently, forming connections, engaging in active learning, getting feedback, and setting goals are all effective ways to apply secondary and cumulative learning. Active learning is doing things like summarizing important ideas, imparting concepts, and solving issues that call for active engagement. Students who receive regular feedback from teachers, others, or online resources are better able to modify their learning approaches and expand their knowledge base (Pereira et al., 2016). Students can maintain motivation to keep getting better by setting specific learning objectives and monitoring their progress over time. Students who implement these strategies can effectively incorporate sequential and accumulative learning techniques into their study habits, resulting in deeper understanding, improved grades, and overall academic success.

Collaborative Teaching Workshops and Assessments

Collaborative teaching involve two or more educators planning, organizing, instructing, and evaluating students' progress collectively (Singh & Bhuyan, 2024; López-Hernández et al., 2023). Some of the strategies used in collaborative teaching workshops and assessment include co-teaching, team teaching, differentiated instruction, collaborative lesson planning, peer observation and feedback, multidisciplinary collaboration, and student collaboration. While team teaching divides curriculum areas and incorporates several teaching methods of instruction, co-teaching involves sharing accountability for lesson design and delivery (Beninghof, n.d.). Peer observation and feedback encourages collaboration and professional development. Ensuring alignment with learning objectives and student engagement is made possible through collaborative lesson design. Interdisciplinary cooperation establishes links between subjects, whereas student collaboration promotes teamwork, communication skills, and critical thinking (Bovill, 2020).

Collaborative workshops are critical for promoting teamwork, communication, and professional development among educators and enables students to establish professional networks (Huang & Xu, 2024). Collaborative workshops offer a forum for exchanging knowledge, encouraging collaboration, and improving instructional techniques. In addition, collaborative workshops also provide chances for networking, skill development, and ongoing education. A culture of cooperation, mentoring, and mutual support is promoted by these sessions. Collaborative workshops promote reflective practice, which increases the efficacy of instruction and pinpoints areas in need of development. Also, collaborative workshops establish a learning atmosphere that is student-centered, emphasizing the needs and goals of the students. In general, taking part in cooperative workshops improves teaching abilities, creates a strong professional network, and has a favorable effect on student learning (Silva et al., 2020).

Collaborative assessments are essential for developing a culture of teamwork among educators and for gaining a thorough knowledge of student learning (Healey & Healey, 2024). They facilitate the collection of information from many viewpoints, allowing for an integrated assessment of student performance and well-informed choice-making regarding teaching tactics. Additionally, they encourage educators to take on shared responsibility, which guarantees impartial and consistent evaluation procedures that support learning goals. Collaborative assessments also help educators improve professionally by letting them exchange best practices and benefit from one another's knowledge (Shagrir, 2017). Additionally, they support data-driven decision-making by seeing patterns and trends that guide focused interventions and modifications. By laying out precise guidelines, expectations, and standards, they also encourage transparency and responsibility.

Gaps in the Literature

While the benefits of innovative pedagogical strategies are widely recognized, the literature reveals gaps in empirical evidence supporting their effectiveness, particularly in Art and Design education. Detailed case studies and research on the 'Design for Learning' methodologies, 'Student as Researcher' approaches, and the

specific impact of digital integration on learning outcomes are notably lacking. These gaps underscore the need for further exploration of how these contemporary educational trends can be effectively applied to enhance student learning in Art and Design disciplines.

Alignment with the Current Study

This study aims to address these gaps by empirically investigating the impact of innovative pedagogical strategies, including 'Design for Learning', 'Student as Researcher', and the integration of digital tools, on student learning outcomes in Art and Design education. By providing concrete evidence on the effectiveness of these approaches, this research contributes to the advancement of pedagogical practices that respond to the demands of the modern educational landscape in Art and Design.

METHODOLOGY

A quantitative methodology with an experimental design was utilized. The design enables establishing the causal effects of an intervention on the identified outcomes (Wang & Ji, 2020). The interventions implemented were the three teaching pedagogies and the outcome variable was students' knowledge of the taught course content. Students were randomly assigned to the three teaching pedagogies using Microsoft Excel. The randomization process ensured an even distribution of students across the three groups based on their prior knowledge levels about the course. Instructors utilized different teaching strategies under each pedagogy to deliver a common course content..

