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The effectiveness of digital storytelling in teaching medical information searching

Mohsen Nouri, Leila Shahmoradi[1], Aeen Mohammadi[2], Hojat O. Soleimani[3], Rita Mojtahedzadeh[2]

Ph.D. Student, Medical Library and Information Sciences Department, School of Allied Medical Sciences, Tehran University of Medical Sciences, Tehran, Iran, [1]Ph.D. Professor, Health Information Management Department, School of Allied Medical Sciences, Tehran University of Medical Sciences, Tehran, Iran, [2]MD, MPH, Ph.D. Associate Professor, Department of E-Learning in Medical Education, School of Medicine, Center of Excellence for E-Learning in Medical Education, Tehran University of Medical Sciences, Tehran, Iran, [3]Assistant Professor, Medical Library and Information Sciences Department, School of Allied Medical Sciences, Tehran University of Medical Sciences, Tehran, Iran

Address for correspondence:
Dr. Rita Mojtahedzadeh, Department of E-Learning in Medical Education, School of Medicine, Center of Excellence for E-learning in Medical Education, Tehran University of Medical Sciences, Tehran, Iran.
E-mail: r_mojtahedzadeh@tums.ac.ir

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Abstract:

BACKGROUND: Novel technologies development has created a new path for education. Digital storytelling (DST) is one of the educational approaches used in universities and scientific centers. We aimed to investigate the effect of DST on Scientific Information Search (SIS) and Information Seeking Anxiety (ISA) in students.

MATERIALS AND METHODS: This mixed-method study utilized the pre-test-post-test method containing test and control groups. We used the simple random sampling method (available) and used the formula to determine the sample size. Forty-two people participated in the study. A researcher-made questionnaire was used to collect SIS data and standard questionnaire for ISA data. The teaching approaches were accomplished using DST and the conventional methods in test and control groups, respectively. Using SPSS v. 22, we did paired-sample T-test and independent sample T-test to compare the mean score in before and after intervention in each group. Also Analysis of Covariancetest was used for considering post-test result as dependent variable, groups as independent variables and pre-test score as covariate.

RESULTS: The results showed significant changes in mean score between the post-test and pre-test of both questionnaire in both groups. Also, in the post-test, compared to the control group, the experimental group obtained higher scores for *SIS*, which was statistically significant, and obtained lower scores for *ISA*, but it was not statistically significant.

CONCLUSIONS: It can be concluded that the DST method has a positive impact on learning and reducing *ISA* compared to the conventional ones, and students' interest and participation in learning have increased using DST method.

Keywords:

Databases, information seeking behavior, narration, test anxiety

Introduction

Technological advances accompanied by computer-assisted authoring systems have made novel approaches to education possible. Multimodal communication involves learners producing text in multiple semiotic forms entailing writing, images, and sound through digital tools bringing about, in turn, more rich communication.[1]

The story is a narrative founded upon individuals' experiences, literary works, or traditions[2] either in a real or virtual form[3] with a well-organized structure including beginning, middle, and ending, as well as containing a clear objective that provoke audiences' emotions.[4] Mostly, storytelling in the 20th century was linked to children; even so, in 1973, telling stories shifted from children to adults.[5] As the writing process of the story is a process of producing meaning, they are inextricably interconnected; consequently, this builds a novel concept in

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the educational field.[6,7] the state-of-the-art technologies contribute to telling stories through usages of multimedia tools and together with these technologies, storytelling art evolved into digital storytelling (DST) in 1990s.[8]

DST was created for the first time in 2008[9] that has been described as an arts-based multimedia presentation of a story, mostly by means of a video[10] that through this individuals can create a narrative regarding a specific subject to distribute their living experiences by multimodal materials.[11] Computers' availability accompanied by cheap, user-friendly multimedia editing software such as iMovie, Movie Maker, WeVideo, makes DST a powerful educational device to engage students in critical thinking regarding their experience.[1]

Digital stories (DSs) in education are mainly guided toward an academic purpose,[12] and there are manifold approaches that DST can be utilized in education. Whether an instructor or their students will create the DSs should be considered as one of the first decisions to utilize that in the curriculum.[13] So, teacher, student, and the environment are imperative items for the prosperous use of DST in classrooms.[14] In addition to the mentioned benefits, the construction of a DS is often associated with challenges that people are easily affected by them.

