Iyer, S. et al. (Eds.) (2022). Proceedings of the 30th International Conference on Computers in Education.
Asia-Pacific Society for Computers in Education

The Effects of Learning with Digital Storytelling on Classroom Engagement in a Grade 6 English Class

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Abstract: Digital storytelling (DST), an innovative pedagogical approach, has the potential to facilitate active learning in the classroom. Literature indicates that engagement is essential to effective learning. However, the investigation of the impacts of DST on learning engagement in English as a Foreign Language (EFL) education in China is scarce, especially in the K-12 context. Moreover, although related efforts have been made, few studies examine these effects with a clear focus on classroom engagement. To address this issue, this study adopted a 5-factor classroom engagement framework (affective engagement, behavioral engagement-compliance, behavioral engagement-effortful class participation, cognitive engagement, and disengagement) to investigate whether learning with DST affects multidimensional classroom engagement in a Grade 6 English class. A quasi-experimental approach with pretest and posttest was conducted, and data were collected from 70 Grade 6 students via Classroom Engagement Inventory. The quantitative results using ANCOVA revealed that there was a significant difference in overall classroom engagement between the experimental (n=35) and control groups (n=35) in the posttest, particularly in terms of the behavioral engagement-compliance and cognitive engagement. In other words, it was found that, when learning with DST in English class, students were more likely to adhere to the class norms and arrangements, as well as devote mental efforts to be strategic and self-regulated. Yet, no significant difference was manifested in affective engagement and behavioral engagement-effortful class participation, suggesting that the use of DST may not bring about more positive emotions and effortful involvement in English class. This study contributes to a realistic perspective for EFL educators and teachers to understand the potential of the DST approach through the lens of classroom engagement. The second stage of this project has been exploring the reason behind the research results, shedding light on possible mediators within DST that could facilitate or impair certain aspect(s) of classroom engagement. Further implications for DST integration in the EFL classroom can be proposed.

Keywords: Digital storytelling (DST), Classroom engagement, English as a Foreign Language (EFL), Quasi-experimental study

1. Introduction

In recent years, the pervasive technologies used in education give rise to an innovative pedagogical approach, digital storytelling (DST). As a merger of multimedia technologies and ancient storytelling (Rahimi & Yadollahi, 2017), this technology-integrated approach has shown potential to facilitate active learning in the classroom (Robin, 2016). When learning with DST, students are motivated to construct and represent their own meaning as a social practice (Bruner, 1990; Meadows, 2003; Van Gils, 2005).

In terms of classroom practice, however, the use of DST in English as a Foreign Language (EFL) education in China is rare (Niemi, Niu, Vivitsou, & Li, 2018), particularly in the K-12 context. There is a gap between the technology provision and its effective integration in the EFL classroom (Jacobsen, 2001). In fact, many English teachers are facing challenges in adopting the DST approach in their classes due to the lack of a shared vision of its potential to improve students' learning and effective professional training (Sadik, 2008).

Engagement is essential to learning success (Herrington, Oliver, & Reeves, 2003). Classroom engagement can serve as an indicator to measure the effectiveness of the DST practice in the classroom.

Recent studies have shown that effective DST integration in EFL class could bring about many learning benefits, such as increased learning motivation, enhanced student engagement, and better academic performance (e.g., Hung, 2019; Niemi & Multisilta, 2016). Nevertheless, there is still a lack of research investigating the effects of DST in EFL class with a clear focus on classroom engagement using a tailored theoretical framework and instrument. Therefore, it is meaningful and necessary to examine the impacts of learning with DST on classroom engagement in EFL education.

This study aims to explore to what extent and in what aspects learners are engaged in a Grade 6 DST English class. Based on the quantitative results yielded from this research, a more comprehensive analysis of how learning with DST affects various aspects of classroom engagement could be conducted in the second-stage study. It can contribute to a realistic perspective for EFL educators and teachers to understand the educational affordances of the DST approach to facilitate EFL learning in terms of classroom engagement (Sadik, 2008).