Participants

The participants in this study were second-year students enrolled in graphic design courses. Based on the GPower analysis, the required sample size for attaining a power of .80, the effect size of 0.40, at a .05 level of significance for the analysis of covariance (ANCOVA) with three groups was 64. However, all enrolled students (n = 79) were randomly assigned to the three teaching pedagogies; Student as researcher (n = 26), sequential skills and knowledge accumulation (n = 27), and collaborative teaching workshops and assessments (n = 26).

Intervention

The interventions involved utilizing the three teaching pedagogies to deliver the course content throughout the semester. The course taught was Typography 1, developed for second-year arts and design students. The contents of the course, which focused on Latin Script, included the applications and fundamental elements and categories of type, basic letterforms, typographic contrast, hierarchy of information, major type families and characteristics, and typographic grids; and how these apply to print media. It also included a discussion of the theory, practice, technology, history, and evolution of typography. Students were expected to gain skills for expressive typography and conceptual thinking and combine the theoretical and underlying principles with practical outcomes.

Under the student as researcher group, the instructor utilized different teaching strategies emphasizing the active involvement of students in the research processes. For example, the instructor encouraged students to develop research questions, design experiments, analyze data, engage in critical thinking, and investigate real-world problems based on the related course contents. For the sequential skills and knowledge accumulation group, the instructor utilized teaching techniques that focused on building knowledge and skills progressively. Teaching techniques included scaffolded learning and mastery of basic skills by ensuring students understood the prerequisite materials and related contents before advancing. For the third group, collaborative teaching workshops and assessment, three instructors collaborated to deliver the course contents. Teaching strategies utilized in the third group focused on teamwork and shared responsibilities in teaching and learning, whereby teachers and instructors collaborated in the learning process. Techniques used included completing assignments and projects in groups and peer teaching. Instructors assigned some topics to a group of students to research and present to their peers to facilitate peer learning and sharing of ideas.

Data Collection

Data were collected in two phases; before and at the end of the 15-week course. The baseline data were collected by administering a general knowledge test about the identified course. The baseline test was administered before randomization. Table 1 provides an overview of the baseline scores. The purpose of the baseline test was to control for the student's initial knowledge about the course in the final test scores. The baseline test constituted 10 multiple-choice questions developed based on the course contents. The posttest was collected by administering a second test about the course content after the completion of the coursework. Standardized tests were administered and scored by the instructors. The tests constituted four main parts; theoretical understanding (30%), typographic application (40%), evaluation and critical thinking (20%), and design and application (10%). The first part of the test contained multiple-choice and short-answer questions. The tests were developed based on the course contents. Table 2 contains summary statistics for the post-test results while Figure 2 depicts the mean comparison across the three groups respectively.

Data Analysis

It was hypothesized that at least one teaching pedagogy was more effective in improving students' learning outcomes. The analysis of covariance (ANCOVA) was conducted to investigate if there was an effective teaching pedagogy based on students' test scores at the end of the coursework. The baseline test scores for the students' general knowledge of the course content were controlled to enhance the determination of the true causal effects of the three teaching pedagogies on students' learning outcomes. Baseline and post-test data were collected and compiled in a Microsoft Excel spreadsheet. The Statistical Package for Social Science (SPSS) was used to analyze a .05 level of significance (a predefined threshold for statistical tests).

Ethical Considerations

Ethical approval for the study was obtained from the institutional review board. Informed consent was obtained from all students, ensuring that they were fully aware of the study's purpose, procedures, and their right to withdraw at any time. Confidentiality and anonymity of the participants were maintained throughout the study. No personally identifiable information, such as students names, were collected.

FINDINGS

Baseline Scores

A total of 79 students completed both the pre- and post-test assessments. The mean baseline score for general course knowledge was 60.13%, with a standard deviation of 8.08. As expected from the randomization process, there were no significant differences among the three groups in their baseline knowledge scores, confirming a fair starting point for comparison (see Table 1).