Özüdoğru (2021) stated that there are teachers who depend on traditional computer learning methods and do not desire to change their teaching approaches and have some deficiencies in teaching skills.[14] Likewise, the destitute of personal interaction between the lecturer and the students and the problem of catching up with the lecturer's teaching pace for below-average students owing to the swift teaching method can be mentioned as serious drawbacks[3] and lack of access to computer makes it difficult to create DSs.[15] Urstad *et al.* (2018)[16] expressed that using images, music, and students' voices led them to perceive the message as a personal experience, making them feel more insecure and lacking privacy.

LaFrance and Blizzard (2013) posited that the challenges reported by students primarily related to sharing personal information and utilizing brand-new technologies to create the DS.[17] Other pitfalls that can be found in other sources, including: Technological pitfalls,[18] problems of finding apt stories and lacking of the cultural and language aptitudes to handle storytelling in English, curriculum space,[19] inadequate time,[19-22] appropriate guidance of efficient narration, technical support with troubleshooting hints, and copyright and portrait rights.[20,21]

DST steps

Different steps are mentioned for DST in various sources mainly involved several steps:

A story identification, story circle (contributing preliminary stories), film production characteristic (technical session), individual manuscripts generation and digitalization, group presentations, and discussion.[16] Banny (2017) highlighted that DST has seven components and four phases including:

Elements: 1. A point of view; 2. A dramatic question; 3. Emotional content; 4. The gift of your voice; 5. The power of the soundtrack; 6. Economy; 7. Pacing.

Phases: 1. Pre-production phase (Owning your insights/Owning your emotions/Finding the moment); 2. Production phase (Seeing your story/Hearing your story); 3. Post-production phase (Assembling your story); 4. Distribution (Sharing your story).[23]

Uses of DST

Different types of storytelling entailing socio-cultural storytelling, business storytelling, academic storytelling, personal storytelling, and family storytelling can be found.[24] DST topics can be very different so that from content knowledge of education to individual experience can be included.[1] DST has been brought in different disciplines[25] including nursing,[7] mathematics,[26] chemistry,[27] and pathophysiology.[28] Meanwhile, DST has a positive impact on critical thinking[29] and this promotes reflection.[30] Indeed, information seeking involves critical thinking, and this has been appealing to information literacy instructors and information science researchers.[31] Consequently, DST can be an appropriate option for this study.

Scientific Information Search (SIS)

Information seeking is a natural and essential mechanism of human reality known as an individual's manner of information gathering and sourcing for personal utilization, knowledge renewing and expansion[32] and individuals' ability to address and recall health-related information is considered essential for them to stay healthy.[33] Kuhlthau's Information Search Process (ISP) is one of the most widely studied and cited models associated with the potential to teach students regarding information search.[34] User's thoughts, feelings, and actions are common to the series of such subjects at any stage.[35] Figure 1 shows Kuhlthau's ISP.[36]

The Kuhlthau's ISP concentrates on the user's emotions and cognitive states, which is supported by DST as well. Zhao *et al*.[37] declared that emotions can perform as the locomotive force to motivate narrative evolution. DST has a pivotal role in students' cognitive, emotional, and social development. By making a story, especially, relevant to their internets, students are more likely to activate their internal cognitive mechanisms by external stimuli. Therefore, emotion plays a crucial part in stories.[38] One

