

EFFECTS OF A SERVICE FOR AUTOMATED GENERATION OF POSTERS ON LEARNING COMPREHENSION

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Abstract. In the evolving landscape of educational technology, integrating innovative tools that enhance teaching and learning is crucial. This study examines the impact of an automated poster generation service on student engagement and learning outcomes. By bridging the gap between technological capabilities and pedagogical needs, this service significantly improves how educational content is delivered visually and interactively. Using advanced technologies like neural networks and sophisticated machine learning algorithms, the service automates the creation of educational posters from spoken language, offering a streamlined approach to producing visually appealing content.

The research was conducted at the Higher School of Economics, involving 148 undergraduate students through surveys and complemented by in-depth interviews with five educational experts, including innovators in education. The methodology aimed to assess the effectiveness of automated posters in improving student engagement during lectures and their overall learning experience. Results show a measurable boost in engagement, with students reporting increased interest and improved comprehension when educational materials are presented through automated, visually enriched posters.

The study highlights the service's ability to address educational challenges, such as the need for time-efficient creation of materials and enhancing traditional teaching methods with innovative visual aids. Findings suggest that these technological advancements save time and enhance educational productivity and student satisfaction.

Additionally, the study examines the broader implications of implementing these technologies in educational contexts, showing how automated poster creation can

revolutionize teaching methods. By offering accessible and easy-to-operate tools, this service aims to promote a more dynamic and productive learning experience. This research contributes to the discourse in educational technology by demonstrating the professional significance and innovative implementation of neural networks and machine learning in education. It sets the stage for further exploration into the long-term effects of such technologies on educational outcomes and the potential challenges of their broader implementation.

Keywords: Educational Technology, Automated Poster Generation, Student Engagement, Learning Outcomes, Neural Networks, Machine Learning, Visual Learning Aids, Higher Education, Innovative Teaching Tools, Lectures.

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Introduction

Educational activities play a big part in fostering students' engagement which in turn leads to more productive learning. However, maintaining students' engagement presents a significant challenge in the digital age. Educational posters have been identified as effective tools in enhancing learning outcomes and engagement, offering visual and interactive elements that captivate students' attention. Despite their benefits, the creation of educational posters involves complexities and demands considerable time and expertise, hindering their widespread adoption [7].

In response to these challenges, our research focuses on measuring the effects of integrating an automated service for generating educational posters in the learning process. This integration seeks not only to enhance visual engagement but also to reduce the logistical burden of content creation on educators. By automating the synthesis of comprehensive visual aids, the service aims to facilitate more dynamic and accessible learning environments.

This service leverages advanced technologies such as neural networks and machine learning algorithms to transform spoken language into summarized text

and corresponding creative images. This innovative approach not only promises to revolutionize how educational content is delivered but also aims to bridge the gap in current educational practices by providing a more dynamic and engaging learning experience.

The need for tools that simplify the educational process is becoming increasingly apparent, particularly as educators seek ways to retain student interest and improve information retention. Traditional methods often fail to engage digital-native students who got used to interactive and multimedia-rich content [16]. We anticipate that by automating the process of creation of educational posters, this service meets these requirements, providing an easy-to-use solution that minimizes the time and expertise needed to create effective visual aids.

Furthermore, this study explores the impact of automated poster generation on students' engagement. The incorporation of machine learning and neural networks in educational contexts is not merely a technological advancement; it represents a paradigm shift in pedagogical strategies. The ability of these technologies to analyze and synthesize information in a visually appealing format can significantly enhance the educational experience, making complex concepts more accessible and easier to understand [5].

Recording academic information manually is quite time-consuming and energy-intensive for both teachers and students. One thing that needs to be noted is that text without visual reinforcement is not as memorable and engaging. It is expected that the use of automated posters can lead to a noticeable increase in student participation and interest during lectures. By providing timely and relevant educational content in a visually engaging format, the service facilitates a more interactive and productive learning environment.

The potential of such technologies to transform educational practices is immense. Not only do they hold promise for improving student engagement and learning outcomes, but they also contribute significantly to the field of educational technology. This research underscores the importance of integrating advanced technologies in education and points out a significant deficiency in the availability of effective, easy-to-use tools for producing educational content, which has been pointed out by other researchers [14]. As a result, there is a critical need for an automated system in the educational sector that streamlines the creation of educational posters, making them more accessible and advantageous for both educators and students.

By addressing these gaps, our research contributes to the understanding of how technological innovations can be effectively integrated into educational settings to enhance both learning and teaching. The findings of this study are expected to provide valuable insights into the benefits of automation in education and pave the way for further research in this exciting area.

Historical context

Scribing is a method of visually recording information that has been used more and more in educational processes since the early 2000s. The main idea of scribing is to create drawings and diagrams in real time during a lecture or presentation, which helps students better remember and understand the material [15].

