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| RESEARCH ARTICLE

Digital Narratives for Academic Success: Enhancing Student Achievement through Storytelling

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| ABSTRACT

This study looked at how Digital Story-telling (DST) affected high school students studying English as a second language in terms of their learning motivationm, critical thinking, and academic achievement. This year-long study included 48 10th-grade students from two English courses using a quasi-experimental design with pretest and posttest assessments. Information technology-integrated instruction at two levels—lecture-style (for the comparison group) and DST (for the experimental group)—was the independent variable. In order to assess how well DST improves learning outcomes, both quantitative and qualitative data were gathered. This included critical thinking and English language competence tests as well as questionnaire answers about learning motivation. The collected data underwent examination through descriptive analysis, analysis of covariance (ANCOVA), multivariate analysis of covariance (MANCOVA), and qualitative content analysis. Our findings show that participants in the DST group surpassed those in the lecture-style ITII group concerning critical thinking, learning motivation, and English proficiency. Insights gathered from interviews underscore the noteworthy educational impact of DST. Both the teacher and students expressed that DST elevated their understanding of course content, heightened their curiosity, and enhanced their critical thinking abilities—essential skills for equipping students for the dynamic challenges of the 21st century. Incorporating stories from Palestinian culture, rooted in the real-life experiences of students, has been successfully undertaken to enhance the cultural relevance of DST. This addition brings a valuable dimension to the research, providing a more comprehensive understanding of how DST impacts students' learning experiences. By integrating these authentic narratives, the study successfully captures the cultural richness and diversity inherent in the students' backgrounds, thereby enriching the overall research findings.

| KEYWORDS

Digital Story-telling; Academic Achievement; Critical Thinking; Learning Motivation; Information Technology-Integrated Instruction; Quasi-Experimental Design; Multivariate Analysis; Palestinian Culture; Real-life Experiences;21st Century Skills.

| ARTICLE INFORMATION

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1. Introduction

Rapid technology breakthroughs have changed the educational landscape in the ever-changing 21st-century learning environment. The characteristics of this evolving landscape include abundant access to information, the integration of emerging technologies in classrooms (such as mobile devices, online applications, and social media tools), and the ability to collaborate and contribute on an unprecedented scale (Malita & Martin, 2010). Teachers and researchers now have the task of equipping students with the knowledge and abilities required for 21st-century citizenship in response to these shifts. The Partnership for 21st-century Skills (2004) and other scholars have published publications that place a strong emphasis on information literacy, learning motivation, critical thinking, and core topics. It has been proposed that accomplishing modern educational goals requires a synergy between technical breakthroughs and pedagogical innovations. Scholars suggest an optimal mix of technology-integrated learning

and social constructivism to satisfy the needs of the present educational landscape (Koohang et al., 2009; Neo & Neo, 2010). The concepts of social constructivism emphasize how crucial it is for students to work together in a real-world setting, constructing and reconstructing ideas while utilizing the resources at their disposal (Vygotsky & Cole, 1978). Teachers have pushed for information technology-integrated instruction (ITII) based on social constructivist theory because they see technology as an essential teaching tool. IT-integrated learning is essential, but putting it into practice effectively might be difficult if one has the necessary expertise in technology-supported pedagogy. Three categories of technology-supported teaching exist (a) replacement, (b) amplification, and (c) transformation (Hughes, 2006). Every category reflects many ways that technology works to accomplish learning objectives. Instructors frequently turn to comfortable and accustomed uses of technology, such as providing course material via PowerPoint slides, rather than experimenting with cutting-edge instructional tactics, even if technology-supported approaches have the potential to be transformational. The availability of sophisticated, affordable, and user-friendly digital cameras and multimedia editing software is one of the technical innovations impacting education and presents a fantastic opportunity for creative teaching and learning. With these tools at hand, digital Storytelling (DST) presents itself as a potentially transformational technology-enabled method. DST entails the production of multimedia narratives that promote information literacy, drive, and critical thinking abilities. This study is to investigate how students' learning experiences are affected by varying ITII levels, particularly lecture-style ITII and DST.

1.1 Digital Story-telling (DST)

According to Porter (2006), digital story-telling (DST) is a cutting-edge method that creates personal narratives by fusing the age-old craft of oral Storytelling with a variety of technology resources, graphics, including image music, and sound. Numerous research studies have proven the usefulness of DST in overcoming traditional story-telling approaches. DST has been demonstrated to improve student enthusiasm, engagement, and focus; it also fosters teamwork and idea organization; it makes difficult material easier to understand; and it presents information in a way that makes sense (Robin, 2005, 2008; Sadik, 2009).

1.2 DST and academic achievement

In order for innovative technology-supported instructional strategies to be considered appropriate and permanent options for instructors, their influence on students' academic performance must be evaluated. Researchers have examined the effectiveness of DST in increasing students' academic achievement. In terms of language learning, researchers (Ellis, 1993; Gomez, Arai, & Lowe, 1995; Schank, 1991) have demonstrated that, at an early stage of In the realm of language acquisition, there exists a positive correlation between academic achievement and oral behaviors such as repeating, chanting, and singing. Narratives, especially those conveyed through Storytelling, play a pivotal role in early learning and have the potential to influence the essence of intelligence (Schank, 1990; Tsou, 2004). Specifically, the efficacy of Digital Storytelling (DST) has been validated in enhancing listening comprehension skills among elementary school students learning English as a second language (Tsou, Wang, & Tzeng, 2006). The author recommends that forthcoming studies encompass diverse age groups and delve into various linguistic aspects. DST is a useful tool for teachers and students alike since it provides objective evaluation standards, intuitive software, and methodical teaching techniques. It is consistent with constructivism's "learning by doing" immersion approach and offers a straight-forward process that makes it easier for teachers to create educational activities. Four stages usually comprise the DST story-telling process: pre-production, production, post-production, and dissemination (Chung, 2006; Gere, 2002).

Students participate in a range of activities throughout the pre-production stage, such as asking questions, researching current events, writing scripts, submitting them for peer critique, reading stories aloud, and creating story-boards and narrative maps. Teachers start the process by asking questions about the lives and interests of their students, which motivates them to consider their options and choose a subject. Students then conduct research on the selected subject, compose scripts, and participate in peer evaluation. Practice of oral story-telling aids in their discovery of important facts. The key element and flow of the narrative are represented visually through story-boarding and story mapping. Students prepare multi-media pieces and record their voices throughout the production process. The material is organized and edited to produce the finished digital tale during the post-production stage. Students share their digital stories throughout the distribution phase and get comments. This interactive method promotes a closer relationship with the material and experiences that go beyond the curriculum.


