

Computer Science Students' Perspectives on Incorporating Digital Storytelling for Developing Critical Thinking Skills in English Classroom

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Abstract—In the era of rapid technological advancement, access to digital opportunities makes it possible to prepare students for the jobs of the future and have a positive influence on the development of their future-proof skills, which will be of paramount value. Amid unpredictable changes in the labor market, critical thinking skills are becoming increasingly strategic and enabling labor market entrants to think independently and make informed decisions. Although numerous studies suggest that digital technologies can enhance students' engagement and motivation, the current academic literature lacks research that captures students' perspectives on developing critical thinking skills through digital storytelling. To address this gap, the study aims to investigate students' perspectives on incorporating digital storytelling for developing critical thinking skills in the English classroom. To achieve this aim, the researchers developed a questionnaire containing both open- and closed-ended questions and surveyed 397 computer science undergraduate students from two Ukrainian universities. The findings demonstrate that all students surveyed consider digital storytelling an effective way to develop their critical thinking skills, and digital tools are convenient for creating, visualizing and presenting ideas. To draw well-founded conclusions, the researchers use both qualitative and quantitative data analysis. This study is limited to computer science undergraduate students studying English.

Keywords—computer science students, critical thinking skills, digital storytelling, digital technologies.

I. INTRODUCTION

As all aspects of modern society become increasingly digitized, there is a growing need not only for professionals with in-depth hard skills but also for those capable of innovative and critical thinking [1]. To keep pace with rapid changes and remain at the forefront of the Tech

industry, computer science specialists already working in the market must not only adapt and generate new ideas but also continuously improve their professional competencies [2]. Changing labor market needs mean that the demand for such specialists capable of creating new technologies and products is driving new requirements for computer science students' training, particularly in developing critical thinking as the foundation for innovative, unconventional solutions.

The accelerated digitization of higher education is driving the modernization of traditional approaches, teaching techniques and methods through the use of digital technologies, helping ensure the accessibility and quality of education for today's students [3]. Considering the level of advancement of digital technologies and their accessibility for a wide range of users, it is obvious that they are becoming increasingly popular among both teachers and students. Given that each type of digital technology has its own advantages and disadvantages, teachers should have a range of user-friendly technologies at their disposal that facilitate the effective organization of students' educational activities. Currently, one of the innovative teaching methods that harmoniously combines classic principles of narrative construction with digital ways of presenting, appealing to students growing up in the digital world, is digital storytelling [3; 4; 5].

The literature shows that an increasing number of modern researchers are seeking to define and formulate the "digital storytelling" concept and to demonstrate, with supporting evidence, the benefits of applying digital storytelling in the educational context. For instance, according to Robin, digital storytelling is an "art of telling stories with a mixture of digital media, including text, pictures, recorded audio narration, music, and video" [6, p. 18]. We favour Robin's idea that digital storytelling is not

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only about boosting students' communication skills, creativity, and motivation and showing a thorough understanding of topics they study, but it is also about giving them "a voice to share their ideas and feelings with others" [6, p. 19].

Cai expresses a similar idea concerning the definition of the "digital storytelling" concept [7]. The scientist defines it as a tool that "combines traditional narrative techniques with modern digital technology to create a new and highly interactive narrative experience [7, p. 91]. In the context of our research, the most valuable is the idea expressed by Cai that the use of digital storytelling in the classroom helps improve students' motivation and enhance classroom interaction, on the one hand, and, on the other hand, it enables the enhancement of students' overall experience, which leads to a deeper understanding of educational content [7].

Alismail considers digital storytelling as a tool that "combines researching, creating, analyzing, and combining visual images with written text, which is considered a positive style in teaching" [8, p. 127]. The researcher contends that to enhance students' motivation to improve their learning and performance, teachers have to use this kind of activity in their classrooms. However, believing that digital storytelling is effective in developing students' higher-order thinking skills and motivation, Alismail states that further research is required in this field [8].