Currently, this “visual anchoring” technology is actively used by teachers and other representatives of various professions (marketers, top managers, trainers, etc.) to effectively convey information to their target audience.

With the digitalization of education, scribing has also been subject to computerization. This is how a new concept appeared - Digital Scribing, in which

the application / scribe listens and records the main points of the speaker, and then displays the images on the screen.

Digital scribing, however, is not the only prominent educational visualization tool, even before its popularization the first electronic interactive whiteboards appeared. Beginning in the 1990s, these devices allowed teachers to visualize and interact with course material directly in front of the classroom [18].

Another important participant in the history of the development of digital technologies in education is the graphics tablet. In 1964, US universities and laboratories began purchasing and using these devices provided by the RAND Corporation. Graphics tablets have evolved and improved rapidly, and now there are many similar devices with specialized programs: software like Adobe Illustrator and online services such as Canva and Piktochart have become available to a wider audience and have had a significant impact on teaching methods.

Recent developments in the field of visualization of educational content provide the opportunity to create complex infographics and educational posters with a high level of interactivity [12].

Literature Review

Digital scribing is already used in various fields like medicine and marketing, as discussed in the articles by Enrico Coiera, Baki Kocaballi, John Halamka and Liliana Laranjo (2018) [4], but it is equally important to consider its potential in the field of education.

Ghatnekar S., Faletsky A. and Nambudiri V.E. (2021) [8] examine the practicality and current application of digital scribe technology, along with the challenges in its deployment. Digital scribes hold promise for revolutionizing the medical documentation industry by mitigating many of the inherent inefficiencies associated with electronic health records (EHR). By employing innovative

technology, digital scribes are capable of converting doctor-patient interactions into detailed clinical notes, thereby markedly decreasing the time required for documentation and reducing the necessity for extra staff within the healthcare team.

According to the 2023 Gradient Learning Poll [20], 50% of students openly admit that they are not engaged in what they are doing in class. Furthermore, 80% of teachers say they are concerned about their students' engagement in classroom-based learning. Therefore, lack of student engagement is a relevant issue that needs to be resolved. According to this article, the most effective way to enhance student engagement is building stronger teacher-student connections. 95% of teachers say it should be a priority for every school to support teachers with the tools and strategies they need to increase and sustain student engagement. For this reason, a service for automated generation of posters will be effective in solving the problem, improving communication in the classroom through the creation of additional activities and reducing the time spent on record-keeping [19].

A study by Maloshonok N. G. (2014) [11] also discusses issues with student engagement in the educational process, providing a deep analysis of the engagement of students from HSE University in classwork, group work, and extracurricular academic activities beyond the requirements set by the instructor. The study evaluates parameters such as asking questions during seminar sessions, participating in group discussions, solving problems at the board, attending seminars, working in group sessions, completing group homework assignments, and much more. The results of the study revealed that students at Russian universities face problems with engagement in the educational process, and it also confirmed the impact of engagement on students' academic performance and their satisfaction, as confirmed by Pandita and Kiran's paper [13].

A study by Elmurzaeva, Borlakova, and Kilaev (2022) [3] underscores the significance of information visualization in university learning processes, demonstrating that graphical information significantly boosts student interest and motivation. In the field of educational technology, substantial progress has been made, [10] leading to the development of numerous tools aimed at enhancing the learning experience. Bates and Poole (2003) [1] argue that technological innovations should go beyond conventional educational methods to promote novel teaching and learning strategies. Within this technological spectrum, automated poster generation services emerge as pivotal educational aids. These tools do not only streamline the creation of educational materials but also enrich the instructional environment.

Central to this technological integration is the concept of scribing or digital note-taking, which is instrumental in the automation of educational poster production. Kim et al. (2016) [2] investigate the transformation of spoken information into visual content through digital scribing technologies. Utilizing voice recognition and neural network technologies, these systems convert auditory information into visual formats, including images and diagrams. This method enhances the poster production process and supports diverse learning preferences by visually conveying information. To use and implement such technologies, you can use ready-made generative artificial intelligence models, which will facilitate the development task [6].

Objective and Hypothesis

The primary objective of this research is to gauge the impact of an automated service for generating educational posters on students' involvement in the learning process. It is hypothesised that integrating this technology will lead to improved students' engagement and better learning outcomes by providing educators and students with easy-to-use tools for creating visually appealing

educational materials. The expected benefits include not only time savings and improved productivity but also an enriched educational experience through more effective visual aids. Additionally, a potential secondary effect of the service could be an increase in technological proficiency among teachers. These assumptions predict the overall positive impact of the tool in question on the social and effective components of the education system.