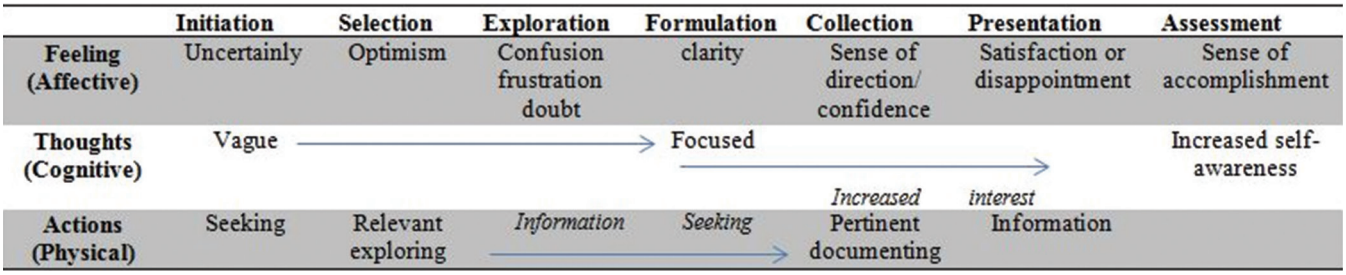

Figure 1: Kuhlthau's Model of the information search process

of the SIS-related issues which can be surveyed in this study is information seeking anxiety (ISA).

Information seeking anxiety

Anxiety is a mental condition of a person observed in a dilemma.[39] Kuhlthau (1988) posited that anxiety, as a natural feeling, is more likely to occur at any stage of the ISP. She reported that since students are suffering from confusion and lack of certainty, they experience the highest level of anxiety during the beginning of the search process.[40] There is no valid and reliable instrument to measure the levels of ISA among students. Unfortunately, studies that have investigated the ISA did not establish a scale to measure that. However, lots of them have contained information seeking as a part of general library research and utilized library anxiety scales.[41]

However, Erfanmanesh, Abrizah, and Karim (2012) introduced the term 'ISA' referring to patrons' feelings of discomfort while seeking out information from various sources entailing the library, the web, and human.[42,43] If students are unable to retrieve valid information and their search eventuate in a failure, this will be associated with fear, frustration, and anxiety in a large proportion of research students.[42]

Therefore, DST concentrates on the user's emotions, conveys people's experiences, and improves critical thinking and reflection. Meanwhile, teaching SIS based on the Kuhlthau's ISP covers all the points above. This study aims to investigate the effect of the DST method on students' SIS and ISA.

Materials and Method

Study design and setting

The study was approved ethically by the Tehran University of Medical Sciences Institutional Review Board. This pre-test-post-test mixed-method study using qualitative and quantitative methods (Quasi-experimental) evaluated the impact of the DST method in the SIS (using ISI, PubMed, and Scopus databases) and ISA of students. In experimental studies, the effect of one independent variable on another dependent one is investigated.[44]

Study participants and sampling

We used the simple random sampling method (available). Based on sample size formula, sample size was determined to be at least 16 people. In total, 42 undergraduate students of laboratory sciences (19 students) and surgical technologists (23 students) with an average age of 20.6 years have participated in the study. Due to the coronavirus disease 2019 (COVID-19) pandemic, face-to-face classes were canceled; therefore, the virtual classes using the adobe connect platform (according to the schedule and time) were held. Seven weeks of training by DST and conventional teaching methods for the test and control groups were held. Coordination and communication between students and teacher outside of class hours were done using the Telegram Application.

Data collection tool and technique

In this study, three tools were utilized to collect data.

(1) *SIS questionnaire*: 10 questions (30 questions in total) from each of the three databases, including PubMed, ISI, and Scopus were extracted based on the study's goals. After the final approval by the research team, these questions were implemented in Google Form; they were given as pre-test-post-test to the students.

(2) *ISA questionnaire*: This questionnaire was made based on a pre-designed questionnaire of Erfanmanesh *et al*.[41] This tool as a Likert scale with 47 items and 6 main factors, including Barriers Associated with Information Resources, Barriers Associated with Computer and the Internet, Barriers Associated with Library, Barriers Associated with Searching for Information, Technical Barriers and Barriers Associated with Topic Identification was used. In this study, due to the conformity with the type of intervention, Barriers Associated with Library (11 items) were removed, and five main factors (36 items) remained. The validity of the items was reported using appropriate factor analysis, then confirmed by experts. To distinguish the reliability, a questionnaire was distributed among 139 undergraduate students of the paramedical school and the result was analyzed. Cronbach's alpha value was 0.956 indicating the high reliability of this tool. Then, the questionnaire's items were placed in Google Form and were given as pre-test-post-test to the students.