The following research questions guided the present study: *Does learning with digital storytelling affect multidimensional classroom engagement in a Grade 6 English class?*

2. Literature review

2.1 Digital Storytelling

In recent years, rapid advances in Information and Communication Technology have sparked many multimedia tools, providing opportunities for educators and learners to not only make use of but also create their own digital content (Churchill & Barratt-Pugh, 2020). DST, a combination of conventional storytelling with a mixture of digital content, including text, pictures, audio, music, and video (Robin, 2016), has gained popularity in many contexts, particularly in education. As a modern expression of ancient storytelling art, digital stories can be interpreted as multimodal artifacts that require students to make sense of, and then share their personal experiences through digital narratives as a social practice (Bruner, 1990; Meadows, 2003; Van Gils, 2005). Despite its promising educational benefits, to our knowledge, the effective integration of DST into K-12 EFL education in China is scarce.

2.2 Digital Storytelling in English as a Foreign Language Learning

As a student-centered approach (Barrett, 2006), DST is beneficial for student learning in various aspects. When learning with DST, students are situated in an active learning environment where they build knowledge constructively (Chubko, Morris, McKinnon, Slater, & Lummis, 2020). It facilitates collaboration and communication skills among learners as they need to go through continuous interaction and cooperation when weaving digital stories (Smeda, Dakich, & Sharda, 2014). Also, it provides opportunities to develop 21st-century skills (Niemi & Multisilta, 2016), such as critical thinking and problem-solving skills, since students as creators are expected to manage and represent ill-structured problems in their digital stories (Robin, 2008). When involved in the manipulation of a wide range of digital tools, students' digital literacy can also be enhanced (Churchill & Barratt-Pugh, 2020). Overall, the use of DST helps to facilitate a constructivist learning environment in the classroom (Smeda et al., 2014) and thus has great potential to provide better learning outcomes. So far, several empirical studies have confirmed this hypothesis (e.g., Sadik, 2008; Yang & Wu, 2012).

In EFL teaching and learning, the DST approach inherits advantages to improving EFL students' learning performance and skills. Many studies emphasized that learning with DST can promote EFL learners' language learning performance. For instance, it is suggested that students can significantly improve their writing and reading proficiencies when drafting English scripts for their digital stories (Yoon, 2014). The pervasive use of English in digital story creation and sharing provides ample opportunities for students to improve listening skills and practice speaking skills (e.g., Tsou, Wang, & Tzeng, 2006; Hwang et al., 2016; Yang & Wu, 2012). Apart from positive impacts on students' language capabilities, the DST approach in English class can also empower EFL learners' 21st-century skills as mentioned above, such as collaborative skills (Hung, 2019), critical thinking (Yang & Wu, 2012), creativity (Liu, Tai, & Liu, 2018), multiliteracy skills (Chubko et al., 2020). Thus, more practices in DST integration are needed in the EFL classroom.

Over the past decade, there has been an increasing number of researchers examining learning motivation and engagement in DST integrated EFL learning. Previous studies suggest that thanks to the meaningful scenario and interactive construction process in digital story creation, EFL learners are more likely to be engaged in deep and meaningful learning (Smeda et al., 2014) with increased motivation and interests (Sadik, 2008). However, these studies mostly center on students' long-term course and program-level engagement, which is overall student engagement, without proper contextualization (Lu, Xie, & Liu, 2022). There is a lack of research examining the effects of learning with DST in English class with a clear focus on classroom engagement. Literature on classroom engagement illustrates that learning motivation and classroom engagement are reciprocally related (Jang, Kim, & Reeve, 2012), and high-level classroom engagement can help to stimulate student motivation, thus triggering more educational benefits (Smeda et al., 2014).

To summarize, the DST approach is conducive to students' learning from multiple facets, especially in EFL education. It is worthwhile to examine the effectiveness of the DST approach in the EFL classroom and explore how it benefits students' learning through the lens of classroom engagement.

2.3 Why Classroom Engagement instead of Student Engagement

Engagement can be interpreted as the physical and mental efforts that students commit to learning (Astin, 1984). As the prerequisite of learning (Pittaway, 2012), engagement is essential to learning success (Herrington et al., 2003). The measurement of engagement has been one of the crucial considerations in educational research.

However, the conceptualization and contextualization of learning engagement in literature are quite blurred (Baron & Corbin, 2012). The term "student engagement" was used indiscriminately in many studies, and there is a dearth of well-articulated and context-specific measures of classroom-level engagement (Fredricks & McColskey, 2012).