Parole et al. [9] propose their own definition of the "educational digital storytelling" concept and detail the benefits of creating digital stories in the classroom. The team of researchers defines it as "facilitated production of a short digital story in an educational community setting that should contain a mixture of digital media, including text, recorded audio narration, pictures, music, and video" [9, p. 119]. They also view digital storytelling as an efficient tool for facilitating students' reflection on and pursuit of a meaningful life shaped by their interests and motives.

In their study Austen, Jones and Wawera provide a definition of "digital stories" concept which they regard as "a collection of still images with accompanying audio or textual narration, and used as data in student voice research within higher education" [10, p. 27].

Gürsoy, who conducted research to examine the influence of digital storytelling on the development of 21st-century skills, concludes that digital storytelling is effective in improving a wide range of skills [11]. The researcher groups these skills into three categories: learning and innovation; information, media, and technology; and life and professional skills [11, p. 105]. Interestingly, the life and professional skills category included skills such as taking responsibility, critical thinking, and planning. In research conducted by Gürsoy, respondents stated that providing feedback on digital stories enabled them to acquire a critical perspective, which is an inseparable part of critical thinking [11].

Of particular interest to our research is a definition of "digital storytelling" concept formulated by Yang, & Wu

[1]. The researchers believe it is "a promising transformative technology-supported approach for enhancing learning, including subject matter content acquisition, critical thinking skills, motivation, and information literacy" [1, p. 340].

Although numerous studies suggest that digital technologies can enhance students' engagement and motivation [12; 13; 14; 15; 16], the current academic literature lacks research that captures students' perspectives on developing critical thinking skills through digital storytelling. To address this gap, the study aims to investigate students' perspectives on incorporating digital storytelling for developing critical thinking skills in the English language classroom.

II. MATERIALS AND METHODS

For the investigation, the researchers developed a questionnaire containing both open- and closed-ended questions. To characterize the student sample, the researchers included several demographic questions about professional activity and participation in additional career-oriented courses. Among the respondents, 48.11% (191 computer science students) balance their studies and work. 61.96% of respondents (246 computer science students) experience participating in additional career-oriented courses.

As part of data collection process, the questionnaire contains two closed-ended questions:

Q 1. Do you believe that digital storytelling is useful for developing critical thinking skills?

Q 2. Is digital storytelling more effective for developing critical thinking skills than traditional methods like textbooks and lectures?

The questionnaire contains two closed-ended questions aimed at rating on a 5-point Likert scale (ranging from 1 – "strongly disagree (SD)", 2 – "disagree (D)", 3 – "neutral (N)", 4 – "agree (A)", 5 – "strongly agree (SA)"):

Q 3. To what extent do you agree that digital storytelling helps develop critical thinking skills?

Q 4. To what extent do you agree that digital storytelling should be a part of your learning in the English language classroom?

The questionnaire contains three open-ended questions:

Q 5. Which skills, in addition to critical thinking, do you develop most by making digital stories?

Q 6. Which aspects of your critical thinking have improved as a result of participating in digital storytelling?

Q 7. What challenges do you face while creating digital stories?

In this study, English is selected as the survey discipline because it is an obligatory component of the computer science students' curriculum and it incorporates various innovative teaching and learning methods including digital storytelling.

To provide a clearer understanding of digital storytelling exercises, an example is given in Table 1.

TABLE 1 AN EXAMPLE OF DIGITAL STORYTELLING EXERCISE

Topic	Blended Learning vs Traditional Learning: Benefits and Challenges
Objective	To develop students' ability to analyze information regarding the benefits and challenges of blended and traditional learning, critically assess the information studied, formulate their own positions and argue them convincingly, draw and justify their own conclusions
Instructions	First, write a short story in English (150-200 words) based on the analysis of modern scientists' papers on the benefits and challenges of blended and traditional learning. The story should include an introduction, 2-3 main arguments, and a conclusion. Second, prepare images, photos, or drawings (you may use your own or find free images on the Internet). If using photos/images/drawings from the Internet, please provide proper source references. Third, record yourself narrating the digital story in English.
Digital tools	Use Canva or Google Slides (or any other digital tool) to create and present the digital story
Assessment Criteria	Be ready that the groupmates will assess the digital story using the following assessment criteria: - English language proficiency (grammatical accuracy and appropriate vocabulary usage); - creativity and originality; - well-balanced presentation structure; - quality of arguments and examples; - effective integration of multimedia elements; - ability to answer question after presenting the digital story

The survey lasted three months, from September to November 2025. The sample comprised 397 computer science undergraduate students from two Ukrainian universities, namely, Kyiv National University of Technologies and Design and Kyiv National Economic University named after Vadym Hetman.