(3) *Survey questionnaire:* This questionnaire was taken from a similar study in this field,[15] whose validity was confirmed by experts, and its reliability obtained by calculating Cronbach's alpha was 0.663. This tool includes seven questions with a 5-point Likert-type scale (from very low to very high) and four multiple-choice questions. These questions included the result of participation in this project, the initiating time for starting the project, the suggestions for better efficiency of this method, suggestions of essential points by the teacher for better performing of this method, which the validity was confirmed by two experts. Using such a questionnaire, the satisfaction level, personal opinions of students, and the DST effectiveness concerning the given teaching method we examined.

Ethical consideration

The ethical code of this study was obtained from the ethics committee of Tehran University of Medical Sciences (Ref. No. IR.TUMS.SPH.REC.1398.269, Research Project Code: 43089) before conducting the research. Students participated in this study with informed consent and were assured that their information would remain completely confidential.

Study design

Step 1: Preparing the DST model to use in the SIS lesson

Based on recent studies, the different stages of the DST model were extracted. Then, a focus group session was held to build the DST model. In this session, the experts chose the most appropriate model and then edited it according to the study and based on the adaptation to the Kuhlthau's ISP. Specialists had the authority to remove, add, or modify any of the steps.

Step 2: Control group

Pre-test: To prevent contamination, first, the control group was determined. This group consisted of 19 students who received the SIS questionnaire and ISA questionnaire as a pre-test through Google Forms in the first session of the beginning of the semester; then, they were asked to complete them.

Intervention: At this stage, class through the adobe connect platform was held. Firstly, study's' purposes and expectations, an introduction on search-related topics, including Boolean operator, uses of such topics on search strategy, and H-Index and impact-factor indicators were presented by the teacher. Afterward, Scopus, ISI Web of Science, and PubMed databases were taught to the students, orderly. In each database, students were introduced to the purposes and scopes of the databases. Next, the topics of simple and advanced search strategy, author affiliation, and source search were taught using various examples.

Post-test: At this stage, the mentioned two questionnaires were provided to them as post-tests through Google Forms to complete.

Step 3: Test group

Pre-test: This group consisted of 23 members who were provided SIS and ISA questionnaire as pre-test using Google Forms at the first session of initiating semester, and then they were asked to accomplish them.

Intervention: In this step, based on the DST steps, lesson topics were presented to students using the adobe connect platform. At the beginning of the session, the purposes and expectations of the lesson were presented, and then an introduction of search-related topics entailing the Boolean operator and how to use them in the search strategy, as well as H-Index and impact-factor indicators were presented by the teacher.

Next, in the Telegram platform, the students were divided into six groups (five groups of four and one group of three), and the teacher supervised all groups. Each database was designated to both groups, and database-related practices were given to the students. They were obligated to work together to find the answer by trial and error. They were obligated to work together to find the answer by trial and error. The teacher supervised their work all the time and presented them with the necessary feedback.

Post-test: After the above step, SIS, ISA, and Survey questionnaires were provided to students through Google Forms, and they were asked to complete them.

Data analysis

The analysis of scores of SIS and ISA questionnaires were between groups and within the group which done to measure the differences between the effectiveness of the DST method and the traditional method in education and ISA. Analysis of pre-test scores between groups showed that both groups were in the same level in terms of ISA and SIS. Also, individuals had no prior knowledge regarding creating DS. The results were analyzed using SPSS software version 22. Paired sample t-test was used to evaluate the relationship between pre-test and post-test mean scores of SIS and ISA questionnaires within each group. Furthermore, the independent t-test and Analysis of Covariance tests were utilized to evaluate post-test scores between the two groups. In the qualitative section, we used frequency in to analyze individual's opinions.

Results

In total, all of the 42 individuals participating in the study completed the questionnaire. The control and test groups

contained 19 and 23 participants, respectively, of whom 20 (47.6%) persons were male and 22 (52.4%) were female.

Change in results (within the group)

Table 1 shows the comparison between the mean scores of SIS and ISA preceding and after the intervention in the test and control groups. For this purpose, paired sample t-test was used.