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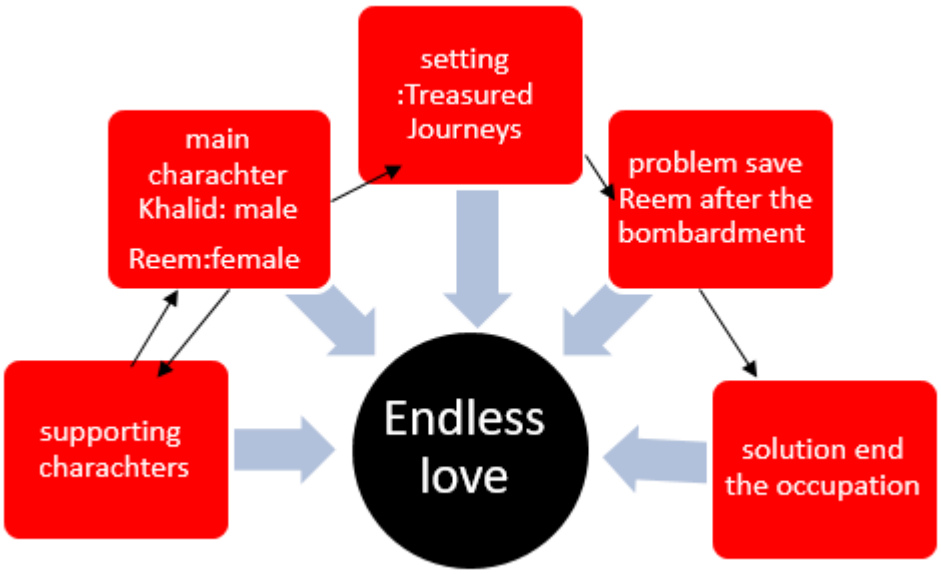

Fig. 1. Story map.

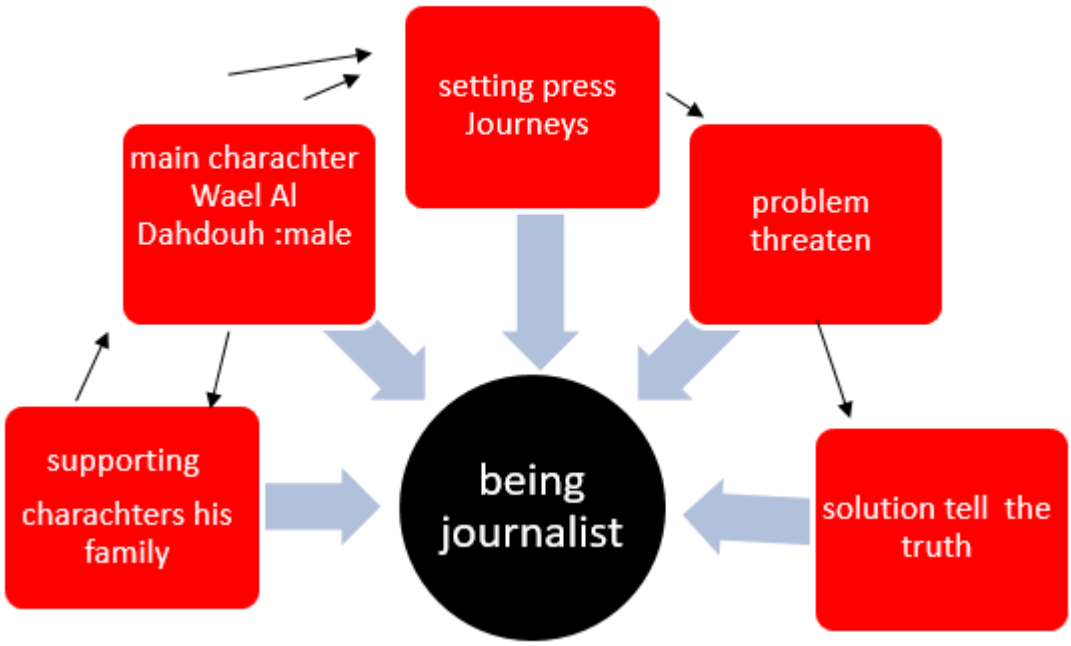

Fig. 2. Story map.

Domains like writing and reading would support the idea that acquiring a language is correlated with a media-rich environment. Therefore, the initial objective of this research was to investigate how DST affects academic accomplishment in several language domains (listening, reading, and writing).

1.3 DST and critical thinking

Improving students' critical thinking skills is another important way that DST is put to use. Scholars have stressed this as a key educational objective ever since Dewey (1910). A common definition of critical thinking provided by the American Psychological Association (APA) is "judging in

Fig. 3. Storyboard.

In light of the current information overload, students must reflectively acquire the critical thinking abilities necessary to evaluate the veracity of assertions (Yang, Newby, 2008). There are several quantifiable aspects to critical thinking, such as identifying presumptions, inferring, deducing, interpreting, and assessing arguments (Yeh, 2003).

Critical thinking, as articulated by Facione (1990), entails the adept conceptualization, application, analysis, synthesis, and evaluation of information derived from observation, experience, reflection, reasoning, or communication. In the context of creating digital stories, students engage in actively collecting evidence to substantiate the plot, drawing parallels with challenges akin to those encountered in their daily lives. By projecting these difficulties onto the protagonists of the story, they cultivate empathy and foster critical engagement. Sims (2004) asserts that...in order for story-tellers to successfully communicate their narratives, they must use critical thinking techniques, including deductions and interpretations. Through the process of crafting digital stories, students not only make decisions but also confront and overcome the difficulties presented by the characters, employing critical theorizing processes and reflective abilities (Benmayor, 2008; Maier & Fisher, 2006; Malita & Martin, 2010). This shows that using Digital Story-telling (DST) as an educational technique might help students become more adept at critical thinking. Though critical thinking is widely recognized as an essential educational objective, little study has been done on how DST specifically affects critical thinking. Thus, investigating and comprehending the impact of DST on students' critical thinking abilities is the study's second objective.

1.4 DST and learning motivation

The maintenance and enhancement of student motivation is an essential component of good learning outcomes. Numerous studies have provided evidence in favor of the claim that incorporating technology into the classroom can enhance student motivation and performance, particularly in settings that are rich in technology (Jonassen, 2000; Roblyer & Edwards, 2000). These environments include classrooms that use Information Technology-Integrated Instruction (ITII) techniques. However, given that students today are accustomed to using technology, will the traditional lecture-style ITII be enough to spark their interest in learning? According to recent research (Chang, 2005; Pintrich & Schunk, 2002; Svinicki, 2004), it is critical that educators provide engaging activities that not only use technology but also increase students' motivation and interest. This creates an atmosphere that is favorable to active learning. By providing students with real-world examples that connect to their own experiences, digital Story-telling (DST) imbues the material with meaning and purpose. Students' confidence and motivation are increased when they successfully complete difficult assignments in a dynamic learning environment (Koohang et al., 2009; Neo & Neo, 2010). As a result, DST emphasizes task value and self-efficacy for learning as two motivating components. Task value incorporates students' evaluations regarding the interest, utility, and importance of the course material (Pintrich, Smith, Garcia, & McKeachie, 1993). On the other side, self-efficacy refers to students' opinions of their potential to accomplish an academic activity (Pintrich, 1999). Thus, comparing the efficiency of lecture-style ITII and DST in promoting learning motivation is the third goal of this research.

