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AI-GENERATED PHOTOBOOKS FOR EDUCATIONAL USE

Fehmina Khalique [1], Deepika Sharma [2], Jagtej Singh [3], Preetjot Singh [4], Dr. Priya Bajpai [5], Sakshi Pahariya [6], Saudagar Subhash Barde [7]

[1] Greater Noida, Uttar Pradesh 201306, India
[2] Assistant Professor, School of Sciences, Noida International University,203201, India
[3] Chitkara Centre for Research and Development, Chitkara University, Himachal Pradesh, Solan, 174103, India
[4] Centre of Research Impact and Outcome, Chitkara University, Rajpura- 140417, Punjab, India
[5] Associate Professor, Department of Management Studies, JAIN (Deemed-to-be University), Bengaluru, Karnataka, India
[6] Assistant Professor, Department of Design, Vivekananda Global University, Jaipur, India
[7] Department of Information Technology Vishwakarma Institute of Technology, Pune, Maharashtra, 411037, India

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Corresponding Author
Fehmina Khalique,
fehmina.khalique@lloydbusinessschool.edu.in

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ABSTRACT

The fast development of artificial intelligence has created new opportunities in the creation of educational materials, previously, the so-called AI-based photobooks to learn visually. This paper will look into the creation, application, and instructional worth of AI-created photobooks on various education levels. Based on the existing models of visual cognition and multimedia education, the study seeks to understand how visual images and layouts created by AI could contribute to student engagement, understanding, and memorization. It employed a mixed-methods research design, which became a combination of surveys, controlled experiments, and qualitative analysis of photobook samples to determine the reactions and usability of learners. Students and teachers of primary, secondary, and higher educational establishments were randomly chosen to participate in this study with the help of purposeful and stratified sampling. The paper defines the technological process of creating AI-generated photobooks, including prompt engineering, image-generating applications, content selection guidelines, and layout designing plans in accordance with the educational requirements. It also breaks down the ways such photobooks could be used in various subject areas like science, history, and language learning and demonstrates that differentiated instruction can be achieved with the application of customizable visual materials. The benefits of AI-generated content in terms of accessibility are specifically highlighted, specifically by the students with visual, cognitive, or linguistic impairments.

Keywords: AI-Generated Photobooks, Educational Technology, Visual Learning, Image Generation, Learner Engagement, Inclusive Pedagogy

1. INTRODUCTION

The recent years have seen the introduction of artificial intelligence (AI) into the educational environment in a rather fast-paced manner, transforming the way learning resources are created, presented, and consumed. The use of

AI-generated photobooks is one of the new ways of AI applications that have been promising but not adequately explored in the optimization of visual learning. Photobooks, which are traditionally groups of edited images with a central theme or story, have been used for a long time in the educational process as a means to demonstrate complex information in easily understood and attractive visual format. The possibility of creating individualized, dynamic, and pedagogically oriented photobooks has been broadened significantly with the emergence of sophisticated AI models that can create high quality images with specific contexts with the help of textual prompts. Visual resources are a crucial part of modern classroom teaching that can assist the learner to better understand abstract concepts, establish links among ideas, and memorize information Xu et al. (2024). Cognitive psychology studies indicate that images, used with meaningful text, enhance learning by a dual coding, multimodality processing, and high attention of the learner. Traditional photobooks can however be seen to take a lot of time, skills and monetary resources to create.

In their turn, AI-based tools make it possible to create customized visual content within a short time frame and in a cyclic manner, so photobooks could be personalized to the needs of different age groups, learning abilities, topics, and cultural backgrounds. This democratization of content creation enables teachers and institutions to develop educational materials, which were not realistic before because of the resource restrictions Du et al. (2024). Generative AI has also revived the visual storytelling as a pedagogical tool. AI-created photobooks provide a chance to present scientifically precise illustrations, historically inspired scenes, fantastical scenes or culturally-absorbing depictions that would otherwise be absent in traditional repositories. In such areas as science, history and language learning, the provision of on-demand generated image enables educators to complement curriculums with images, which are accurate in terms of instructional objectives Cao et al. (2023). The stepwise process flow of developing photobooks with the assistance of AI is presented in Figure 1. As an example, a photobook where an AI generates images detailing a life cycle of a living being, a historical event reenacted, or a visual depiction of a narrative scene in literature can help learners interact more, and understand better.