Test group

As can be seen in Table 1, the average score of the SIS questionnaire for the students in the pre-test was 3.47, which increased to 16.56 in the post-test, and this increase was statistically significant (p = 0.000). Furthermore, the ISA questionnaire score of students in the pre-test was 101.39, which decreased to 91.13 in the post-test, and this decrease is statistically significant (p = 0.004).

Group control

As shown in Table 1, the SIS questionnaire score for the students in pre-test was two that increased to 11.73 in post-test, and this increase was statistically significant (p = 0.000). In addition, the ISA questionnaire score for the students in the pre-test was 100.21, which decreased to 89.68 in the post-test, and this decrease was statistically significant (p = 0.018).

Change in results (Between the groups)

The independent t-test was used to survey the scores obtained from two questionnaires between the two groups. As shown in Table 2, there is a statistically significant difference in the mean of SIS questionnaire scores between two groups in the post-test (p = 0.005). Meanwhile, considering that (p = 0.846), there is no significant difference in the mean scores of the ISA questionnaire between the two groups in the post-test.

As Table 3 shows, the results of Analysis of Covariance test, considering post-test result as dependent variable, groups as independent variables and pre-test score as covariate shows significant difference for SIS (F = 6.188, df = 1, *P* value = 0.017). However, did not show significant difference for ISA (F = 0.011, df = 1, *P* value = 0.918).

In order to survey the relationship between two items in both groups, their correlation was calculated. According to Table 4, there was a negative relationship between both variables in the test group. In this regard, increasing the SIS questionnaire score was associated with decreasing the ISA questionnaire ones. However, this decrease was not statistically significant. In the control group, this relationship was unexplainable.

The result of the survey questionnaire

At the end of the intervention, a questionnaire was used to collect the opinions of the test group concerning the use and effectiveness of the DST method. Table 5 shows the results of the questionnaire. As can be seen, the necessity of using this method for teaching were declared 56.5% and 39.1% as high and moderate rates, respectively. Also the necessity of existence computer literacy skills (60.9%, high), editing and writing skills (39.1%, high), English language proficiency (47.8%, very high), narration skills (52.2%, high), time management skills (34.8%, high), and creativity (52.2%, high) were determined by the students, among them the most necessary factor was related to the English language (47.8%, very high).

Table 1: Pre-test and post-test results for SIS and ISA in the test and control groups using paired sample *t*-test

Variables	Test group (*n*=23)			Control group (*n*=19)		
	M (SD)	*t*	*P*	M (SD)	*t*	*P*
SIS						
Pre-test	3.47 (4.09)			2 (1.79)		
Post-test	16.56 (5.34)	12.26	0.000	11.73 (5.25)	8.22	0.000
ISA						
Pre-test	101.39 (21.53)			100.21 (24.38)		
Post-test	91.13 (21.52)	3.24	0.004	89.68 (26.55)	2.59	0.018

Table 2: Post-test results for SIS and ISA in the test and control groups using independent sample *t*-test

Variables	*t*	df	MD	*F*	Std. deviation	*P*
SIS						
Test group					5.34	
Control Group	2.94	38.73	4.82	0.534	5.25	0.005
ISA						
Test group					21.52	
Control Group	0.191	34.52	1.44	0.117	26.55	0.850

Since the *P*<0.05, the interaction between the independent variable and two covariate variables was not significant, so the assumption of homogeneity of regression slopes was considered

Multiple-choice questions results

69.6% of participants considered the start of the second semester as the appropriate time; on the other hand, 21.7% thought that will suitable if there will have enough time in the second semester. 56.5% of students also stated that in order to use this method better and more effectively, the applications for this method should be vividly specified, and 47.8% said that more examples should be included for a proper understanding of students. Likewise, 87% of students posited that the teacher should give more advice and suggestions to students to construct an effective DS. Among the steps of the designed model, the most attractive and arduous steps were related to the sympathy and storyboard creating, in order. Students encountered some difficulties, including the time-consuming process of digital story-making, the accessibility of technology, and the inability to deal with technology.

