



The Art of Captivating Writing: Exploring Digital Storytelling from a New Dimension

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While previous research has primarily focused on evaluating the effectiveness of digital storytelling (DST) itself, there is a dearth of knowledge regarding the impacts of flow, group engagement, and perceived instructional support on learners' DST experiences. Addressing this gap, the present study examines data collected from a sample of 225 students enrolled in DST-based writing courses. The results of this study indicate that learners' perceived instructional support significantly and positively influences their writing skills. Furthermore, the findings demonstrate that the relationship between instructional support and learning engagement is mediated by flow and group engagement. These findings underscore the significance of offering appropriate support to foster group engagement and facilitate students' flow experiences within the DST context. By shedding light on these less-explored aspects of the DST strategy, this study contributes to the existing literature in the field. It suggests that educators and instructional designers should consider the interplay of flow, group engagement, and instructional support when incorporating DST into their pedagogical practices. Understanding and effectively addressing these factors can enhance the learning experiences and outcomes of students engaged in DST-based writing activities. Further research is warranted to explore additional dimensions of DST and its impact on various educational contexts.

در حالی که تحقیقات قبلی عمدتاً بر ارزیابی اثربخشی داستان‌سرایی دیجیتال متمرکز بوده است، دانش کمی در مورد تأثیرات غرق‌گیم‌شارکت گروهی و پشتیبانی آموزشی درک شده بر تجربیات یادگیرندگان از طریق داستان‌سرایی دیجیتال وجود دارد. با پرداختن به این شکاف، مطالعه حاضر داده‌های جمع‌آوری‌شده از نمونه 225 زبان‌آموزی را که در دوره‌های نوشتاری مبتنی بر داستان‌سرایی دیجیتال ثبت‌نام کرده‌اند، بررسی می‌کند. نتایج این مطالعه نشان می‌دهد که حمایت آموزشی درک شده فراگیران به طور معناداری و مثبت بر مهارت‌های نوشتاری آنها تأثیر می‌گذارد. علاوه بر این، یافته‌ها نشان می‌دهند که رابطه بین حمایت آموزشی و مشارکت یادگیری با غرق‌گی و مشارکت گروهی ارتباط دارد. این یافته‌ها بر اهمیت ارائه پشتیبانی مناسب برای تقویت مشارکت گروهی و تسهیل تجربیات غرق‌گی دانش‌آموزان در زمینه داستان‌سرایی دیجیتال تأکید می‌کند. این مطالعه با روشن کردن این جنبه‌های کمتر مورد بررسی استراتژی داستان‌سرایی دیجیتال، به ادبیات موجود در این زمینه کمک می‌کند. پیشنهاد می‌کند که مربیان و طراحان آموزشی باید تعامل غرق‌گی، مشارکت گروهی و حمایت آموزشی را در هنگام گنجاندن داستان‌سرایی دیجیتال در شیوه‌های آموزشی خود در نظر بگیرند. درک و پرداختن مؤثر به این عوامل می‌تواند تجارب یادگیری و نتایج زبان‌آموزانی را که در فعالیت‌های نوشتاری مبتنی بر داستان‌سرایی دیجیتال درگیر هستند، افزایش دهد. تحقیقات بیشتر برای کشف ابعاد مختلف داستان‌سرایی دیجیتال و تأثیر آن بر زمینه‌های آموزشی مختلف ضروری است.

Keywords: digital storytelling, writing skills, flow, group engagement, perceived instructional support

Introduction

The integration of DST in second language (L2) writing skills has emerged as a prominent educational trend in the era of digitalization (Yang et al., 2022). Given that learners in this digital era are largely considered digital natives who have grown up surrounded by digital technologies and have had to acquire new skills to meet evolving demands (Höyng, 2022; Fu, 2022), the use of DST has shown to enhance



learner motivation and engagement in the learning process. Within the existing literature, researchers have presented compelling evidence supporting the effectiveness of DST in the L2 context, surpassing the outcomes of traditional lecture-based instruction (e.g., Nam, 2017; Tanrikulu, 2022). By employing DST, L2 learners engage in interactive and enjoyable writing activities, facilitating the acquisition of competencies and management skills such as decision-making and problem-solving, which are crucial components of the learning process (Rubino et al., 2018). Furthermore, DST provides a safe and supportive environment that encourages knowledge acquisition through experiential learning and diminishes the fear of failure often associated with traditional lecture-based classes (Hava, 2021).