Figure 1

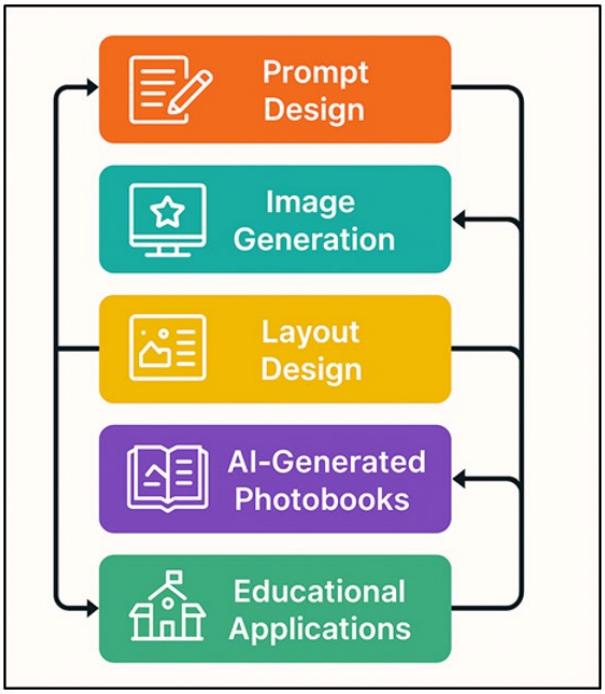

Figure 1 Process Flow of AI-Driven Photobook Development

In spite of these encouraging opportunities, AI-generated photobooks cast some significant questions on the quality of education, authenticity, and morality. The issue of image accuracy and the possible bias in the training data of AI, as well as the possibility of creating false images, emphasize the necessity of thorough consideration and control. The teachers have to think of what they can do to certify AI-generated material and make sure that the photobooks correspond to curriculum requirements and disciplinary expertise Lee and Yeo (2022).

2. LITERATURE REVIEW

2.1. OVERVIEW OF AI IN EDUCATIONAL MEDIA

Artificial intelligence has become more and more embedded in the contemporary educational media, transforming the way the instructional material is created, distributed and modified to the demands of the learners. The initial ones were the applications related to adaptive learning systems and intelligent tutoring platforms that could customize instruction and tailor it to the performance of the learners. With improved AI designs, especially natural language processing and computer vision systems, educational media evolved to incorporate automated assessment systems and chatbots, as well as personalized feedback systems Guo et al. (2023). Increased efficiency and accuracy of instruction were the results of these innovations, which enabled educators to give their focus on more advanced pedagogical activities. The recent advances in the generative AI field have also altered educational media since pictures, videos, simulations, and textual content can now be generated automatically according to specific learning scenarios Tao et al. (2023). Now AI-powered tools can help teachers to create lesson plans, multimedia, and differentiated materials according to the profiles of various learners. Those features contribute to multimodal learning styles, which are consistent with modern conceptualizations of cognitive and experiential learning focusing on the use of visual and interactive data in the process of knowledge building Rudolph et al. (2023). Moreover, it has also brought new possibilities to data-based teaching methods due to the capacity of AI to study the behavior of learners at large scale. Machine learning analytics, which are learning analytics, can be used to identify the progress of students, their misconceptions, and engagement patterns.

2.2. HISTORICAL DEVELOPMENT OF PHOTOBOOKS IN PEDAGOGY

The history of photobooks in education is quite old, they developed as an appearance of the visual aid and transformed into the complex pedagogical tools that contribute to the multimodal learning. They can be traced to the beginning of the nineteenth century, in the first instruction manuals and illustrated textbooks, which used photographs and drawings to illustrate scientific concepts, record historical events, and describe cultural practices. The use of photobooks by teachers was growing as photography developed into a medium that was accessible to everyone, and the gap between the abstract information and the visual representation became bigger Kasneci et al. (2023). These photographic books were more realistic and real images were used to provide credibility and promote sensory learning. Photobooks appear in the twentieth century in a diversity of subject matter, particularly in geography, natural sciences, ethnography, and early childhood education. Teachers realized that coherent visual sequences would be able to organize stories, make complicated concepts easy to grasp, and arouse the interest of learners Jalil et al. (2023). Photobooks were also in line with the new theory of visual learning which suggested that images would better enhance memory storage, conceptual learning, and motivation. As the printing technologies grew, photobooks became cheaper and became common within the classroom, library and museums Liang et al. (2023). With digital photography and desktop publishing, another age came in, where customization and interactivity were increasingly increased.