2. Purpose of the study

Even though teachers are frequently urged to use social constructivist-based Information Technology-Integrated Instruction (ITII) methodologies to support effective learning, many still have difficulties incorporating technology into routine classroom activities. Technology is frequently used in oversimplified ways that just enhance or replace current practices. This points to a lack of training for instructors in creating transformative technology pedagogy, which results in a lack of expertise in matching technology tools and instructional materials to course content. By contrasting cutting-edge instructional technology techniques that include students in active learning and knowledge building in the classroom, this study seeks to investigate any potential gaps between lecture-type ITII and Digital Story-telling (DST). In particular, the study aims to investigate the following research issues empirically:

1. Will there be any difference in academic achievement between classes taught under different levels of ITII (lecture-type ITII and DST)?
2. Will there be any difference in critical thinking between classes taught under different levels of ITII (lecture-type ITII and DST)?
3. Will there be any difference in learning motivation between classes taught under different levels of ITII (lecture-type ITII and DST)?

3. Method

The aforementioned study issues were investigated using a pretest and posttest quasi-experiment design with an experimental group and a comparison group. Figure 3 depicts the study design.

3.1 Participants

A total of 48 participants were enlisted from two 10th-grade English classes at a comprehensive senior high school in Palestine. Entrance exam results for both classes indicated scores below the national average. The gender distribution was approximately 1:2, with a higher representation of female students. Both classes adhered to the same curriculum, had the same instructor, followed a similar schedule, and underwent identical examinations. However, they were instructed using two distinct strategies. The comparison group comprised 25 students taught with Information Technology-Integrated Instruction (ITII), while the experimental group consisted of 23 students taught using Digital Story-telling (DST). The students were further organized into eight heterogeneous groups, each comprising five individuals, based on their proficiency in English.

3.2 Independent variable

Information Technology-Integrated Instruction (ITII) was applied at two different levels—lecture-type ITII (comparison group) and Digital Story-telling (DST) (experimental group)—and was the independent variable in this study. In a lecture-style ITII, the teacher provided content-based lectures using technological aids such as computers, projectors, and presentation software. For assignments and exams that required paper work, students studied mostly alone. Occasionally, they took part in group discussions. On the other hand, students in the experimental group had an active part in developing DST assignments. This involved creating coursework-related projects by fusing their own voices with visuals, graphics, music, and sound effects. Following an introduction to the course topic, students were directed through the four phases of DST (refer to Fig. 1) to collectively produce digital tales. Table 1 lists the precise curriculum activities and time allotment for the two ITII levels.

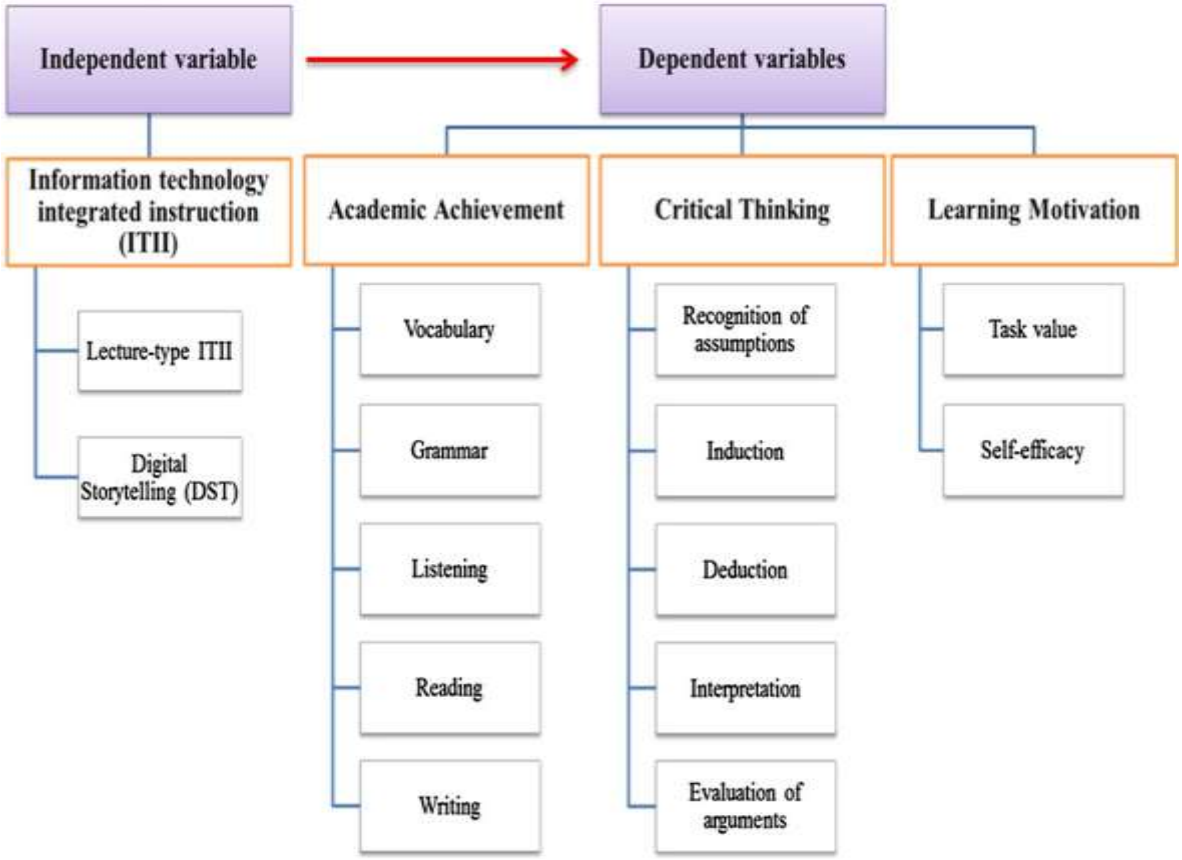

Fig. 3. Research design.

3.3 Dependent variables

The following tests were used to measure the three dependent variables in this study: students' academic success in English, their capacity for critical thought, and their drive to learn:

English Achievement Test (EAT): To assess students' academic performance in English, the researchers and the teacher created the

EAT. The vocabulary, grammar, hearing, reading, and writing components made up its five divisions. There were multiple-choice questions in the first four parts, totaling 100 points. Writing a 100-word essay about traditional festivals based on two photos was the writing assignment for the writing part. The General English Proficiency Test (GEPT) Level 1 Writing Rubric was used to evaluate the writing component.