Discussion

In this study, the effect of the DST method on SIS and ISA training was investigated. For this purpose, seven weeks of training by DST and conventional teaching methods for the test and control groups were held, respectively. Data were collected using SIS and ISA questionnaires as the pre-test and post-test method. Data analysis showed that there was a significant difference between the SIS scores of the two groups in the post-test.

There is also a negative correlation between the SIS and ISA scores in the test group. Therefore, it can be concluded that the DST method has led to better learning compared to the conventional teaching ones among students. It was observed that the students in the test group participated more actively that of the control ones in discussions and activities of the class. Using Telegram and Adobe Connect provided an environment for students to discuss and exchange ideas and feedback. Ozudogru *et al*. (2020)[45] showed that for the effortless and better impact on training, the necessary infrastructures should be provided for DST implementation.

Data analysis of the test group showed that there were statistically significant differences between the pre-test and post-test scores of SIS and ISA results. Ee Hui Li *et al*. (2017)[3] showed that the students in the test group scored higher in learning Chinese terms than the control group; meanwhile, they were more satisfied. In addition, DeLenardo (2019)[28] showed that nurses' training by the DST method was effective and they achieved higher scores.

Sancar-Tokmak and Yanpar-Yelken (2015)[44] also stated that the DST method has a statistically significant difference in teachers' self-confidence scores before and after DS construction. Although mean scores of technological content knowledge increased, the change was not statistically significant.

In the control group, a significant correlation between pre-test and post-test results for SIS and ISA methods was observed. This could mean that the conventional approach has somehow efficiency and effectiveness in light of the fact that in many fields, by this method, students pass their courses and enter the next semester. Based on the results of Ee Hui Li *et al* (2017)[3], the control group successfully passed their course and considered its content appropriate.

Furthermore, Aktas and Yurt (2017)[46] stated that the training in the control group led to improving their academic performance and has had a positive impact on their grades. On the other hand, the study by Duman and Gocen (2015)[47] reported different results. They stated that there was no significant difference between the pre-test and post-test scores of the control group that were trained using PowerPoint.

The reason for better learning and high average scores for the test group in the post-test compared to the control group might be related to the construction of DSS. Because they were constantly building DSs and sharing their personal experiences with others. Based on Duman and Gocen (2015),[47] the control group's members regularly were producing DS and StoryBoard associated with a positive impact on their flexibility, organization, and writing skills.

Likewise, Aktas and Yurt (2017)[46] showed that the scores in the test group increased significantly compared to the control group. Another similar study conducted by Ofoegbu *et al*. (2020)[48] showed that there was a significant difference between the pre-test and post-test scores in the test group and the burnout among the test group was reduced, while this difference was not observed in the

Table 3: Post-test results for the test and control groups using Analysis of Covariance test

Variables	df	*F*	*P*
SIS			
Between the groups	1	6.188	0.017
ISA			
Between the groups	1	0.011	0.918

Table 4: The relationship between SIS and ISA after intervention

Group	Pearson correlation	Sig. (2-tailed)
Intervention	-0.370	0.82
Control	0.58	0.814

Table 5: Student survey results on the implementation of DST

Characteristic	Very low	Low	Medium	High	Very high
DST necessity	4.3%	0%	39.1%	56.5%	0%
Computer literacy skills necessity	0%	0%	8.7%	60.9%	30.4%
Editing and writing skills necessity	0%	8.7%	26.1%	39.1%	26.1%
English language proficiency necessity	4.3%	4.3%	21.7%	21.7%	47.8%
Narration skills necessity	0%	4.3%	13%	52.2%	30.4%
Time management skills necessity	0%	8.7%	30.4%	34.8%	26.1%
Creativity necessity	4.3%	0%	17.4%	52.2%	26.1%

control group. Meanwhile, the comparison between the scores of the two groups after the intervention showed a significant difference.

According to the results, there was a negative relationship between SIS and ISA in post-test scores in the test group. Due to increasing the level of learning and understanding search methods, the anxiety decreased but was not statistically significant. Therefore, it can be concluded that students who have a higher learning level in search will have less anxiety. The results of Jan, Ahmed, and Naveed (2020)[49] showed that there was a negative correlation between emotional intelligence and ISA.