The advantages of using DST to enhance writing skills in the L2 context have been highlighted by several researchers (e.g., Nam, 2017; Tanrikulu, 2022). However, it is worth noting that some studies have found no significant difference in effectiveness between DST and conventional instruction (Thang et al., 2014). To foster learner engagement and motivation in DST, learners need to recognize the overall value and effectiveness of the learning experience (Yang et al., 2022). Despite the growing interest in DST, empirical research examining the specific factors that encourage L2 learners and enhance their writing skills through DST remains limited. This study aims to address this research gap by investigating the factors that promote L2 learners' adoption of DST strategies for improving their writing skills.

Previous research has confirmed the significance of perceived instructional support, group engagement, and flow in enhancing engagement within technology-enhanced classrooms (e.g., Fu, 2022). Building on this research, the present study explores the effectiveness of perceived instructional support, group engagement, and flow in encouraging L2 learners to utilize the DST strategy for learning writing skills. By examining these factors, this study aims to contribute to a deeper understanding of the motivational aspects that influence L2 learners' engagement with DST for enhancing their writing abilities.

Reviewing the Literature

Pedagogical Strategies Supporting Storytelling for L2 Learners

Storytelling has gained significant attention in the L2 learning process as one of the key factors contributing to learner engagement. Recently, there has been a growing recognition of the role of stories in facilitating unconscious language learning and promoting activities that support language acquisition. Stories possess the potential to teach various skills, including reading, listening, speaking, and writing (O'Byrne et al., 2018). Initially, storytelling proves to be an effective technique for beginner-level L2 learners, offering them a safe environment and engaging them in enjoyable activities. However, its popularity has expanded worldwide, and it is now employed by L2 learners across different proficiency levels. Pedagogical storytelling is characterized by its natural repetition, meaningful contexts, captivating plots, and endearing characters.

The evolution of storytelling has witnessed significant growth in various functions and settings, with a contemporary and dynamic presence (Rahiem, 2021). The integration of digital technology with storytelling has revolutionized the delivery of narratives in terms of time and space, fostering collaborative learning approaches among students within the classroom (O'Byrne et al., 2018). Digital storytelling (DST), as a modern pedagogical initiative, leverages creativity to blend traditional storytelling with digital tools such as computers, video cameras, and sound recorders (Kim & Lee, 2018; Ohler, 2013). The widespread adoption of DST can be attributed to the interactive nature, simplicity, and affordability of technology. By encouraging students to express and organize their knowledge and ideas in a meaningful and distinctive manner, DST has the potential to enhance learning outcomes (Robin, 2008). Moreover, it provides educators with valuable insights into the learning process and serves as a powerful resource to engage teachers in meaningful conversations with their students, promoting a deeper understanding of language structure (Kervin & Mantei, 2016).

Engaging in story discussions prompts learners to transform their perceptions, experiences, and imaginations into narratives. DST strategies serve as a motivating tool to enhance learners' interest and stimulate their exploration of new ideas (O'Byrne et al., 2018). Educators have the opportunity to deeply analyze the learning resources and the self-representation of the creators involved (Hull & Nelson, 2005). In summary, DST provides creators with the means to express themselves, convey their perspectives on the world (O'Byrne et al., 2018), and evaluate and reflect upon their thoughts through an inherent record of progress and a cyclical process. However, previous studies have primarily focused on the overall effectiveness of DST as a pedagogical tool, neglecting these specific factors. Understanding the impact of flow, group engagement, and instructional support within the DST context is crucial for optimizing student learning experiences and outcomes in L2 courses. Further empirical research is needed to bridge this research gap and provide evidence-based recommendations for educators and practitioners in the field.