Level I of the Critical Thinking Test (CTT-I):

The CTT-I, designed by Yeh (2003), contained five subscales: recognition of assumptions, induction, deduction, interpretation, and evaluation of arguments. There were five multiple-choice questions on each subscale, for a total score of 25. The CTT-I's total Cronbach's alpha was 76. Motivated Techniques for Learning Questionnaire (MSLQ): Participants' learning motivation and techniques were evaluated using the MSLQ (Wu & Cherng, 1992). Eleven items, namely from two pertinent MSLQ subscales—six for task value and five for self-efficacy for learning—were employed. With correlations across the MSLQ's other motivational subscales ranging from 17 to 79, both subscales showed general construct validity and strong internal consistency (Cronbach's alpha of.91 and.89, respectively). To guarantee accurate measurement of the designated dependent variables, the aforementioned devices underwent meticulous selection and validation.

Table 1 Class activities and time allocation for the two levels of ITII

Class activities	Comparison group (lecture-type ITII)	Time allocation	Experimental group (DST)	Time allocation
Instruction	Instructor provides leading questions.	5%	Instructor provides leading questions.	5%
	Instructor presents course content with PowerPoint & textbook.	75%	Instructor presents course content with PowerPoint & textbook.	5%
Student tasks	Students collaborate on team work.	10%	Students collaborate on DST project (including four phases: pre-production, production, post-production, and distribution)	70%
Student presentations	Students present their team work.	5%	Students present their DST project and post it to the class blog, accessible for a global audience.	10%
	Instructor provides feedback on students' presentation.	5%	Whole class provides Feedback for the DST presentations.	10%

Table 2 Questions from the two MSLQ subscales.

Task value		
Interest	1	I am very interested in the content area of this course.
	2	I like the subject matter of this course.

Importance this class.	3	It is important for me to learn the course material in
	4	Understanding the subject matter of this course is very important to me.
Usefulness in other courses.	5	I think I will be able to use what I learn in this course
	6	I think the course material in this class is useful for me to learn.
Self-efficacy		
7	I'm certain I can understand the most difficult material presented in the readings for this course.	
8	I'm confident I can understand the basic concepts taught in this course.	
9	I'm confident I can understand the most complex material presented by the instructor in this course.	
10	I believe I will receive an excellent grade in this course.	
11	I'm certain I can master the skills being taught in this course.	

3.4 Research procedures

The researcher held a number of meetings and conversations before starting the trial to acquaint the teacher with the study methods, which included DST-based instruction, critical thinking, and learning incentive techniques. For the first semester, the researcher and teacher worked together to create 10-week lesson plans and class activities. Two research groups participated in the study, which used a pretest and posttest quasi-experimental approach. Over the course of 22 weeks, both programs met twice a week for 45-minute sessions. Students in both groups took three pretests (EAT, CTT-I, and MSLQ) at the beginning of the semester (week 1). They then finished the identical three examinations and took part in posttest interviews in week 22. The interviews were placed in groups and lasted between fifteen and twenty minutes. The two chosen topics for this experiment were "Palestinian cause" and "Palestinian Folklore," each extending over 10 weeks. Table 3 delineates the class schedule, detailing DST activities specially tailored for the experimental group.

Class Outline for Experimental Group:

Week 1: Introduction and Pretest

- Pretest: EAT, CTT-I, and MSLQ
- Introduction to Digital Story-telling (DST) procedures
- Group formation and division
- Introduction to vocabulary, grammar, and content
- Showcase a self-made digital story

Week 2: Topic 1 - Khaled and Reem (Ws 2–11) - Pre-production Phase

- Pose questions and present an authentic scenario
- Group discussion on posed questions
- Set up an authentic scenario related to traditional Chinese festivals
- Explore topic information and choose a traditional festival for DST

Week 3: Topic 1 - Khaled and Reem (Ws 2–11) - Script & Peer Review (Part 1)

- Scriptwriting: Compose the 1st draft of the story
- Peer review of the 1st draft
- Revision of the 2nd draft based on peer feedback

Week 4: Topic 1 - Khaled and Reem (Ws 2–11) - Script & Peer Review (Part 2)

- Continued work on scriptwriting
- Peer review of the revised script
- Finalize the script for oral Story-telling

Week 5: Topic 1 - Khaled and Reem (Ws 2–11) - Oral Story-telling and Story Mapping

- Perform oral Story-telling within the groups
- Share comments and feedback on oral Story-telling
- Design story maps and storyboards for the final presentation

Week 6: Topic 1 - Khaled and Reem (Ws 2–11) - Production Phase

- Search for images and audio relevant to the story
- Record any additional content needed for the digital story

Week 7: Topic 1 - Khaled and Reem (Ws 2–11) - Post-production Phase

- Edit digital stories using Microsoft Photo Story 3
- Refinement and enhancement of multimedia content

Week 8-9: Topic 1 - Khaled and Reem (Ws 2–11) - Distribution Phase

- Upload completed digital stories to the class blog
- Homework: Watch and provide comments on peers' digital stories online

Week 10-11: Topic 1 - Khaled and Reem (Ws 2–11) - Final Oral Report and Reflection

- Final oral presentation of the digital stories
- Share reflections on the DST process and received comments
- Provide a conclusion for Topic 1

Week 12-21: Topic 2 - Wael Al Dahdouh - Similar Process Using Microsoft Movie Maker and once upon a bot

- Follow the same DST process as Topic 1 but using different software (Microsoft Movie Maker and once upon a bot)

Week 22: Conclusion and Posttest

- Posttest: EAT, CTT-I, MSLQ, and interviews
- Concluding remarks on both Topic 1 and Topic 2
- Evaluation of the overall DST experience

Table 3 Descriptive statistics for English academic achievement.

EAT (maximum score)	Comparison group					Experimental group				
	Pretest		Posttest			Pretest		Posttest		
	M	*SD*	*M*	*SD*	*Adj.M*	*M*	*SD*	*M*	*SD*	*Adj.M*
Vocabulary (20)	9.29	3.76	14.14	4.67	14.82	10.59	4.34	16.67	2.77	15.96
Grammar (20)	8.39	2.92	12.82	4.17	13.98	12.48	3.27	16.67	2.88	15.47
Listening (20)	12.05	5.46	9.73	5.43	10.29	10.65	5.32	14.26	4.99	13.68
Reading (20)	7.68	3.14	7.61	4.75	8.75	10.67	3.30	12.93	4.34	11.74
Writing (20)	3.14	4.40	1.76	4.03	2.35	8.86	6.08	11.29	4.72	10.68
Total score (100)	40.55	9.88	46.06	16.16	49.93	53.25	13.17	71.81	12.74	67.80

The two sessions had identical learning objectives: teaching vocabulary, grammar, listening, reading, and writing abilities; moreover, the students were expected to gain familiarity with the Palestinian cause and other pertinent Palestinian causes. On the other hand, the lecturer used PowerPoint slides and textbook readings to lecture the comparison group on the two subjects. As a group assignment, the students debated the textbook's questions and composed a piece of writing on the subjects. Ultimately, they used presentation software to showcase their work in groups.