Methodology

To obtain relevant information about existing solutions in the field of visualization and their impact on the educational environment, various scientific sources of information were analyzed, and a review of statistical data on problems in education was carried out. To test the hypothesis, it is necessary to collect statistical data. The research methodology includes a survey consisting of 10 questions for 148 participants (students of HSE University), aimed at understanding their experience with using a similar service. The survey consists of three information blocks: Demographic Data, Experience with Educational Tools, Attitude Towards Automated Service. Additionally, five in-depth interviews were conducted with representatives from the educational sector (two HSE University lecturers, two experts in educational activities, and one educational innovator) to assess the relevance of using this educational tool.

Results

Five experts from the education sector took part in in-depth interviews. The Interview questions related to students' interest in lectures, the potential of the automated poster generation service, weak points in education and the preferred format of posters. Questions and answers are presented in the table below:

Table 1.

In-depth interviews' outcomes

Purpose	Question	Audience	Answers
Identifying weaknesses in current educational content	What elements of the lecture material do you find least engaging?	Lecturers, experts	Theoretical material, lack of examples, monotony of presentations
Identifying student needs to improve educational resources	What features in educational posters could increase student engagement?	Experts, the innovator	Interactive elements, quizzes, visual diagrams
Identifying difficult topics for additional support through educational posters	What topics or sections of the course do you find most difficult to understand through lectures?	Lecturers, experts	Complex theoretical concepts, practical problems
Determining the preferred format for educational materials	In what form would you prefer to receive educational posters (digital or printed)?	Lecturers, the innovator	Digital, printed, combined
Assessing interest and expectations from new technology	How do you assess the potential of automated educational poster generation to increase student engagement?	Lecturers, experts, the innovator	High potential, moderate interest, doubts about effectiveness

The students' survey revealed the following important results for the study:

- 1) The survey involved students from various programs, primarily freshmen and sophomores;
- 2) Most survey participants confirmed their experience of using visualisation of educational content (Figure 1);

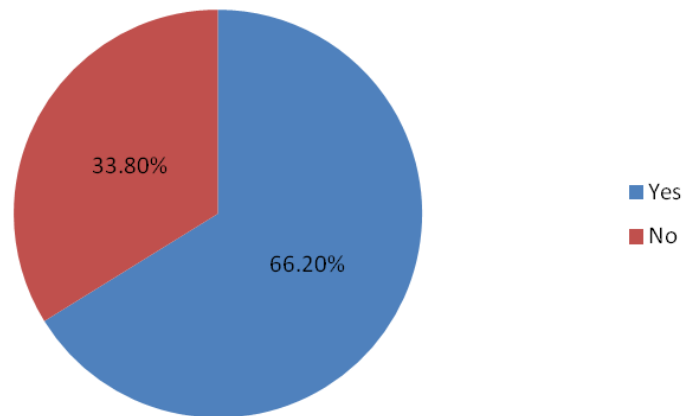


Figure 1. Have you had experience using educational posters in the learning process?

3) The average interest score for such educational tools was 3.05 (out of a maximum of five);

4) About 65% of the students who tried the service stated that the generated posters correspond to the lecture topic;

5) The majority of the respondents confirmed an increase in productivity using the service (Figure 2);

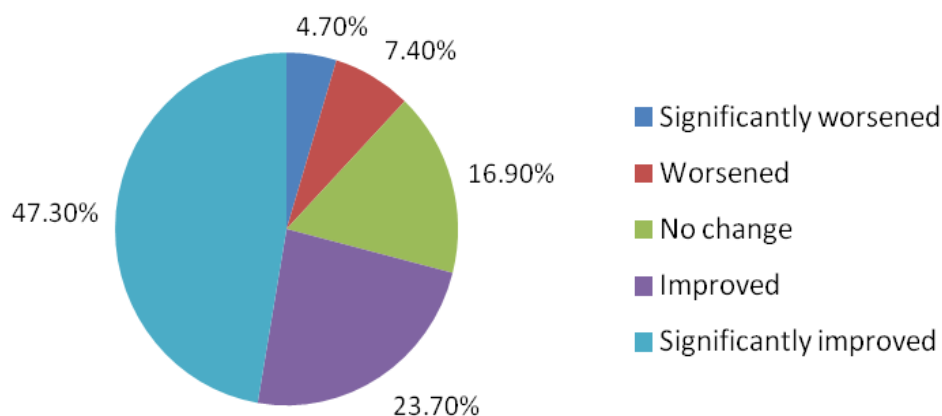


Figure 2. How has the service affected your productivity during learning?

6) Figure 3 shows that 57% of the surveyed students reported that the service helped to improve their educational outcomes.