Classroom engagement differs from student engagement in its nature. It refers to a student's active participation in classroom learning activities (Reeve, Jang, Carrell, Jeon, & Barch, 2004). That is to say, "student engagement", which is usually measured at the school level, cannot directly and precisely reflect engagement in the classroom setting. For instance, the same student may be highly engaged in one class, but not in others (Darr, 2012). Moreover, this student may be actively involved in in-class activities, but not be invested in after-class learning. Thus, the measurement of learning engagement should be context specific. Additionally, the investigation of classroom engagement and student engagement serve different functions (Wang et al., 2014). The measure should be at the classroom level when the research aims to evaluate the effectiveness of an intervention implemented in the classroom context (Wang et al., 2014). Hence, this study focuses on classroom engagement to examine the impacts of learning with DST in English class.

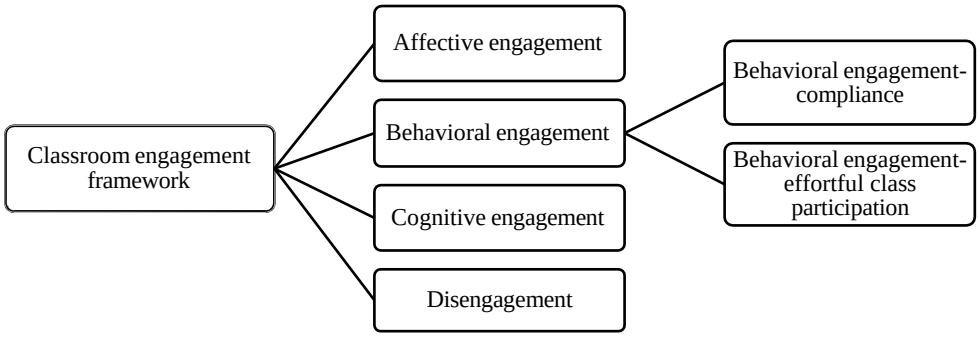
As stated above, according to the relevant literature, the use of DST in EFL classes has the potential to increase learning motivation and engagement (e.g., Hung, 2019; Niemi & Multisilta, 2016; Smeda et al., 2014). However, the understanding of the extent to which and in what aspects learners are engaged in such classes remains unexplored (Sadik, 2008). Moreover, although these studies were supposed to measure classroom-level engagement, the instruments employed were mostly centered on overall student engagement. It may lead to invalidities in research results and make it difficult for teachers and educators to understand the essence and effects of the DST practice in EFL class. Therefore, to investigate the impacts of learning with DST on EFL learning, it is necessary to have a clear focus on and tailored conceptual framework of classroom engagement.

2.4 Theoretical Framework of Classroom Engagement

There are three dimensions of classroom engagement: affective (emotional), cognitive, and behavioral (Fredricks, Blumenfeld, & Paris, 2004). This typology is well-grounded in the learning engagement across disciplines (Tang & Hew, 2022). At the classroom level, high-level affective engagement represents students' positive emotions, such as interest, enjoyment, and enthusiasm during class (Skinner, Kindermann, & Furrer, 2009). Behavioral engagement is often manifested by observable behaviors, such as overt attention, task participation, and question-asking in class (Fredricks et al.,

2004). Cognitive engagement refers to mental efforts devoted to classroom learning, such as meaningful processing and strategy use (Fredricks et al., 2004). It is often reflected through students' task investment in terms of being strategic or self-regulating (Lamborn, Newmann, & Wehlage, 1992).

Based on the 3-dimension engagement model, Wang et al. (2014) designed a self-report instrument, Classroom Engagement Inventory, to measure multidimensional classroom engagement comprehensively. To ensure its internal consistency and reliability, they conducted several rounds of exploratory factor analysis and confirmatory factor analysis with large sample sizes. As a result, a 24-items, 5-factor Classroom Engagement Inventory was finalized with a stable structure that is invariant between groups (e.g., age, subject, gender, etc.). One of the significant contributions of this inventory is that it expands the traditional 3-dimension engagement model to a new 5-factor classroom engagement framework (Figure 1), including affective engagement (AE), behavioral engagement-compliance (BEC), behavioral engagement-effortful class participation (BEE), cognitive engagement (CE), and disengagement (D). The advantage of this framework mainly resides in the behavioral level, as it differentiates students who are invested and fully immersed in class (effortful class participation) from those who just show obedience to the classroom norms but do not invest in and enjoy classroom learning (compliance). As Fredricks et al. (2004) once emphasized, it is of importance to separate compliant participation (e.g., classroom rules adherence) from autonomy involvement or self-directed learning behaviors. An articulated and customized instrument makes a thorough



understanding of classroom engagement in DST EFL class a possibility.