The lecturer taught the identical subjects to the experimental group using PowerPoint slides and textbook readings as well. In contrast to the comparison group, the experimental group members were tasked with working together to create digital stories. Based on how the obligations for the DST-related activities were designed, the students were divided into groups of five individuals. At the start of the first week, the researcher stressed the value of group cooperation. Individual tasks (such as screenplay writer, photographer, and animator) were then chosen and recorded on a group collaboration sheet. To promote active involvement, students were told that their final project ratings would be determined by how much they contributed to the group.

For the two DST themes, technology utilization was scaffolded. During the first subject, Microsoft Photo Story 3 was utilized with students who knew the basics of editing. Microsoft Movie Maker and Once Upon a Bot were used for topic two, enabling more sophisticated features. The following is a description of a comprehensive teaching approach and DST activity related to subject two, "Wael Al Dahdouh." The lecturer went over work tasks for the DST task, including writing, art design, acting, and video editing, at the beginning of the course (week 12). Additionally, the teacher exhibited a self-made digital tale and spent approximately fifteen minutes quickly explaining the course material, grammatical rules, and important terminology.. he asked some open-ended questions on the subject in week 13 in an effort to get the children talking. Some examples of questions to ask include: "who is Wael Al Dahdouh? What happened to his family?" and "why he kept working as a journalist? "Why not, and why not?" After that, the teacher gave the class scenario: a contest to create a narrative for Wael. Next, the students selected one Palestinian journalist to feature in their digital narrative and used the internet to research the subject.

After week 14, students took on more of an active leadership role, with the teacher taking on the position of a facilitator, keeping an eye on each group's progress and offering assistance only when necessary. Together with group members, they worked alone to find solutions to issues. They worked together to write their story's first draft during weeks 14 and 15; then, they made revisions to the second draft based on feedback from their peers. Based on English vocabulary, grammar, narrative logic, and tale content, each group offered their observations.

Each group performed their narrative screenplay on stage for around five minutes in week sixteen. After that, they exchanged feedback so that they could make revisions and compose the final manuscript. After that, group members worked together to create storyboards and narrative maps based on the final versions. In week 17, students looked for pictures and music, and then they captured all the multimedia information they needed. Following that, they moved on to the post-production stage, using Microsoft Movie Maker and once upon a bot to edit the digital narrative. Every group had to post their finished digital stories to the class blog, which was visible to everyone on the planet. Before the next sessions (weeks 18 and 19), they also had to watch a total of seven digital tales and remark on each other's posts online.

Each group gave a final report and presentation of their work on stage during the last two weeks (20 and 21). Students were invited to submit their thoughts about the DST task, including any intriguing, thrilling, or upsetting events that happened, as well as any challenges they had and how they overcame them. In addition, the instructor concluded by giving comments on each group's performance and summarizing the lessons the students had learnt during the preceding ten weeks.

3.5 Data analyses

For this study, data in both quantitative and qualitative forms were gathered. The means, standard deviations, and adjusted means for the three tests (EAT, CTT-I, and MSLQ) between the two groups were described using descriptive statistics. After 22 weeks of teaching, the final learning outcomes of the two research groups were compared using analysis of covariance (ANCOVA), with pretest scores on the EAT, CTT-I, and MSLQ acting as variables to remove the influence of any previous pretest differences on the results. Multivariate analysis of covariance

Table 4 ANCOVA summary table for English academic achievement.

SV	*SS*⁰	*Df*	*MS*⁰	*F*	*p*
Pretest EAT	5602.38	1.00	5602.38	34.50	.00*
Between (Group)	6727.71	1.00	6727.71	41.43	.00*
Within (Error)	17373.36	107.00	162.37		
Total	420220.00	110.00			
Corrected total	41194.10	109.00			

*$p < .05$.

Table 5 MANCOVA summary table for English academic achievement.

Table 6
MANCOVA summary table for English academic achievement.

SV	*Df*	*SSCP*	*Wilks' fl*
Between	1	169.24 56.67 73.95 149.13 414.74 18.98 24.76 73.95 24.76 32.31 65.17 181.23 149.13 56.6 49.94 65.17 131.41 365.47 49.94 138.88 414.74 138.88 181.23 365.47 1016.41	.62*
Covariances	5	274.82 249.02 238.81 282.06 153.22 305.93 305.36 238.81 305.36 366.88 315.90 118.64 282.06 263.51 315.90 434.37 206.21 263.51 130.66 153.22 130.66 118.64 206.21 162.04	.56*
		249.0	
		2	
Within	103	2666.54 309.80 380.18 549.08 307.15 309.80 1300.93 648.03 554.30 385.94 380.18 648.07 1031.34 556.84 66.12 549.08 554.30 556.84 1806.70 337.14 307.15 385.94 66.12 337.14 1910.26	

*$p < .05$.

The three posttests' subscales were compared using (MANCOVA) and post hoc comparison (Bonferroni confidence intervals) to see if there was a significant difference. The teacher and student interviews were assessed qualitatively using the outcome variables as a framework. The interview data gathered from questions pertaining to the participants' experiences and perspectives was arranged using a content outline. Utilizing terms like academic achievement, critical thinking, and learning motivation, categories were formed during the transcription and analysis of audio recordings utilizing protocol analysis.

4. Results and discussion

4.1 Academic Achievement in English

Table 4 displays descriptive data for the English scores between the two research groups, including means, standard deviations, and adjusted means. On the posttest, both research groups showed improvement. However, the ANCOVA findings demonstrate a significant difference in EAT posttest scores between the comparison group (lecture-type ITII group) and the experimental group (DST group), $F(1, 107) = 41.43$, $p = .00$, partial $\eta 2 = .28$ (see Table 5). Taking into consideration the partial eta squared of .28, we may infer that DST had a very large main effect on academic success in English (Cohen, 1988, pp. 280–287; Richardson, 2011).

The outcomes of the Multivariate Analysis of Covariance (MANCOVA) demonstrate significant differences in the posttest scores on the five subscales of the English Achievement Test (EAT) between the experimental and comparison

groups (Wilks' λ = .62, F(5, 99) = 12.01, p = .00). Subsequent Bonferroni confidence interval analysis revealed notable distinctions in the listening, reading, and writing subscales.

Listening Skills: The experimental group exhibited superior listening skills compared to the comparison group. This aligns with findings from Tsou et al. (2006) and Verdugo and Belmonte (2007). The collaborative nature of digital Story-telling (DST) requires active listening during story presentations, evaluations, and feedback sessions. The immersive English language environment, coupled with the use of advanced technology for voice recording and audio editing, contributed to enhanced listening comprehension.