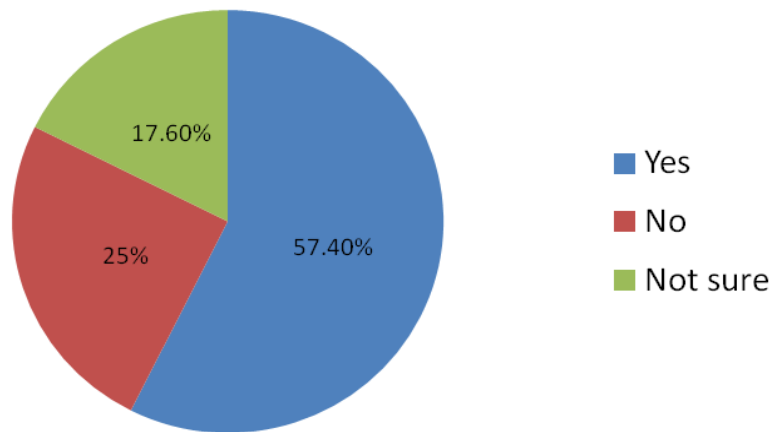


Figure 3. Has the automated service helped to improve the quality of your educational outcomes?

7) According to Figure 4, the absolute majority of the students who participated in the survey reported an increased interest in lecture-based learning.

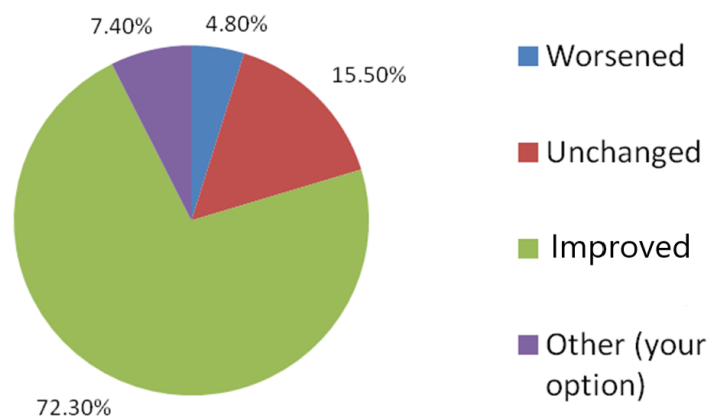


Figure 4. How has your attitude towards the lecture changed with the use of the service?

Discussion

The discussion explores the transformative potential of automated poster creation, comparing anticipated benefits with existing research findings. For example, studies show [9] the importance of visualizing educational content and review the influence of various factors on student motivation and engagement,

but do not consider the full integration of automated scribing into the educational process. It highlights the innovation's significance in advancing educational practices.

The data analysis revealed that student engagement was influenced by the incorporation of interactive elements and visual diagrams into educational posters, which helped to clarify complex concepts. A preference was found for the digital poster format, indicating the importance of easy access and wide dissemination [17]. The Education experts and lecturers see significant potential in using automated educational posters to increase student engagement. This highlights the readiness of the educational community to integrate new technologies into the educational process.

The survey results strongly affirm the hypothesis that the automated poster generation service boosts student engagement in the educational process by enhancing productivity, making lectures more engaging, and facilitating a better grasp of lecture topics.

Conclusion

This research has uncovered the substantial benefits of integrating an automated poster generation service into the educational landscape. The study conducted at the Higher School of Economics has demonstrated that such technology significantly boosts student engagement and enhances the learning process. Survey results and expert interviews highlight the attractiveness of automated posters, with students noting a significant rise in interest and comprehension when content is presented through this innovative medium. The service's ability to produce educational materials swiftly and effectively addresses a crucial need within the educational sector for time-efficient and engaging teaching aids.

Moreover, the broader implications of adopting this technology in educational settings are profound. It represents a significant step towards modernizing educational practices, making learning more accessible and appealing to digital-native students. By bridging the gap between traditional teaching methods and the digital preferences of today's learners, automated poster generation has the potential to revolutionize educational experiences and outcomes.

Automated poster generation tools not only facilitate the creation of engaging and informative educational materials but also allow for a more personalized learning experience. Educators could utilize these technologies to tailor content to the needs of diverse student populations, potentially improving outcomes for students with different learning styles and preferences. Additionally, educational administrators should consider these technologies as viable options to enhance their curriculum offerings, potentially increasing the appeal of their programs to prospective students.

This study sets a promising direction for future research in the field of educational technology. Future studies could explore the long-term impacts of automated poster generation on learning retention and student performance over multiple academic terms. Another fruitful area of research would be to examine the scalability of this technology across different educational levels and subjects to determine its effectiveness in various educational contexts. Additionally, further research is needed to understand the barriers to adoption of such technologies by educational institutions, including technological, pedagogical, and financial considerations.

In conclusion, the adoption of automated poster generation services in educational settings represents more than just a technological enhancement; it is a pedagogical advancement that enhances the effectiveness of teaching and

enriches the learning experience. As this field continues to evolve, it is imperative that continued research is conducted to fully understand and harness the potential of these innovative tools in education.

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