Digital Storytelling and L2 Writing

The incorporation of technology in storytelling has been a topic of interest for nearly a decade, and its educational significance is well recognized. For instance, Liu et al. (2011) conducted a study comparing the impact of classroom learning with and without social media on two groups of students. The researchers found that while social media can enhance the coherence of oral stories in diverse groups, it can also impede story flow compared to linear collaboration. In another study, Yang and Wu (2012) conducted a mixed-method longitudinal study to examine the role of technology in instruction. They compared the levels of critical thinking and achievement among learners and reported that DST had a significant positive effect on English proficiency achievement and critical thinking skills compared to the control group. Qualitative data analysis further revealed a deeper understanding of course content when utilizing the DST approach. Moreover, Kim (2014) investigated the impact of DST on the speaking skills and self-confidence of English as EFL learners through several months of experimental research, demonstrating its effectiveness in the language learning process.

The concept of learning writing through DST involves the integration of various multimedia elements such as videos, images, and audio (Azis, 2020; Salem, 2022). This approach utilizes technology and software to create a short film by combining multimedia artifacts that revolve around specific events or narratives (Rubino et al., 2018). Writing in DST encompasses two main objectives (Hava, 2021). Firstly, it aims to enhance the durability and effectiveness of knowledge by leveraging storytelling elements and plot structures. Secondly, it promotes learner engagement and active participation in the learning process through the use of technology. The process of DST entails several stages, including the addition of a soundtrack, special effects, and transitions (if time permits), the incorporation of a narrative track, sequencing of images through a video editor, script discussion and revision, storyboard planning, and initial script writing (Yang et al., 2022).

The story writing stage holds significant importance in DST, as its primary objective is to narrate compelling stories to the intended audience. In essence, writing plays a crucial role in the DST process (Nam, 2017; Tanrikulu, 2022). A well-crafted script for the storyboard is instrumental in enhancing the success and effectiveness of the digital story, as writing assumes an organizational function by bringing together meaningful elements (Hava, 2021). Furthermore, the exploration of the targeted topic during the writing phase can contribute to the development of improved scripts (Rubino et al., 2018). Once the necessary materials for the story have been assembled, learners proceed to write the script, make edits based on computer recordings, and create a draft recorded on a storyboard (Tanrikulu, 2022). Learners often compose concise scripts of approximately 500 words to grasp critical points and facilitate the production process (Lambert, 2010). Following script finalization, peer evaluation takes place, where suggestions and feedback contribute to revisions (Pardo, 2014). Within the L2 context, research indicates the positive impact of DST on learners' writing skills (e.g., Hava, 2021; Nam, 2017; Rubino et al., 2018; Tanrikulu, 2022). However, there exists a literature gap regarding the mediation model of flow, group engagement, and perceived instructional support in motivating L2 learners to utilize DST.

Mediating Role of Flow

Csikszentmihalyi (1975) is widely recognized as the originator of flow theory, a fundamental concept in the field of positive psychology. Flow can be defined as the state of being fully engaged in a captivating and pleasurable activity (Csikszentmihalyi, 2008). During a flow experience, individuals become completely absorbed in an activity to the extent that nothing else seems to matter. It is so enjoyable that individuals are willing to persist with it, even if it requires significant personal sacrifice (Csikszentmihalyi, 1975). In this state, individuals may lose track of time, their self-awareness may diminish, and their abilities may be optimized (Nakamura & Csikszentmihalyi, 2009). A higher level of flow during the learning process can lead to increased time devoted to the activity, more frequent practice, and enhanced performance (Csikszentmihalyi, 2008).

In a broad sense, flow refers to a state of deep engagement or optimal experience in an inherently enjoyable activity, as observed in athletes or artists when they focus on their performances or engage in play (Liu & Song, 2021). During this state, learners perceive their performance as successful and pleasurable due to their intrinsic motivation and the inherent worth of the activity itself (Ibrahim & Al-Hoorie, 2019). Flow is contingent upon the interdependent relationship between challenges and the corresponding abilities required to overcome them. In other words, flow experiences occur when an individual's capabilities align with the challenges they encounter, striking a balance between being neither too easy nor too difficult (Cho, 2018).