Table 1 Summary Statistics for the Baseline General Knowledge Scores

Group	*n*	Minimum	Maximum	Mean	Standard Deviation
Student as Researcher	26	50	70	60.77	8.449
Sequential Skills and Knowledge Accumulation	27	50	70	60.37	8.077
Collaborative Teaching Workshops and Assessments	26	50	70	59.23	7.961
Overall	79	50	70	60.13	8.085

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Posttest Scores

Table 2 shows the descriptive statistics for the posttest scores for the three groups and overall student scores. The assumption of equal variance between the groups was tested using Levene's test. The test was not statistically significant ($F(2,76) = 0.576$, $p = .581$), indicating the variance across the three groups was homogenous.

Table 2 Summary Statistics for the Posttest Knowledge Scores

Group	*n*	Mean	Standard Deviation
Student as Researcher	26	80.19	4.891
Sequential Skills and Knowledge Accumulation	27	81.22	4.353
Collaborative Teaching Workshops and Assessments	26	83.62	4.981
Overall	79	81.67	4.898

Following the implementation of the three teaching strategies, the post-test results revealed notable variation in learning outcomes. Students who experienced the collaborative teaching workshops and assessments approach achieved the highest mean post-test score (M = 83.62), compared to 81.22 for the sequential skills and knowledge accumulation group and 80.19 for the student-as-researcher group. These results, detailed in Table 3, suggest that collaborative methods can be particularly effective in enhancing knowledge acquisition and retention.

Table 3 Summary of ANCOVA Results

Source	Type III Sum of Squares	df	Mean Square	*F*	*p*	Partial Eta Squared
Corrected Model	165.25	3	55.084	2.42	.073	.088
Intercept	9600.38	1	9600.378	422.0	.000	.849
Baseline Scores	4.667	1	4.667	.205	.652	.003
Group	155.171	2	77.586	3.41	.038	.083
Error	1706.192	75	22.749			
Total	528812.00	79				

The results of the ANCOVA analysis, which controlled for pre-test scores, confirmed that the differences between groups were statistically significant ($F(2) = 3.41$, $p = .038$). Post hoc comparisons using the Tukey HSD test indicated that the collaborative teaching group performed significantly better than the other two groups ($p = .030$), while no significant differences were found between the sequential skills and student-as-researcher groups. These comparisons are visually summarized in Figure 2, which illustrates the adjusted post-test means across all groups.