2.3. PRIOR RESEARCH ON AI-GENERATED IMAGES AND LEARNING OUTCOMES

The study of AI-generated images in educational settings is quite new yet evolving at a fast rate. The initial research involved the application of computer-based graphics and simulations and determined that the visuals that are produced artificially may enhance the conceptual knowledge, particularly in the areas that involve the abstract thinking, which encompass physics, biology and mathematics Yang et al. (2023). Due to the development of generative adversarial networks and diffusion models, scientists started to examine the differences between images created by AI and more traditional visuals in terms of image clarity, interest, and cognitive effects. The preliminary results suggest that AI-generated imagery is frequently perceived by the learners as more creative and beautiful and can boost motivation and attention. A number of studies emphasize the pedagogical advantages of AI-generated visuals, such as their flexibility to serve various learners, as well as, the differentiated instructions approach. Adjustable images can enable teachers to change complexity, cultural relevance, and image style to match the instructional requirements Wu et al. (2024). Table 1 provides the summary of the research on AI-generated photobooks and visual learning technologies. Nevertheless, there is also research that points to the challenges. The inaccuracy in the AI-generated images, especially in the field of

science or history, provokes the issue of misinformation and visual biases. Researchers underscored the importance of teacher supervision in order to facilitate accuracy of facts and moral depiction.

Table 1

Table 1 Summary of AI-Generated Photobooks and Visual Learning Technologies

Focus Area	Methodology	Key Findings	Benefits	Impact on Learning	Future Trends
Dual coding and visual cognition	Theoretical analysis	Visual+verbal inputs enhance retention	Supports multimodal learning	Improved memory and comprehension	Increased integration of visual AI tools
Multimedia learning Lambert and Stevens (2024)	Experimental studies	Learners benefit from well-designed visuals	Reduces cognitive load	Better conceptual understanding	AI-optimized multimedia design
Visual storytelling in education	Case studies	Story-driven visuals support engagement	Narrative-based learning	Higher motivation	AI-generated narratives and images
Digital visual media Kortemeyer (2023)	Mixed methods	Interactive visuals boost inquiry	Improved exploration	Enhanced critical thinking	Adaptive visual content via AI
Computer-generated images Sun et al. (2024)	Experimental	CGI increases clarity for abstract topics	Accuracy in depiction	Stronger conceptual grasp	AI-driven science simulations
EdTech personalization	Survey research	Personalized visuals improve participation	Tailored learning	Higher engagement	Fully personalized AI photobooks
GAN-based educational imagery Watts et al. (2023)	Technical evaluation	GAN images effective for diverse contexts	High-quality visuals	Better inclusivity	Bias-reduced generative models
Digital photobooks in learning	Classroom trials	Photobooks improve reading motivation	Strong visual narrative	Better literacy outcomes	Hybrid AI-human content creation
AI for historical visualization	Controlled experiment	AI recreations increase curiosity	Realistic representations	Increased inquiry tasks	Accurate AI historical reconstructions
AI in science diagrams DenNy et al. (2023)	Quantitative	AI diagrams outperform manual ones	Fast generation	Higher test scores	Automated curriculum-aligned visuals

3. CONCEPTUAL FRAMEWORK

3.1. THEORIES SUPPORTING VISUAL LEARNING

Visual learning is based on the various established cognitive and pedagogical theories that focus on the use of imagery to lead to understanding, retention, and involvement. Among the most powerful models is the Dual Coding Theory by Paivio which states that all human beings perceive the information in two channels: a verbal and a nonverbal channel. The learners form more comprehensive mental images when they are presented with the information both visually and through text, and this is better remembered and understood. In addition to this, the Cognitive Theory of Multimedia Learning emphasized by Mayer supports that learning is better achieved when visuals and text are meaningfully combined, and this alleviates the cognitive load and aids in the active processing of information. Gestalt also forms part of visual learning principles since it describes the way people see patterns, relationships and structures in images. These principles, proximity, similarity and continuity, assist the learners to sense the visual information effectively. Constructivist views also emphasize the relevance of visuals in assisting the learner to develop knowledge as a process of interpreting and relating to the previous experience.