The concept of flow, which highlights the relationship between individual ability and the challenges presented, has gained attention among educators, coaches, and designers in various L2 learning contexts (e.g., Kaowiwattanakul, 2018; Liu & Song, 2021; Ibrahim & Al-Hoorie, 2019). However, there is a dearth of information specifically pertaining to flow in the context of technology-enhanced learning in L2 settings. Within the domain of DST, storytelling activities must strike a balance between the inherent challenges they pose and the learner's ability to overcome them (Fu, 2022). If the challenge is excessively difficult, the activity may become overwhelming and generate anxiety. Conversely, if the challenge fails to engage the learner, their interest wanes and they are more likely to discontinue their participation. Building upon Fu's (2022) research, this study aims to investigate the mediating role of flow in the relationship between L2 learners' group engagement, perceived instructional support, and the enhancement of their writing skills through the implementation of DST strategy.

Several studies have investigated the significance of flow in the EFL context. For instance, Kirchoff (2013) conducted a case study on the extensive reading skills of EFL learners and found that they indeed experienced flow while reading. Similarly, Zareiee (2013) explored the flow experience of EFL learners in relation to their reading skills and observed that flow can enhance learners' interest and facilitate effective text comprehension. Mcquillan and Conde (1996) reported that flow experienced during both L1 and L2 reading comprehension can generate a sense of pleasure and attract learners to engage further. Furthermore, the crucial role of flow experience in L2 learning motivation and attitudes has been established. Piniel and Albert (2017) asserted that a flow experience can heighten individuals' motivation to learn a language. Similarly, other researchers (e.g., Shernoff et al., 2003) have emphasized the significance of the flow experience in shaping learners' attitudes toward language learning. However, there remains a dearth of L2 literature specifically investigating the role of flow in enhancing L2 learners' writing skills through the use of DST.

Mediating Role of Group Engagement

The utilization of group work or cooperative learning is a widely employed instructional approach, particularly in technology-enhanced classes, as it offers learners opportunities for collaboration and learning from more proficient peers, as highlighted by Shafiee Rad et al. (2023). In the context of L2 learning classes, the significance of group work is even more pronounced, as it facilitates language output and interaction, both of which are integral elements of effective language acquisition (Poupore, 2016). The

value of group work can also be understood from a sociocultural perspective, wherein learning is fostered through peer assistance, such as within the zone of proximal development, and interaction (Toth & Davin, 2016). Empirical evidence supporting the efficacy of peer assistance further underscores the crucial role of group work in L2 learning classes (e.g., Leeming, 2024; Shafiee Rad et al., 2022).

The present study focuses on team-based writing using DST, with a specific interest in examining the influence of engagement on group language learning outcomes (Dörnyei, 2019; Sang & Hiver, 2020). Sang and Hiver (2020) indicate that without engagement in language use activities and learning processes, learners may face challenges in achieving their goals. The incorporation of DST is expected to enrich the learning experience and foster group collaboration in terms of group engagement, as outlined by Fu (2022). Within this framework, group engagement is conceptualized as an interpersonal construct characterized by a shared identity among members, with similar experiences and a mutual understanding, all working towards a common objective. Previous research has indicated a close interrelation among perceived instructional support, technology-enhanced learning, and group engagement (Fu, 2022). Teachers possess the capacity to promote and support learners' group engagement in these DST activities. Group engagement contributes to a more positive learning experience, characterized by enjoyment and the absence of negative affect, as highlighted by Gomez et al. (2011). However, there is a paucity of research examining these relationships within the context of L2 learning.