Due to the virtual classroom, the distance interventions and the use adobe connect platform, the education quality might be slightly affected so that despite the negative relationship between the two components in the study, they were not statistically significant. In face-to-face training, this relationship might be meaningful. In face-to-face training, this relationship might be meaningful. Resemblance to our results, Khan, Anwar, and Naveed (2021)[42] reported that there was no significant difference between ISA scores and factors such as previous education type (private or public), geographical location, or the level of English proficiency. Naveed and Ameen (2017)[43] also concluded that there is a significant relationship between overall ISA and its subsets (anxiety resource and information technology anxiety) as well as computer skills, as the increasing number of student publications, ISA, and information technology anxiety is declining. Most of the students were keen on the project and they learned a lot of novel information, but in order to better understand, the uses of this method should be further explained. Similar to our study, the results of Makarova and Pirozhkova (2020)[15] showed that more than 80% of students are positive regarding using the DST method and expressed their desire to pursue this learning method regularly. Ee Hui Li and Soon Hin Hew (2017)[3] also found in their report that the test group had higher scores and more satisfaction than the control group.

Many students in this study found this method necessary and they posited that the start of the second semester was an appropriate time to perform this project. What's more, they expressed that skills such as computer literacy, writing and editing, English, speaking, time management, and creativity are pivotal factors to perform this approach. The students suggested that they should receive more guidance and recommendations from their teacher, and more time should be allocated for the project accomplishment because of the better performance of the designated practices. Aktas and Yurt (2017)[46] stated that the DST method caused the education to be more attractive and enjoyable, and with the active participation of students, their incentive level increased. Niemi and Jenny Niu (2021)[26] showed that students were able to understand mathematics effectively and had felt more confident when talking to their classmates concerning mathematics.

During the project, students were welcomed and participated in the project, but they complained about insufficient time as well as various software pitfalls. Similar to our study, Ozudogru (2020)[45] stated that factors, including inadequate technological infrastructures and the devoid of time, were obstacles to the method implementation.

Limitation and recommendation

This study had some limitations. For example, some students had problems in writing the script and they asked the teacher to help them. The time-consuming process of creating a digital story made the students tired and some of them faced challenges with software and technical issues. For example some students did not know how to work with editing software or could not open the Google Form questionnaire link and had to use different browsers or PC instead of smart phones. Also, the interruption or slowness of the Internet was one of the inevitable issues during the class.

Conclusion

The study aimed to elevate the acquisition and fondness of undergraduate students toward the understanding of SIS and ISA methods. For this purpose, two-group pre-test-post-test method was utilized. The results showed that there was a significant difference between the SIS score of the test group and the control group. Of note, the difference was not statistically significant for ISA. In general, this method can be recommended for teaching other students.

Data analysis of test group before and after intervention showed a significant difference in the scores of SIS and ISA questionnaires. Likewise, data analysis displayed a significant difference in the control group between the scores of the SIS and ISA before and after the intervention.

DST can increase people's interest and participation by creating a fun atmosphere. Meanwhile, this is associated with a positive impact on their creativity, learning professional skills, and responsibility. However, the complexity and difficulties of building a DS can create problems for them. An active learner can better understand the content, so motivation and collaboration were considered throughout the project process. As the individuals worked in groups, learned the SIS method by trial and error, and shared their experiences with

others, they were more interested and motivated than the control group.

The test group was more involved in the class Q&A, came up with creative ideas, and even attended class earlier. Teaching using a virtual classroom may not always be attractive for students[50] and cannot be a suitable substitute for face-to-face learning.[51] On the other hand, virtual education can include problems entailing inadequate skills of some teachers in virtual education, lack of effective learning, students' poor planning for learning, invalid evaluations, hardware, and software problems. Due to the prevalence of the COVID-19 virus, the classes were held virtually; however, the face-to-face intervention might increase the scores in the test group, and the negative relationship between SIS and ISA might be significant.

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Conflicts of interest

There are no conflicts of interest.

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