3.2. AI-DRIVEN CONTENT CREATION MODELS

The AIs-based content creation conceptualisers mark the next stage of the educational content conceptualisation, generation, and personalisation. These systems are fuelled by machine learning systems (generative adversarial networks (GANs), diffusion models, transformer-based models) that are able to generate high quality images based on textual descriptions. The work of GANs is based on the competition of the generator and the discriminator networks, pursuing more realistic visual images. Diffusion models, in contrast, progressively reduce noise into consistent images, and permit a high amount of fine-graded control over style, details, and the accuracy of concepts. In the educational

setting, these models can be used to develop photobooks fast and based on the needs of the learners. They are able to create images that align with the curriculum objectives, modify images to suit the various levels of proficiency, and to be inclusive by including different cultures, abilities, and settings. The element of timely engineering, i.e. the process of creating accurate textual inputs, is very important in streamlining the quality and relevance of the generated texts. Teachers have the possibility to enhance prompts repeatedly to obtain images that can be used to attain definite educational goals. The development of AI-based content creation is also supported by multimodal representations that have the capacity to analyze and integrate visual, language, and context information. These systems help to create integrated image-textual elements of photobooks which are supposed to support written descriptions.

3.3. RELATIONSHIP BETWEEN AI-GENERATED PHOTOBOOKS AND LEARNER ENGAGEMENT

The ability of AIs to produce photobooks with personalised visuals and narrative format gives AI-generated photobooks a distinctive potential to increase the engagement of learners, making the process more immersive. There are entities of engagement, cognitive, emotional and behavioral, and the visually rich educational materials can positively influence all of them. The AI generated images can turn abstract or complex concepts into concrete ones and decrease cognitive load and improve understanding, which is cognitively possible. When pictures are used to explain meaning and aid in deeper processing, learners will find it easier to continue with the task. On the emotional level, AI-generated photobooks might be curious and inspiring due to the colorful, imaginative, or context-specific images that potentially appeal to the interests and backgrounds of learners. Personalized content enables the educators to include culturally-specific or locally-contextualized images to create the feeling of belonging and personal connection. This emotional appeal frequently works as a boost to intrinsic motivation and long-term focus in the process of learning activities. Photobooks encourage active participation, which involves guided exploration, discussions of images, and interpretation opportunity behaviorally.

4. METHODOLOGY

4.1. RESEARCH DESIGN

The proposed research design is a mixed-methods study because it will investigate the development, application, and educational value of AI-generated photobooks. A balanced methodology, specifically mixed-method, is especially applicable since it combines the advantages of quantitative and qualitative methodologies and enables a more in-depth insight into the effects of AI-generated visual content on the learning process. The quantitative part is devoted to the quantitative measurement of learning outcomes, engagement rates, and user satisfaction with the help of the organized surveys and controlled experiments. These tools develop numerical data that can be used to determine statistically significant trends, associations, and dissimilarities between groups which are subjected to the AI-produced photobooks as well as those which utilize conventional materials. The qualitative element will entail the study of interpretive reactions of learners, perceptions of educators and the photobooks as such to reveal more usability, visual sense, and pedagogical fit. This involves interviews, open-ended survey responses as well as content analysis of photobook samples. Qualitative data also contribute to the study positively by demonstrating contextual factors that influence interactions of learners with AI-generated images.

4.2. DATA COLLECTION METHODS (SURVEYS, EXPERIMENTS, ANALYSIS OF PHOTOBOOKS)

The data collection is done through a combination of several complementary approaches to measure the effectiveness and educational benefit of photobooks created by AI. Students and educators are given questionnaires to fill out, in order to obtain data about usability, comprehensibility, interactivity, and aestheticism. These are surveys with Likert-scale questions and open questions, which give the opportunity to measure quantitatively and get qualitative information. They aid in getting the general trends of various groups of participants. The second significant tool of data collection entails experiments. Regulated training activities are developed where students are engaged with either AI created photobooks or with conventional visual documents. Changes in knowledge, comprehension and retention are measured by pre-tests and post-tests. The levels of engagement are also measured by using behavioral indicators like time spent on tasks, the number of times to refer to pictures, and patterns of asking questions. The third approach is to analytically study the photobooks themselves. This involves assessment of quality of images, coherence in the subject as

well as accessibility features and correspondence with curriculum requirements. Visual accuracy, representation diversity and pedagogical appropriateness are measured by the use of rubrics. The workflow of photobook production is also analyzed, such as timely design, choice of tools, and numerous optimal adjustments.