Figure 1. 5-factor Classroom Engagement Framework

3. Methodology

3.1 Research Context

This study recruited 70 students from two Grade 6 English classes at a public primary school in mainland China. Students with similar English academic performance attended as the experimental (n=35) and control groups (n=35). A weekly-2-hour (4 sessions in total) English class based on the central English curriculum was conducted with or without DST for one month. To control experimental conditions, these two classes were taught by the same English teacher with an identical teaching syllabus. Yet, the instructional design of English class for both groups varied from each other. For the control group, the instructor delivered a teacher-led content-based English class, where students were guided to revisit key knowledge learned in the first half term. Whereas for the experimental group, students needed to demonstrate and elaborate on a specific knowledge learned in the first half term via their digital story.

To ensure a relatively smooth DST English class, one school technology coordinator was invited to solve technological issues timely before and during class. The researcher was responsible for DST teacher professional training, DST learning materials design and development, and DST learning

environment support. Students in the experimental group took English class in the computer lab, and those in the control group joined English class in a traditional classroom. Multiple technological tools for learning with DST were available in the computer lab, such as digital cameras, projectors, microphones, video editing software, etc.

3.2 Research Design and Data Collection

To improve the reliability and validity of this research, a pretest-posttest quasi-experimental approach (Figure 2) was adopted. Quantitative data on classroom engagement were collected by Classroom Engagement Inventory (Wang et al., 2014) shortly before and after the intervention in both experimental and control groups. The sampling method for quantitative analysis was simple random sampling.

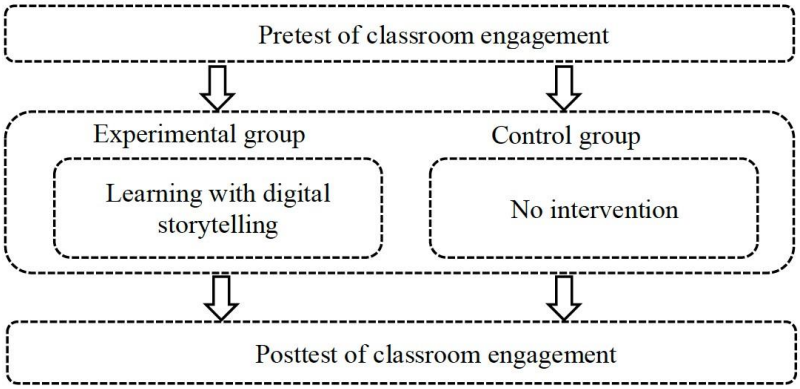


Figure 2. The Overall Research Design

3.3 Digital Storytelling Course Design

The researcher first explained the experiment process to all participants and obtained their consent before the study. Two teacher workshops were then conducted to ensure the English teacher's mastery of the basic technological pedagogical content knowledge to incorporate DST in teaching (Robin, 2016). The first workshop introduced the relevant concepts of DST, and the second was to demonstrate the use of Microsoft PowerPoint to create simple but clear digital stories. Previous studies have shown that PowerPoint is one of the most frequently used constructive tools for students' presentations and projects (Lim & Tay, 2003). For primary school students with limited digital literacy, an easy-to-use DST editing software plays a key role in its successful construction. In this study, students mainly turned to the recording function in Microsoft PowerPoint to combine text, pictures, animation, audio narration, and music for their digital stories.