Reading and Writing Skills: DST students actively participated in both process-oriented and product-oriented tasks involving story map construction, feedback notes, and final script writing. Engaging with English materials of varying complexity, summarizing content, and providing critical perspectives during peer reviews contributed to improved reading and writing skills. The authentic and collaborative construction of meaning in DST fostered a more productive language learning environment compared to the traditional instructional setting.

This analysis suggests that DST, with its emphasis on collaboration and production, positively influences listening, reading, and writing skills, providing students with a more immersive and effective language learning experience.

Table 6 Post hoc comparison for subscales of English academic achievement.

Subscales	Comparison of groups	Mean difference	95% Confidence interval		Direction of difference
			Lower bound	Upper bound	
Vocabulary	E–C	1.14	—.70	2.98	E = C
Grammar	E–C	1.49	—.15	3.13	E = C
Listening	E–C	3.40*	.76	6.04	E > C
Reading	E–C	3.00*	.82	5.17	E > C
Writing	E–C	8.33*	6.10	10.56	E > C

*$p < .05$.

Table 7 Descriptive statistics for critical thinking.

CTT-I (maximum score)	Comparison group					Experimental group				
	Pretest		Posttest			Pretest		Posttest		
	M	*SD*	*M*	*SD*	*Adj.M*	*M*	*SD*	*M*	*SD*	*Adj.M*
Recognition of assumptions (5)	4.20	.82	4.30	.74	4.30	4.17	.72	4.33	.64	4.33
Induction (5)	3.86	1.09	4.00	.91	4.00	3.87	1.03	4.19	.85	4.19
Deduction (5)	4.14	.88	4.11	1.00	4.12	4.13	.87	4.33	.73	4.32
Interpretations (5)	3.32	1.18	3.46	1.22	3.42	3.02	1.16	3.83	.93	3.88
Evaluation of arguments (5)	2.48	1.13	2.48	1.25	2.46	2.17	1.09	3.28	1.12	3.30
Total score (25)	18.00	3.21	18.36	3.04	18.22	17.35	2.66	19.96	2.29	20.11

Usage of language, structure, logic and storyline by offering constructive comments in English; according to Verdugo and Belmonte (2007), using a media-rich environment for reading and writing relied on the usage of multimedia materials, including images, videos, and sounds, which helped students build the knowledge necessary for composition and comprehension of the English language. In other words, a multimedia approach to Story-telling with DST provided the foundation and structure necessary to create an environment where both productive and receptive language skills could be used. DST functioned as a transformative technology-supported pedagogy by successfully integrating English language learning in a constructivist context that valued and embraced collaboration, feedback, and self-production of authentic materials for a given subject, even though ITII also offered opportunities for technology-supported reading and writing.

Information obtained from teacher and student interviews helps to triangulate the quantitative results with the viewpoints of the participants. These instances highlight the value placed on immersion learning environments for English language learners, where students work together to write and revise scripts and then produce finished digital stories. The instructor's and students' replies for the experimental group are shown in the following examples (where S stands for student responses and I for instructor feedback):

> I: "DST served as an integrated teaching approach to support students' English language acquisition. When they were doing DST, I mandated that they speak in English the entire time. The 16-year-old kids found this difficult, but at least they gave it their best go. Their grades in English demonstrated their growth. Though not as much, the other class (the comparison group) did improve as well.

S1: "In order to search for information on the topic, I read lots of English materials and wrote them into our script. My reading and writing abilities in English seem to have improved.

S2: "The content was difficult, and I had to read several scripts when proceeding with the peer review. My English skills have considerably improved after going over the scripts for each group.

Despite placing more of a focus on project-based learning than memorizing and testing, the DST group appears to have performed on par with the lecture-type ITII group, as seen by the lack of significant variations in vocabulary and grammatical scores between the two groups. In the lecture-style ITII group, for instance, the teacher asked students to read aloud and commit new vocabulary and grammatical patterns to memory while presenting and reinforcing the material using technology like PowerPoint. Therefore, While the lecturer gave the DST group a quick introduction to vocabulary and grammar before they started working on their projects, the ITII group members spent more time preparing for practice exams. As a result, in the process of creating and rewriting their stories, the DST group—who was expected to write finished scripts with precise vocabulary and accurate grammar—had to negotiate the meaning of vocabulary and grammar patterns through their experiences and interactions with curriculum content. Although both groups performed comparably on vocabulary and grammar exams, it might be argued that the DST group was provided with a more significant setting in which to use these language components.

4.2 Critical thinking

Descriptive statistics for critical thinking skills (as assessed by the CTT-I) are shown in Table 8. Table 9 presents the ANCOVA results, which indicate a significant difference in critical thinking scores ($F(1, 107) = 17.07$, $p = .00$, and partial $\eta 2 = .14$) between the experimental and comparison groups. According to Cohen (1988, pp. 280–287), an effect size of.14 is considered significant.

Furthermore, Wilks' fl =.85, $F(5, 99) = 3.45$, $p = .01$ shows that posttest results on the five CTT-I subscales varied significantly between the two research groups according to MANCOVA results. Consequently, an analysis of Bonferroni confidence intervals was performed as a follow-up test (refer to Tables 10 and 11). The post hoc comparison results revealed a substantial difference between the two groups on two subscales: interpretation and judgment of arguments. These significant differences suggest that the DST project supported students' overall critical thinking growth, particularly in regard to tasks that required them to evaluate and analyze arguments.

Table 8 ANCOVA summary table for critical thinking

SV	*SS*'	*Df*	*MS*'	*F*	*p*
Pretest CTT-I	178.13	1.00	178.13	31.42	.00*
Between (Group)	96.77	1.00	96.77	17.07	.00*
Within (Error)	606.65	107.00	5.67		
Total	41176.00	110.00			
Corrected total	855.67	109.00			

*$p < .05$.

Table 9 MANCOVA summary table for critical thinking.

SV	Df Wilks' Λ	SSCP	
Between	1	.03 .16 .17 .37 .68 3 1.06 2.35 4.29 .17 1.1 1.14 2.13 4.60 .37 2.3 2.63 5.14 10.26 .68 4.2 4.60 10.26 18.68	.85*
.16 .9			
Covariances	5	7.38 7.42 4.05 3.58 4.32 7.42 14.72 9.47 14.36 9.51 4.05 9.47 9.17 8.89 3.19 3.58 14.36 8.89 26.21 9.74 4.32 9.51 3.19 9.74 10.54	.53*
Within	103	44.46 2.25 −4.87 5.53 2.48 2.25 69.43 6.20 10.32 5.71 −4.87 6.20 74.19 17.321.92 5.53 10.32 17.32 101.22 21.23 2.43 5.71 1.92 21.23 142.28	

*$p < .05$.