To ensure a comprehensive analysis, this study adopted a mixed-methods approach.

III. RESULTS AND DISCUSSION

The information collected from Q 1 shows that 329 respondents (82.87%) believe that digital storytelling is useful for developing critical thinking skills (Fig. 1). The survey results show that there are no negative responses from respondents. At the same time 68 respondents (17.13%) find it difficult to answer this question.

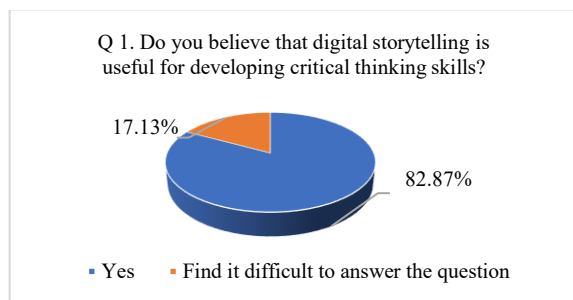


Fig. 1. The data obtained from respondents' answers to Question 1.

Replying to Q 2 "Is digital storytelling more effective for developing critical thinking skills than traditional methods like textbooks and lectures?", the survey results indicate the respondents' responses are predominantly positive – 341 respondents (85.89%). The responses received show a generally positive trend among respondents. These responses indicate that computer science students perceive this innovative teaching and learning method as effective for developing their critical thinking skills. 36 respondents (9.07%) find it difficult to answer the question. Only 20 respondents (5.04%) express a negative attitude (Fig. 2).

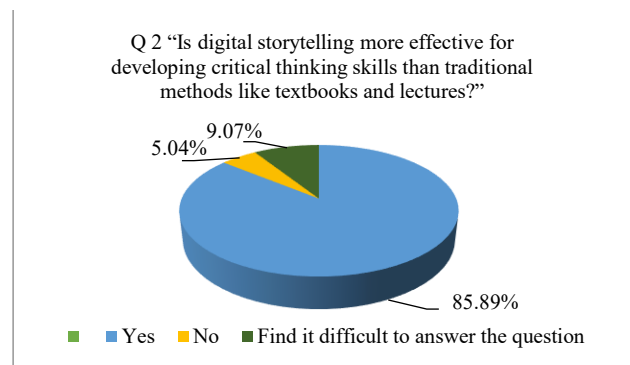


Fig. 2. The data obtained from respondents' answers to Question 2.

Q 3 is aimed to find out to what extent respondents agree that digital storytelling helps develop critical thinking skills. The results obtained are given in Table 2.

TABLE 2 RESPONDENTS' LEVEL OF AGREEMENT REGARDING EFFECTIVENESS OF DIGITAL STORYTELLING IN DEVELOPING CRITICAL THINKING SKILLS

Question 3	Variables				
	SD (1)	D (2)	N (3)	A (4)	SA (5)
To what extent do you agree that digital storytelling helps develop critical thinking skills?	16	39	64	155	123

Source (own study)

The table data demonstrate that only 4.03% of respondents strongly disagree with the view that digital storytelling helps develop critical thinking skills. In their turn, only 9.82% of respondents disagree with this view. 16.12% of respondents take a neutral stance. 39.04% of respondents agree and 30.98% of respondents strongly agree that digital storytelling helps develop critical thinking skills. The results obtained indicate the predominance of positive responses ($M \approx 3.88$, $SD \approx 1.06$, $Mdn=4$, $SE \approx 0.053$). The researchers use Student's t-distribution to assess whether the mean ($M \approx 3.88$) differs significantly from the neutral value ($t(396) \approx 16.41$, $p \approx 0.001$). We can infer that the respondents consider digital storytelling effective for developing critical thinking skills, as supported by both the distribution of responses and statistical analysis.