4.3. PARTICIPANT SELECTION AND SAMPLING

The selection of the participants is done in a strategically oriented sample which is meant to offer representation at the various levels of education and contexts of learning. The research involves both students and teachers of primary, secondary, and higher education institutions, which makes it possible to compare the functionality of AI-generated photobooks regarding the age group and educational requirements. Purposeful sampling shall be used to select the sample consisting of participants who have different degrees of familiarity with digital learning tools to make the study have a different range of views on usability and engagement. At all levels of education, stratified sampling is applied to form subgroups on the subject areas in science, history, and language learning. Such stratification enables a further analysis of the correspondence of photobooks to the learning outcomes related to disciplines. The teachers are chosen on the basis of experience in teaching, their readiness to use new technologies and their role in curriculum development. Their comments play a role in comprehending the pedagogical possibility and the practical issue of implementing AI-generated photobooks. Institutional announcements and classroom invitations are used in recruiting student participants.

5. DEVELOPMENT OF AI-GENERATED PHOTOBOOKS

5.1. TOOLS AND TECHNOLOGIES USED (IMAGE GENERATION, LAYOUT DESIGN)

The evolution of AI-created photobooks is based on the integration of both developed image generation systems and layout design platforms with content integration platforms. The creation of images is normally driven by the state of the art AI models including diffusion models, generative adversarial networks (GANs), and transformer-based multimodal models. Such systems encode written prompts as images with visual consistency in conformance to the instructional objectives, which allows educators to develop illustrations that are consistent with the instructional objectives. Diffusion models, especially, are popular due to their high image fidelity, ability to control methods of stylistic feature, and to produce various representations to enhance inclusiveness and relevance to context. Besides image generation software, layout design software is also important. Web apps like Canva, Adobe InDesign, and layouts generators with AI support photographic, textual, and interactive information to be organized in a layout of a structured photobook. Figure 2 identifies the main technological elements that would make it possible to create AI-generated photobooks. These tools provide templates that are customizable, accessibility, and alignment guides that result in visual and pedagogical sense.

Figure 2

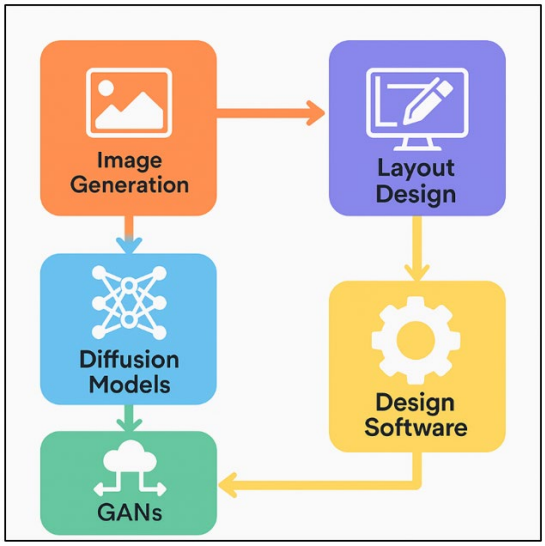

Figure 2 Technological Components for Creating AI-Generated Photobooks

Other AI-based design tools have the ability to create the layout by analyzing the content and suggesting the best layout. Educators can use learning management systems or collaborative digital publishing tools to support embedded multimedia in order to integrate text, metadata and annotations. These platforms result in the smooth distribution, versioning, and cross-platform compatibility.