The nature of Story-telling tasks—which require authors to build a storyline and persuade others of the events depicted in their stories—may contribute to the DST group's progress in terms of interpretation (Sims, 2004). Using a story map (refer to Fig. 1) helped students build a coherent framework for a digital narrative. Creating a storyboard and composing a script together (refer to Fig. 2) improved participants' comprehension of the significance of certain textual, aural, and visual elements within the framework of a cogent and plot-driven structure. Furthermore, Hughes (2005) notes that the use of software for the purpose of organizing and modifying multimedia narrative parts necessitated a certain level of knowledge of the instructional content as well as the flexibility with technology required to promote critical reflection during the process.

In the context of Palestinian culture, Digital Story-telling (DST) served as a platform for fostering decision critical reflection, encouraging students to interpret cultural elements and make thoughtful choices in their narratives. For instance, during the creation of digital stories based on Palestinian traditions, students were tasked with envisioning cultural events or activities for potential participants.

One group, focusing on a Palestinian cause ceremony, incorporated decision critical reflection into their narrative. The narration developed for their digital story is outlined below:

> "*Narrator: As you join us in the vibrant celebration of a Palestinian cause, you'll witness the lively 'Dabke Dance Zone' we've prepared. This decision reflects our cultural pride, as the Dabke dance holds immense significance in our weddings, symbolizing unity and joy for our community.*"

In this scenario, the DST approach not only allowed for the creative representation of cultural practices but also prompted students to critically reflect on the cultural relevance and significance of their chosen elements. By making decisions rooted in their cultural heritage, students deepened their understanding of Palestinian traditions and honed their interpretative and decision-making skills.

Incorporating peer review into the DST process played a pivotal role in enhancing students' proficiency in scrutinizing arguments. Engaging in DST demanded extensive peer interaction as they refined their narratives, thereby refining their ability to comprehend and evaluate arguments. This aligns with findings from prior studies (Benmayor, 2008; Maier & Fisher, 2006; Sims, 2004), emphasizing the connection between critical thinking, compelling Story-telling, and character decision-making. DST group participants not only improved their skills in assessing the information presented by their team members during the drafting stage but also enhanced their capability to evaluate diverse information sources and perspectives within a group setting by participating in peer assessments of project presentations from other groups. Through an interactive process of negotiating ideas, they collaboratively identified arguments or propositions that harmonized with their narratives. The participants offered feedback, suggestions, and justifications for their recommendations after a thorough examination of the scripts and presentations of other groups. For instance, in the scenario mentioned earlier, the Palestinian symbols groups sought more detailed justifications from the Palestinian landmarks group regarding the proposed activities, and the latter responded with specific suggestions. This interactive peer review process facilitated the improvement of both reviewers' and presenters' abilities to analyze and evaluate arguments in the context of Palestinian culture.

Table 10 Post hoc comparison for subscales of critical thinking.

Subscales	Comparison of groups	Mean difference	95% Confidence interval		Direction of difference
			Lower bound	Upper bound	
Recognition of assumptions	E–C	.03	—.22	.28	E = C
Induction	E–C	.19	—.12	.51	E = C
Deduction	E–C	.21	—.12	.53	E = C
Interpretation	E–C	.46*	.08	.84	E > C
Evaluation of arguments	E–C	.84*	.39	1.29	E > C

*p < .05.

Table 11 Descriptive statistics for learning motivation.

MSLQ (maximum score)	Comparison group					Experimental group				
	Pretest		Posttest			Pretest		Posttest		
	M	*SD*	*M*	*SD*	*Adj.M*	*M*	*SD*	*M*	*SD*	*Adj.M*
Task value (36)	26.23	4.05	25.09	4.54	25.67	28.54	3.37	29.43	3.83	28.83
Self-efficacy (30)	16.61	3.80	17.61	4.50	18.28	18.56	4.16	20.57	3.92	19.88
Total score (66)	42.84	6.72	42.70	7.90	44.01	47.09	6.20	50.00	6.80	48.64

Interview data was used to triangulate the findings from the quantitative data. The statements below reflect the emphasis of the peer review process (both internal, see S3, and external, see I and S4) in terms of fostering critical and reflective thinking as well as an emphasis on logic and reason:

I: "Training in critical thinking takes time. The peer review really helps students evaluate others' advantages and disadvantages, which is lacking in traditional English writing classes."

S3: "Exploring a topic related to Palestinian culture was captivating. We delved into various aspects of our culture and brainstormed activities that could authentically represent our traditions. It was crucial for the activities to resonate with our cultural values and make sense in the context."

S4: "Providing feedback on others' scripts posed challenges. While I could identify issues, it was crucial to articulate the reasons to the groups. This helped them in revising the script to ensure it became more culturally relevant and authentic."

Although the DST group did not substantially outperform the comparison group on the other three critical thinking subscales (i.e., recognition of assumptions, inductions, and deductions), both groups scored better than 4.00 on these two subscales on the pretest and posttest (refer to Table 8). There could not have been much possibility for advancement because each subscale could only receive a score of 5. Given that the findings showed how well technology-enhanced instruction raised students' ability to recognize assumptions and draw conclusions, More sensitive assessments of inductive and deductive reasoning abilities or more detailed training in inductive reasoning may be necessary to get superior results. In order to promote induction, future DST activities may be created where students are required to finish a tale and base their judgments on the facts presented before.

4.3 Learning motivation

Table 12 summarizes descriptive statistics, including means, standard deviations, and adjusted means for learning motivation, measured by the MSLQ. The mean scores of the experimental group were higher than those of the comparison group on both the pretest and posttest. The results obtained by ANCOVA indicated a significant difference in the total scores for learning motivation between these two groups, $F(1,107) = 13.87$, $p = .00$, partial $\eta^2 = .11$ (see Table 13).

Additionally, the MANCOVA results showed a significant difference in the posttest scores for the two MSLQ subscales between the two study groups (Wilks' fl =.86, F(2, 105) = 8.36, p =.00). Thus, an analysis of the Bonferroni confidence intervals was done as a follow- up test (E and C refer to the experimental group and comparison group, respectively;

see Tables 14 and 15). The post hoc comparison outcomes showed that there were substantial differences between the two research groups on the task value and self-efficacy subscales. In a rich multimedia classroom, the dynamic and interactive process of creating and publishing digital stories aroused students' motivation. DST gave students a meaningful, authentic scenario related to their personal experiences (Jonassen, 2000; Pintrich & Schunk, 2002; Roblyer & Edwards, 2000). Regarding task value, students mentioned that the technical abilities they had acquired throughout DST assignments might be used in other classes, such as computer and art classes. In order to meaningfully support the story and learning objectives, each Story-telling activity required students to use technology for the purpose of choosing, editing, and presenting multimedia materials. This helped students build their media and technology skills (EDUCAUSE Learning Initiative, 2007). Learning English turned into a worthwhile endeavor for the pupils when they used it to create digital stories. Furthermore, by working in a collaborative setting, students were able to acknowledge their own contributions to the group's overall work—a genuine and meaningful published story—while still concentrating on their particular responsibilities within the group. However, the comparison group did not see a discernible increase in student motivation as a result of the deployment of technology for the purposes of replacement and amplification, which did not change the instructional goals/tasks.