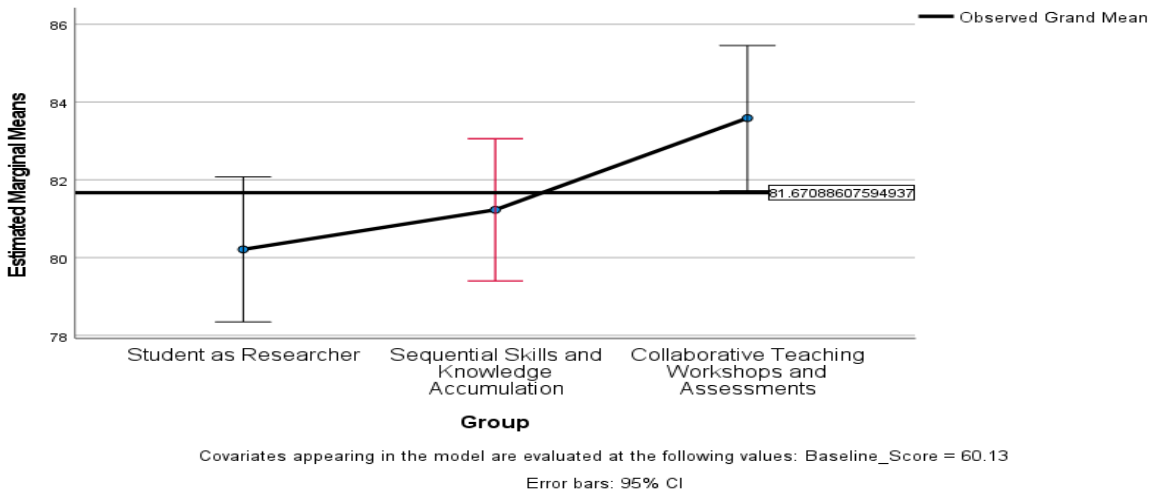

Figure 2 Comparison of Students' Mean Scores Across the Three Groups

Beyond the quantitative results, classroom observations and student feedback highlighted distinct behavioral trends within each group. Students in the collaborative teaching condition engaged more actively during sessions, often taking initiative in peer feedback and group tasks. The student-as-researcher group demonstrated stronger independent inquiry and deeper conceptual questioning, though this was not always reflected in test performance. The sequential skills group, on the other hand, showed steady progression and seemed to benefit from the scaffolding provided throughout the course.

Taken together, the findings suggest that while all three approaches offer valuable learning opportunities, collaborative workshop-based instruction stands out for its capacity to engage students dynamically and improve overall learning performance.

DISCUSSION

The results of this study indicated that the three pedagogies; student as a researcher, sequential skills and knowledge accumulation, and collaborative teaching workshops and assessments significantly differ on how they impact students' knowledge and skills acquisition. Based on the results, collaborative teaching workshops and assessments were more effective than the other two pedagogies. These findings support the constructs of the social constructivism theory that support effective learning through collaborative teaching strategies such as group work, contact, whole class discussions, small group discussions, and pairing of students (Saleem et al., 2021). Collaborative teaching strategies enhance learning by enabling students to students to share ideas and brainstorm to find cause-and-effect links, gain new information, and address problems (Saleem et al., 2021). Collaborative workshops enable students to exchange knowledge, promote collaboration, and promote reflective practice, which may improve knowledge acquisition (Saleem et al., 2021; Singh & Bhuyan, 2024; López-Hernández et al., 2023). Unlike collaborative teaching workshops and assessments, student-as-researcher approaches promote participatory and inquiry-based learning experiences (Huang & Xu, 2024). Student as researcher approaches provide students with practical experience, and nurture their creativity, and problem-solving abilities, which may culminate in improved students' creativity and problem-solving skills, the outcomes that were not explicitly assessed in this study (Huang & Xu, 2024). In the sequential skills and knowledge accumulation approach, students build a solid foundation of knowledge and abilities by progressively raising the degree of difficulty and complexity of assignments.

CONCLUSION

The significance of this study's results implies that the three teaching pedagogies differ in their effectiveness in imparting students with knowledge and skills. Specifically, collaborative teaching workshops and assessments were more effective than student as researcher and sequential skills and knowledge accumulation approaches. Therefore, teaching strategies such as co-teaching, team teaching, differentiated instruction, collaborative

lesson planning, peer observation and feedback, multidisciplinary collaboration, and peer teaching should be encouraged to improve learning outcomes. However, different learning outcomes, such as students' creativity and problem-solving skills, were not explicitly assessed in this study. Students as researcher approach may be more effective in enhancing students' creativity and problem-solving skills (Daryanes et al., 2023; Rabeea Mahdi et al., 2020). Therefore, contextual factors and the overall aim of learning should inform the choice of pedagogical strategy to be used. For example, student-as-researcher approaches may be appropriate for students taking their final year project course. To maximize the effectiveness of innovative teaching pedagogies, it is important to address the challenges and variations in their implementation through improved support, training, and standardized practices. By taking a balanced and comprehensive approach, educators can create a more stimulating, efficient, and comprehensive learning environment that prepares students for the complexities of the modern creative landscape.

RECOMMENDATIONS

Awidi and Paynter (2024) found that digital technological innovations increased students' level of interactions and collaboration, and enabled instructors to provide effective and timely management of feedback. The technology also increased students' access to learning resources (Awidi & Paynter, 2024). Therefore, the effectiveness of collaborative teaching workshops and assessments can be further enhanced by integrating technology to facilitate effective collaboration among students and instructors in situations where physical learning is not applicable.

Additionally, a framework for collaborative teaching should be created, with clear guidelines and consistent assessment criteria, to minimize student confusion and ensure a more cohesive learning experience. Lastly, cross-disciplinary collaborations should be encouraged to broaden students' perspectives and improve their ability to apply knowledge in diverse contexts.

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