5.2. CRITERIA FOR EDUCATIONAL PHOTOBOOK CREATION

The development of successful AI-generated photobooks must be based on the observance of specific pedagogical, aesthetic and ethical standards. First, there must be content accuracy especially when photobooks are used to represent scientific ideas, historical images, or culturally conscious information. Educators need to validate AI-generated pictures to eliminate the misrepresentations or factual errors. The correspondence to the curriculum standards will guarantee that the visuals help to address a particular learning goal and to promote the major ideas. Second, cognition load and pictorial clarity become the factors that control the choice and organization of images. Photobooks are supposed to display the information in an organized way, clear layout, the typography is supposed to be readable and the color contrast should be effective. The images should also be free of any overload or ornamental details that may lose the focus of the learners on the main materials. Similarity in style and view point can serve to preserve coherence between the pages. Third, it is essential in terms of inclusivity and representation. Photobooks are supposed to represent different cultures, skills, and surroundings so that none of the learners feel neglected. The ability to describe images, simplified images, and labels in other languages contributes to easiness as people with different learning requirements can use them. Fourth, the value of engagement should be taken into account. Photos must cause curiosity, aid in narrative development, and make emotional connection.

5.3. WORKFLOW FROM PROMPT DESIGN TO FINAL OUTPUT

The development of AI-generated photobooks proceeds with the thoughtful prompt design, which is a very important step and predetermines the quality and relevance of generated images. Teachers design prompts with key specifications of content, genre, level of difficulty, cultural dimension and the teaching intention. The prompts often need to be refined iteratively since the results might need the refinement in details, accuracy, or visual tone. After prompts are completed, image generating models generate several variations of images. Teachers assess such outputs in terms of accuracy, variety and correspondence to the desired learning outcomes. Chosen images can be slightly edited, i. e. cropped, color-corrected, or even annotated, to increase the clarity and pedagogical appropriateness. The second phase is the arrangement of images in layout designing software. Teachers organize the images and the textual information in a logical order that follows the storylines or development of ideas. Layout software helps to guarantee even the spacing, alignment, and visual hierarchy. At this phase, features of accessibility like alt text, captions, and simplified diagrams can be included. The photobook is also subjected to a review process after layout has been done.

6. RESULT AND DISCUSSION

The findings show that AI-generated photobooks have a strong positive influence on the engagement, understanding, and visual interest of learners at the various educational levels. Students stated that they understood abstract concepts better and teachers appreciated the flexibility and ability to customize it. Tests indicated that retention increased with AI generated visuals to accompany a text in instructions. Nonetheless, some issues were raised about the lack of accuracy in some cases and the necessity to pay attention to the generated content. The challenges practiced in discussions include the significance of balancing creativity with learning rigor and making AI-generated photobooks the most effective ones when carefully selected and consistent with the learning goals.

Table 2

Table 2 Comparison of Learning Outcomes Between Control and Experimental Groups

Measure	Control Group (Traditional Materials)	Experimental Group (AI-Generated Photobooks)
Mean Pre-Test Score (%)	43.4	47.1
Mean Post-Test Score (%)	61.2	80.8
Retention Score (2-week follow-up)	28.7	36.4

Engagement Rating (%)	61	88
Time on Task (minutes)	18.6	24.9

Table 2 gives a clear insight on the learning outcomes between the student that works with traditional materials and those that work with AI-generated photobooks. The findings depict a steady benefit of the experimental group in all the indicators measured. Even though both groups started with equal average pre-test scores, the experimental group had a slightly higher initial score (47.1% and 43.4% respectively) which indicates similar baseline knowledge. Figure 3 presents learning results of the traditional and AI-generated photobook approaches.