In terms of learning self-efficacy, DST participants were aware that their tales may be viewed by others online, and their interests and talents are reinforced, thereby driving them to generate their best work (Standley, 2003). According to constructivism, when a teacher acts as a facilitator, the pupils take ownership of their education, react at their own speed, and participate in the process of learning. When students worked together to complete digital tales, they developed expectations for themselves and thought they could succeed at this challenging activity, which affected their

Table 12 ANCOVA summary table for learning motivation.

	SS	*Df*	*MS*	*F*	*p*
Pretest MSLQ	1791.16	1.00	1791.16	46.83	.00*
Between (Group)	530.50	1.00	530.50	13.87	.00*
Within (Error)	4092.68	107.00	38.25		
Total	242971.00	110.00			
Corrected total	7350.26	109.00			

*$p < .05$.

Table 13 MANCOVA summary table for learning motivation.

SV	*Df*	*SSCP*		*Wilks'* fl
Between	1	246.81	125.15	.86*
		125.15	63.46	
Covariances	2	331.66	389.60	.52*
		389.60	801.76	
Within	106	1582.10	632.16	
632.16	1124.81			

*$p < .05$.

Table 14 Post hoc comparison for subscales of learning motivation.

Subscales	Comparison of groups	Mean difference	95% Confidence interval		Direction of difference
			Lower bound	Upper bound	
Task value	E–C	3.16*	1.62	4.70	E > C
Self-efficacy	E–C	1.60*	.30	2.90	E > C

*p < .05.

Beliefs in self-efficacy, as highlighted by scholars such as Koohang et al. (2009), Neo & Neo (2010), and Pintrich (1999), are crucial for motivating student learning. While IT-integrated instruction does offer certain advantages, the absence of a student-centered focus on technology for transformative learning constrains its impact on student learning motivation. The strength of DST lies not only in creating a technology-rich environment to enhance learning and production but also in adopting a collaborative approach to problem-solving, fostering creativity, and promoting goal-oriented learning. These aspects contribute to the development of student self-efficacy and enhance satisfaction with the learning experience.

Interview data were utilized to validate and complement the quantitative results. Both instructor and student feedback indicated that the incorporation of digital Story-telling positively influenced learning motivation in English language classes. Instructor: "I used to push my students to study English. This was the first time I tried to become a facilitator in class, and they performed well. Unlike the other class (comparison group), every student (in the experimental group) controlled the process of conducting DST, and everyone was responsible for their own learning. They were so engaged!

" Student 5: "I felt confident when I finished the DST task with my group members."

Student 6: "Recording English narration is interesting! I am willing to practice several times to make sure I can perform well." Student 7: "I would like to have an English course this way afterward! It is totally different from the way we used to learn English."

5. Conclusion

Digital Story-telling (DST), as an innovative IT-integrated instructional approach, capitalizes on technological advancements, a well-defined production process, cost-effective media materials, and an enriching learning environment that promotes collaboration and co-construction of meaning. DST proves to be a valuable tool for revitalizing learning and inspiring participants to collectively create and personalize digital narratives as authentic learning products. The outcomes of this quasi-experimental study indicate that over a 20-week period of DST instruction, high school students exhibited substantial enhancements in English proficiency, critical thinking, and learning motivation. This was particularly evident in areas such as English listening, reading, and writing (measured by the EAT), interpretation and evaluation of arguments (assessed by the CTT-I), and task value and self-efficacy (measured by the MSLQ). Furthermore, qualitative feedback from interviews with the instructor and students reinforces the potential of DST as an approach to foster collaborative second language learning within an environment that cultivates higher-order thinking and learning motivation.

While this study employed a quasi-experimental design for the extended assessment of dependent variables, certain limitations need consideration. Firstly, while our use of a self-designed English Achievement Test achieved the research goals of assessing differences in English language acquisition between the two instructional strategy levels (ITII and DST), the instrument lacks standardization with a larger sample, limiting the external validity of our findings. To address this limitation, we conducted interviews with the instructor and students. Future research should consider adopting a more rigorous approach to developing the content validity of academic achievement measures without sacrificing ecological validity, using standardized instruments (such as the MSLQ and CTT-I instruments used in this study). Regarding learning motivation, future research could also incorporate additional subscales from the MSLQ, such as goal orientation and control of learning beliefs. Future studies in DST are recommended to recognize the value of both qualitative and quantitative measures and consider the role of learner affect and engagement in learning.

While instructional design based on social constructivist and IT-integrated approaches for transformative learning has demonstrated the effectiveness of student collaboration in constructing and negotiating meaning, individual

characteristics of these digital narratives (e.g., external and internal thinking styles) should be examined. Students with an external thinking style tend to be more extroverted and prefer collaborative learning, whereas students with an internal thinking style are usually introverted and prefer solitary learning (Betoret, 2007; Sternberg, 1999). Thus, exploring the impact of different individual traits on the effectiveness of instructional strategies will help researchers and instructors adapt their instructional activities, such as collaborative versus individual work, to accommodate individual students' needs.

Additionally, further research is strongly recommended to explore the influence of DST or other technology-integrated pedagogies in promoting 21st-century skills, such as creative thinking, problem-solving, and global literacy. As our study has demonstrated the potential of DST in a specific context, investigating its broader implications for developing essential skills in the evolving educational landscape is a promising avenue for future research.

Although instructional design grounded in social constructivist and IT-integrated methodologies for transformative learning has proven the efficacy of student collaboration in constructing and negotiating meaning, the individual attributes of these digital narratives, specifically external and internal thinking styles, warrant examination. Students with an external thinking style are generally more extroverted, preferring collaborative learning, while those with an internal thinking style tend to be introverted and favor independent learning (Betoret, 2007; Sternberg, 1999). Thus, investigating the impact of diverse individual traits on the efficacy of instructional strategies will assist researchers and educators in adjusting their instructional approaches (e.g., collaborative versus individual tasks) to provide adaptive instruction tailored to the unique needs of individual students.

Furthermore, it is strongly recommended that subsequent research delves into exploring the impact of DST or other technology-integrated pedagogies on cultivating 21st-century skills, such as creative thinking, problem-solving, and global literacy. Our study has demonstrated the potential of DST in a specific context; however, investigating its broader implications for nurturing essential skills in the evolving educational landscape presents a promising avenue for future research.

To enhance academic achievement in English as a foreign language classes using DST, educators and researchers are encouraged to confidently design diverse courses that incorporate engaging and challenging digital Story-telling strategies. Through these initiatives, the cultivation of learning behaviors, encompassing academic performance, higher-order thinking, and learning motivation, will contribute to the development of active learners who are well-prepared for the transformative changes anticipated in the future.

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