Table 3 presents the results concerning question 4 aimed at finding out the level of agreement among respondents on the idea that digital storytelling should be a part of their learning in the English language classroom.

TABLE 3 RESPONDENTS' LEVEL OF AGREEMENT REGARDING THE IDEA THAT DIGITAL STORYTELLING SHOULD BE A PART OF THEIR LEARNING IN THE ENGLISH LANGUAGE CLASSROOM

Question 3	Variables				
	SD (1)	D (2)	N (3)	A (4)	SA (5)
To what extent do you agree that digital storytelling should be a part of your learning in the English language classroom?	12	34	61	159	131

Source (own study)

The findings show that 3.02% of respondents strongly disagree and 8.56% disagree that digital storytelling should be part of their learning in the English language classroom. 15.37% of respondents express a neutral position. On the contrary, 40.05% of respondents agree, and 33.00% of respondents agree strongly with the suggested idea. The results obtained indicate the predominance of positive responses ($M \approx 3.91$, $SD \approx 1.039$, $Mdn = 4$, $SE \approx 0.052$).

By asking Q 5, the researchers imply they want to find out which skills, in addition to critical thinking, respondents think develop most when making digital stories. The analysis of respondents' responses enables the selection of the following categories: Category 1 – creativity and imagination; Category 2 – writing skills; Category 3 – emotional intelligence; Category 4 – communicative skills and confidence; Category 5 – digital skills; Category 6 – creative thinking and ability to structure ideas; Category 7 – visual literacy; Category 8 – time management skills; Category 9 – English language skills (Table 4).

TABLE 4 SKILLS THAT ARE DEVELOPED IN ADDITION TO CRITICAL THINKING WHILE USING DIGITAL STORYTELLING

Category	Responses	
	N	%
Creativity and imagination	197	49.62
Writing skills	194	48.87
Emotional intelligence	99	24.94
Communicative skills and ability to express ideas calmly	190	47.86
Digital skills	230	57.93
Ability to structure ideas	130	32.75
Visual literacy	95	23.93
Time management skills	32	8.06

Category	Responses	
	N	%
English language skills	68	17.19

Source (own study)

The findings suggest that respondents believe that along with developing critical thinking skills digital storytelling is effective in improving respondents' creativity and imagination (49.62%), writing skills (48.87%), emotional intelligence (24.94%), communicative skills and ability to express ideas calmly (47.86%), digital skills (57.93%), ability to structure ideas (32.75%), visual literacy (23.93%), time management skills (8.06%), English language skills (17.19%). These findings help us make an assumption that respondents view digital storytelling as a comprehensive teaching and learning method or process that positively influences the development of a range of creative, communicative, and technical skills, rather than reducing it to critical thinking skills alone.

The aim of Question 6 is to determine which aspects of critical thinking have improved as a result of participating in digital storytelling. The analysis of respondents' replies allows for the identification of the following categories: Category 1 – source analysis, Category 2 – structuring sought-after information, Category 3 – drawing well-founded conclusions, Category 4 – reflecting on work done, Category 5 – ability to create a basis for developing new solutions (Table 5).

TABLE 5 RESPONDENTS' VIEWS ON IMPROVING CRITICAL THINKING SKILLS

Category	Responses	
	N	%
Source analysis	157	39.55
Structuring sought-after information	218	54.91
Drawing well-founded conclusions	144	36.27
Reflecting on work done	229	57.68
Ability to see the situation from different perspectives	181	45.59

Source (own study)

The findings suggest that participation in the creation of digital stories helps computer students improve various aspects of critical thinking. Thus, for instance, 39.55% of respondents believe that their ability to analyze different sources improved greatly. In their replies, respondents mention that selecting information for creating interesting and informative digital stories requires a thorough study and analysis of websites, scientific papers, journals, etc. This way, they learn to analyze various sources of information. For 54.91% of respondents, participating in

digital storytelling means learning how to structure sought-after information. 36.27% of respondents point out that digital storytelling influenced the development of their ability to draw well-founded conclusions. It was interesting to find that 57.68% of respondents reported that digital storytelling improved their ability to reflect on their work. Presenting digital stories in lessons, participating in their assessment, sharing impressions with groupmates about the digital stories, and discussing the challenges they face while creating them positively influence the ability to reflect. 45.59% of respondents reported that digital storytelling helped them improve their ability to see the situation from a different perspective.