Considering the nature of DST, it is powerful in instructing people on a particular concept or practice (Robin, 2006). Thus, students in the experimental group were expected to co-construct digital stories with the purpose of instructing viewers on a specific disciplinary concept or practice. In other words, students, acting as instructors, were asked to deliver explicit demonstration and elaboration on a specific knowledge they learned in English class in their digital stories. Following the Seven Elements of Digital Storytelling (Robin, 2006) and a 12-step Guideline for Digital Storytelling (Robin, 2016), this research made slight changes according to local context and adopted an 8-step 3-layer Digital Storytelling Learning Model (Figure 3) as the instructional design framework. The first layer comprises basic steps of digital story creation: 1) Choose a topic, 2) Research on the topic, 3) Draft the script, 4) Find and create images, 5) Create a storyboard, 6) Record audio narration, 7) Build the digital story and 8) Share the digital story (Robin, 2016, p23). The second layer is the guideline for students and the third layer is the guideline (Robin, 2016, p24) for the facilitator based on the ADDIE model (Analysis, Design, Development, Implementation, Evaluation).

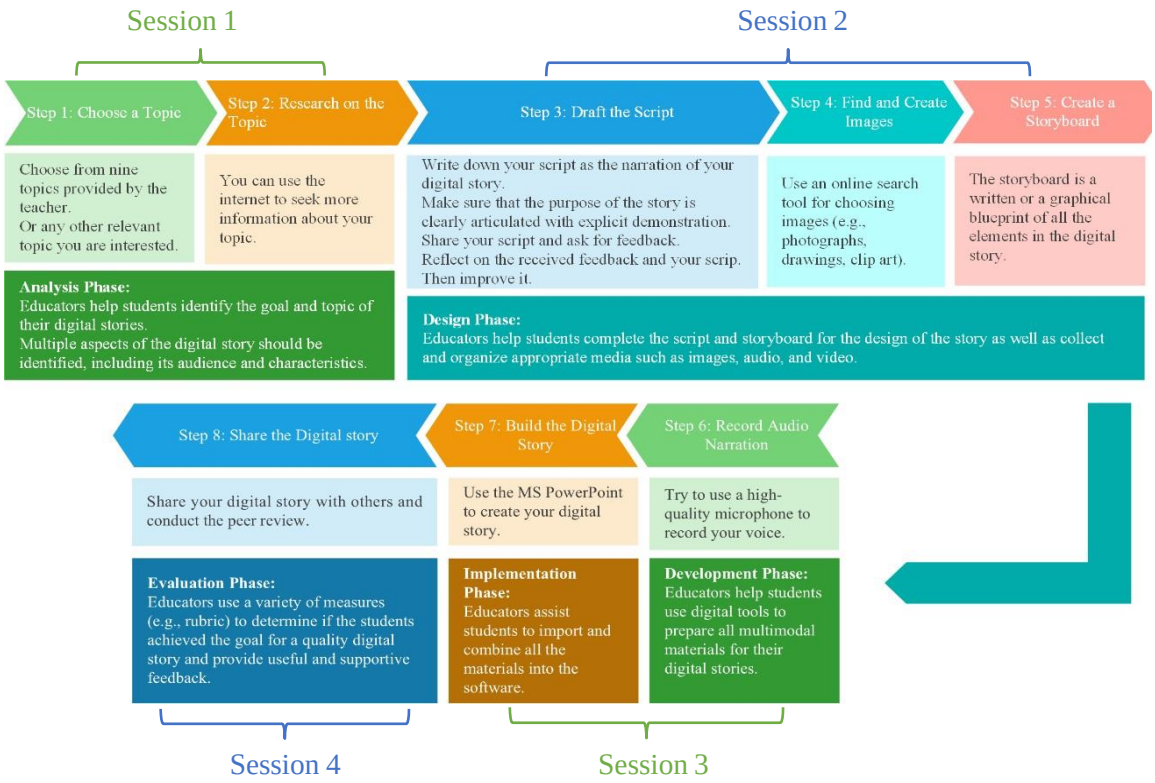


Figure 3. 8-step 3-layer Digital Storytelling Learning Model

3.4 Data Analysis

The quantitative data were analyzed using IBM SPSS 27.0. First, Cronbach's alpha of this inventory was calculated using the pretest data to ensure the internal consistency of each dimension of the Classroom Engagement Inventory in the research context. Next, descriptive analysis and repeated measures of ANCOVA were conducted to respectively provide background information and compare the overall classroom engagement and each specific factor of it between the experimental and control groups using both pretest and posttest data. In this study, the pretest scores of classroom engagement in two groups were considered as covariates that may affect the posttest results but cannot be controlled. Thus, ANCOVA with a confidence interval of 0.95 was adopted to eliminate these undesirable impacts and adjust posttest results according to the covariates. The independent variable was the intervention (learning with or without DST) or "group", and the dependent variable consisted of participants' overall classroom engagement and each specific aspect of it in the posttest. Before performing ANCOVA, all the basic assumptions of it were verified. The Kolmogorov Smirnov test was used to determine whether the data had a normal distribution. Homogeneity of the regression slopes was verified to make sure there was no interaction between the covariates and the intervention, and Levene's test was performed to check the homogeneity of variance across groups respectively.