Figure 3

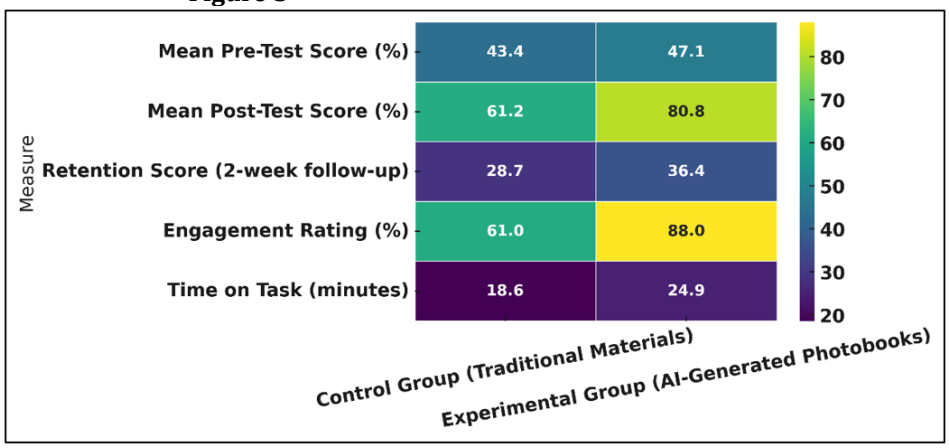

Figure 3 Learning Outcome Comparison Between Traditional and AI-Generated Photobook Methods

The largest difference is observed in the post-test scores with the learners using AI-generated photobooks scoring much higher (80.8%) compared to those who used the traditional resources (61.2%). This significant boost means that visuals created by AI can potentially make the concept and its understanding more efficient.

Figure 4

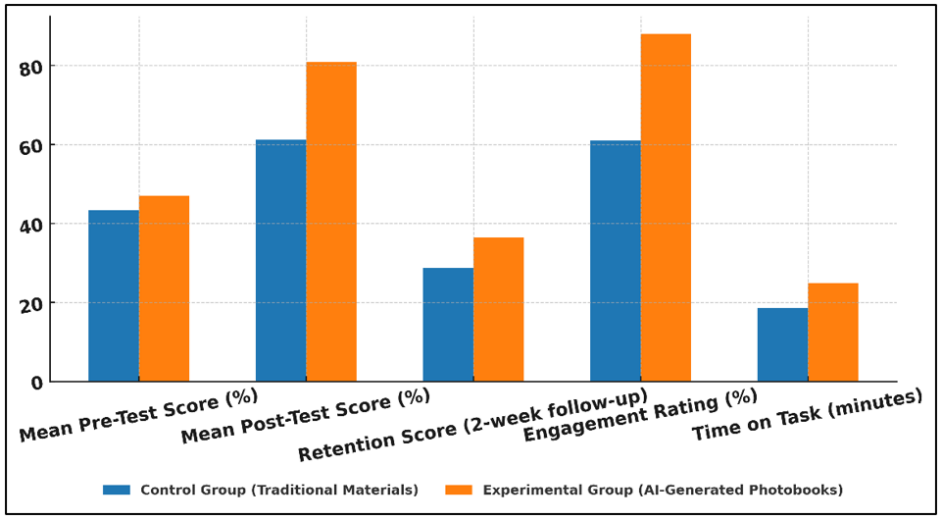

Figure 4 Performance and Engagement Differences Between Control and Experimental Groups

The experimental group also has higher retention scores during the two-week follow-up with a better long-term memory of the learned material. Figure 4 presents differences in performance, as well as engagement, between experimental and control groups. The engagement ratings also demonstrate the benefits of AI-generated photobooks, as the experiment group had a higher rate of engagement (88 percent) than the control group (61 percent). This implies that informative content that is visually engaging and contextually oriented creates more interest and involvement to the learner.

7. CONCLUSION

AI-made photobooks are a groundbreaking experience in the field of educational media as they provide progressive means to incorporate visual learning into the current learning processes. The results of this paper indicate that applied properly, these photobooks are capable of facilitating understanding, encouraging interaction, and addressing special needs of a student. The fact that they provide tailored and context-driven visuals gives educators the opportunity to address the needs of a particular subject, grade level, and cultural environment in a way that makes it more relevant and inclusive. Such flexibility makes AI-created photobooks especially useful in the contemporary and more diverse classrooms. Though it has its advantages, the adoption will have to be implemented thoughtfully. The AI-generated images should be checked regarding their accuracy, clarity, and ethicality to guarantee that learners get quality and culturally sensitive information. In an effort to make the best use of pedagogical value, teachers need to build expertise in timely design, content validation and layout choices. Incorporating these tools in an educator with confidence and responsibility will require the involvement of professional development and institutional support. The research has other implications as well on future education innovation. AI-created photobooks can be used as the example of customized learning content that can help fill in the gaps between visual and written comprehension. Their plastic structure promotes critical thinking, imaginative inquiry, and multimedia interaction, which is in line with the current education systems.

CONFLICT OF INTERESTS

None.

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