By including question 7 in the questionnaire, the researchers aim to identify the challenges computer science students face when creating digital stories. Analysis of the respondents' replies shows that although the respondents' opinions differ on the challenges they faced when creating digital content, they note that these challenges involved not only time management or technical skills but also critical thinking as well. Here are the excerpts for respondents' replies:

S15: *Creating digital stories can be time-consuming and technically distracting. Much depends on the topic, but sometimes you prioritize flashy visuals over the actual quality of your message. It usually happens when you do not have much time to analyze the necessary sources or structure the sought-after information. Now I think I take fact-checking more seriously.*

S29: *The main challenge I face is that it takes a lot of effort to design slides and fix technical issues. Sometimes I focus more on the design than on the content. ... At first, I didn't like such activities. I think it happened because I never checked the facts and used information which I could find quickly. I also didn't have enough skills concerning structuring the information and comparing different points of view....*

S76: *Although it makes me more confident and teaches me to draw well-founded conclusions and express myself properly, I have to admit that sometimes it is time-consuming. What I mean is that to create an informative digital story you have to find the necessary information. You spend much time on searching the Internet and when you find what you need, you have to spend more time analyzing and structuring this information. ... I like such activities, but sometimes it takes much time.*

S47: *I can mention several challenges, namely, time, technical obstacles, and visual image over content. Creation of digital stories can be time-consuming. It usually takes much longer to create a digital story than to write a simple essay (time). If you want to impress your teachers and groupmates by choosing innovative software, it also might cause some difficulties especially for those who don't have enough technical skills. If the Internet is slow, the whole process can be frustrating (technical obstacles). Sometimes you can focus so much on the music, images or effects that you forget about producing high-quality academic content (visual image over content).*

Recognizing these challenges helps acknowledge that developing students' critical thinking through digital storytelling requires appreciating their efforts and fostering a learning environment that provides full support for improving the skills they lack. Involving students in digital storytelling should be targeted at teaching them to use more effective learning strategies, namely time management, critical evaluation of information, critical processing of information, and conscious use of information.

IV. CONCLUSIONS

The study aimed to investigate computer science students' perspectives on incorporating digital storytelling for developing critical thinking skills in the English classroom. The findings obtained clearly demonstrate that computer science students are aware of the importance of critical thinking as a key competency for lifelong learning. The findings also reveal computer science students' general view of the need for a more practice-oriented, competency-based approach to education in higher education institutions, as well as the implementation of innovative methods to develop critical thinking skills in the English language classroom.

Based on the conducted research, we can conclude that the use of digital storytelling in the classroom makes it possible both to consider computer science students' abilities, their educational interests, needs, and their current level of knowledge in a particular discipline and to develop their cognitive abilities (including critical thinking skills as one of the key components of an individual's cognitive activity).

The conducted research highlights the following key findings: 1) the majority of computer science students consider digital storytelling an effective way to develop their critical thinking skills, and digital technologies convenient tools for creating, visualizing and presenting ideas; 2) present-day computer science students as representatives of generation growing up in the digital world perceive digital storytelling as more effective for developing critical thinking skills than traditional methods like textbooks and lectures; 3) digital storytelling is a comprehensive teaching and learning method or process that positively influences the development of a range of creative, communicative, and technical skills, rather than reducing it to critical thinking skills alone; 4) developing critical thinking skills through digital storytelling requires equipping students with effective learning strategies, namely time management, critical evaluation of information, critical processing of information, and conscious use of information.

V. STUDY LIMITATIONS

This study is limited to responses of computer science undergraduate students studying English as a compulsory discipline.

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