4. Results

Before conducting the posttest, Cronbach's alpha was calculated using the pretest results to ensure the internal consistency for each factor within the CEI. The Cronbach's alpha for all factors were larger than .7 (α_{AE} = .708, α_{BEC} = .881, α_{BEE} = .889, α_{CE} = .959, α_{D} = .863), confirming that Classroom Engagement Inventory is a reliable instrument with internal consistency. The regression statistics (p < .05) of interaction between the covariates and "group" ($p_{\text{Group*Overall-Pretest}}$ = .992, $p_{\text{Group*Pre-AE}}$ = .143, $p_{\text{Group* Pre-BEC}}$ = .862, $p_{\text{Group* Pre-BEE}}$ = .326, $p_{\text{Group* Pre-CE}}$ = .78, $p_{\text{Group* Pre-D}}$ = .098) confirmed that there was a lack of interaction between them. Thus, our data met the homogeneity of regression slopes assumption. The homogeneity of variance was tested by Levene's test, and the results (F_{AE} = .154, p > .05; F_{BEC} = 3.865, p > .05; F_{BEE} = 3.605, p > .05; F_{CE} = .574, p > .05; F_{D} = 29.546, p < .05) suggested that there was

no difference between the variances across groups except for the factor, disengagement. Thus, we mainly refer to the overall engagement and the following specific factors of classroom engagement, including affective engagement, behavioral engagement-compliance, behavioral engagement-effortful class participation, and cognitive engagement in the following data analysis.

Descriptive analysis (Table 1) of the pretest and adjusted posttest results of classroom engagement is shown in the table below, suggesting that the overall engagement in both experimental and control groups increased in the posttest.

Table 1. *Descriptive and ANCOVA Results of Classroom Engagement in Pretest and Posttest*

Dimension	Pretest		Posttest		ANCOVA		
	Mean	SD	Mean	SD	F (1, 70)	*p*	η^2
Overall Engagement							
Experimental	4.36	0.52	4.44[a]	0.47	6.399	0.014*	0.087
Control Group	4.02	0.49	4.18[a]	0.45			
Affective Engagement (AE)							
Experimental	3.99	0.64	4.14[a]	0.73	0.814	0.370	0.012
Control Group	3.89	0.53	4.02[a]	0.48			
Behavioral Engagement-Compliance (BEC)							
Experimental	4.50	0.55	4.56[a]	0.48	8.172	0.006*	0.109
Control Group	4.16	0.52	4.26[a]	0.42			
Behavioral Engagement-Effortful Class Participation (BEE)							
Experimental	4.38	0.60	4.34[a]	0.60	1.981	0.164	0.029
Control Group	3.96	0.54	4.16[a]	0.53			
Cognitive Engagement (CE)							
Experimental	4.47	0.52	4.48[a]	0.48	5.753	0.019*	0.079
Control Group	4.03	0.54	4.22[a]	0.48			

Note: Experimental Group n = 35, Control Group n = 35. *p<0.05. Posttest means are adjusted according to the covariates.

Repeated measures of ANCOVA were performed to investigate whether there were significant differences in overall and each factor of classroom engagement between the experimental and control group in the posttest. The results (Table 1) revealed that, in overall, students in the experimental group exhibited significantly higher classroom engagement than those in the control group (F = 6.399, p = .014; η^2 = .087). Specifically, there were significant differences in behavioral engagement-compliance (F = 8.172, p = .006; η^2 = .109) and cognitive engagement (F = 5.753, p = .019; η^2 = .079) between two groups in the posttest. Therefore, the initial conclusion can be drawn that learning with DST in English class has significantly improved the overall classroom engagement in the experimental group, particularly in terms of behavioral-compliance engagement (e.g., listen carefully and complete assignments) and cognitive engagement (e.g., revisit key knowledge for deeper learning, and monitor and reflect on one's learning). Yet, no significant difference was found in affective engagement (F = .814, p = .37; η^2 = .012) and behavioral engagement-effortful class participation (F = 1.981, p = .164; η^2 = .029) between two groups in the posttest. This indicated that learning with DST in English class would not necessarily bring about more positive emotions (e.g., interested, excited, proud, happy, etc.) and effortful involvement in classroom learning (e.g., spontaneously form new questions and actively communicate and cooperate with others).

5. Conclusion and Discussion

This study adopted a pretest-posttest quasi-experimental approach to examine the effects of learning with DST on classroom engagement. The research findings showed that learning with DST could significantly improve the overall engagement in Grade 6 English class, particularly regarding behavioral engagement-compliance and cognitive engagement, though no significant difference was

manifested in affective engagement and behavioral engagement-effortful class participation. It deepens the existing understanding of the effectiveness of DST in EFL class and contributes to a realistic perspective for EFL educators and teachers to recognize the potential of this technology-integrated approach to facilitate classroom engagement.

The above findings are consistent with some studies on DST in EFL learning (e.g., Hung, 2019; Niemi & Multisilta, 2016; Sadik, 2008; Smeda et al., 2014), suggesting that learning with DST could enhance learning engagement in the classroom behaviorally (compliance) and cognitively. Students were motivated to listen carefully and learn deeply as active and self-regulated learners in digital story co-construction activities (Sadik, 2008). Yet, in terms of affective engagement, the research results may contradict some previous studies that positive emotions were not necessarily exhibited in a DST English class. In this study, struggling with problems beyond their reach in DST co-creation, some students became uninterested, frustrated, or even anxious. It was in line with one previous study that a few students expressed that learning activities in DST EFL class were unnecessary, difficult, and time-consuming (Hava, 2021). In addition, mixed results were reported regarding behavioral engagement. Despite many students conforming to the class arrangement, they may not be fully immersed in this class with effortful participation. Previous research has provided some clues for both low affective engagement and behavioural engagement-effortful class participation, indicating that the difficulty of the assigned task of DST may negatively influence students' involvement (Sugimoto, 2011), and students may have difficulties in maintaining group coordination when working cooperatively (Järvenoja, Volet, & Järvelä, 2013). The second-stage qualitative research of this project has been analyzing the student interview data to see whether can explain why learners became more or less engaged in certain aspect(s) in this class. Students' insufficient digital and language literacy, inadequate digital story creation time, collaborative failure of group work, ineffective instruction, scaffolding and feedback from the instructor, have been initially identified as potential moderators that may impair specific aspect(s) of classroom engagement. The detailed results and findings will be reported and discussed in another paper.

There were several limitations in this study. First and foremost, although we advanced the engagement study on DST EFL by looking at classroom engagement, how this engagement fluctuated and changed with time and context remains unanswered. Future research is expected to examine situational engagement in DST EFL class, taking dynamic environmental and individual factors embedded in real-time, fine-grained data into consideration (Xie, Heddy, & Vongkulluksn, 2019). Second, the duration of the intervention (one month) was relatively short, thus its impact on classroom engagement could be limited. Future study can be implemented with longitudinal experiments. Third, the sample size of this study was small with 70 students, and all data were collected by a self-report tool, which could be subjective and inaccurate, leading to limited generality of research findings. Large-scale research using diverse instruments, such as classroom observation and assessment of students' digital story artifacts as e-portfolios can be considered. Notably, though significant differences were manifested in some aspects of classroom engagement, the effect sizes of them were relatively small (e.g., $\eta^2_{BEE} = .029 < .06$), indicating insufficiently substantial differences (Cohen, 2013). More empirical studies with rigorous research design examining the effects of learning with DST in EFL classrooms are still in need.

Nevertheless, to the best of our knowledge, this is the first study examining the effects of learning with DST through the lens of multidimensional classroom engagement in an EFL class. To present a comprehensive picture of how learning with DST affects classroom engagement, the data of the second-stage qualitative research are expected to explain in what ways learners became more or less engaged in this class. After that, implications for future DST integration in EFL learning can be proposed.

Acknowledgements

We would like to thank all the people who participated in this research and helped review this paper.

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