Perceived Instructional Support

In the process of engaging with DST, learners must grasp the intricate relationship between the story and the development of their writing skills. Relying solely on a standalone tool may lead to inefficiency, as noted by Yang et al. (2022). In other words, learners need to identify the images presented on the website and establish a connection between their perception of the image's subject matter and the development of their writing skills. Cognitive and metacognitive awareness is crucial when implementing the DST approach. Therefore, instructional support in the form of feedback, cues, and narratives plays a vital role in fostering desired learning attitudes and behaviors, particularly in the context of technology-enhanced learning (Fu, 2022; Shafiee Rad, 2021). While the use of technology-enhanced tools is optional, instructional support is imperative for teachers to achieve specific learning objectives (Shafiee Rad et al., 2023). Teachers play a pivotal role in enhancing the learning experience (Kali et al., 2015). Supportive instructors who provide timely responses, possess subject knowledge, and offer constructive feedback contribute to positive learning experiences among their learners. Conversely, learners who perceive a lack of support from instructors during technology-enhanced classes may encounter negative learning experiences (Tong et al., 2020).

Recent research suggests that perceived instructional support in technology-enhanced learning can have a positive impact on learners' emotional experiences and contribute to a sense of enjoyment (Fu, 2022). This support can help learners maintain focus and avoid distractions, thus improving their ability to concentrate (Proserpio & Magni, 2012). In the context of DST, providing instructional support becomes particularly important as it helps learners focus on the essential aspects of the process. Conversely, a lack of support may lead to frustration and hinder the acquisition of necessary skills (Fu, 2022). Additionally, cooperative DST approaches can foster learners' creativity, and instructional support is expected to enhance their proficiency levels (Tong et al., 2020). In summary, instructional support plays a critical role in enabling learners to exert control over their learning outcomes when utilizing technology-enhanced tools (Fu, 2022). For instance, in the context of DST, the teacher can exercise control over the story's topic and the selection of website images, facilitating centralized cooperative learning necessary for the acquisition of writing skills.

The literature currently lacks comprehensive research examining the effect of DST on perceived instructional support. While there have been studies investigating the overall effectiveness of DST as a pedagogical strategy, limited attention has been given to the specific aspect of perceived instructional support within the DST framework. This gap in the literature is significant as it hinders a thorough

understanding of how DST influences learners' perceptions of instructional support, which is crucial for optimizing educational outcomes. Further empirical investigation is necessary to bridge this gap and provide valuable insights into the relationship between DST and perceived instructional support. Such research would contribute to the existing knowledge base and inform instructional design practices in leveraging DST for enhanced educational experiences.

Significance of the Study

The relationship between flow, group engagement, perceived instructional support, and the use of DST strategy in L2 classrooms is justified by the current worldwide issue of technology benefit in language education. Integrating technology, including DST, enhances learner engagement and motivation through interactive and immersive learning experiences. It fosters collaborative learning environments by enabling group activities and promoting effective communication. Moreover, the integration of DST provides valuable instructional support, including instructional materials, guidance, and personalized feedback, enhancing learners' motivation, confidence, and overall learning experience. Overall, leveraging technology and DST in L2 classrooms addresses the current worldwide issue of technology benefits by creating engaging, collaborative, and supportive learning environments that meet the evolving needs of language learners in the digital era.

In the realm of L2 learning, the traditional method of teaching writing solely through face-to-face lectures and a predetermined series of activities has long been considered the most effective approach. However, the widespread integration of technology into people's lives worldwide has prompted L2 educators and practitioners to explore alternative approaches that leverage technology to better cater to learners' needs. The main objective of this study was to examine whether the mediating influences of flow, group engagement, and perceived instructional support could motivate L2 learners to utilize DST, an extensively researched and recognized technology-based approach, to enhance their writing skills.

Research Questions

The study aimed to answer the following research questions:

RQ1: Does the flow of L2 learners mediate the positive relationship between their group engagement, perceived instructional support, and DST use in the writing class?

RQ2: Does the group engagement of L2 learners mediate the positive relationship between their flow, perceived instructional support, and DST use in the writing class?

RQ3: Does the perceived instructional support of L2 learners mediate the positive relationship between their group engagement, flow, and DST use in the writing class?

Method

Research Design

This study utilized a quantitative research design, which is characterized by its objective and systematic approach to data collection and analysis. The primary aim of this research design was to investigate the relationship between variables within the context of DST-based writing classes conducted in language institutes. By employing a quantitative research design, the study sought to obtain numerical data that could be subjected to statistical analysis, providing valuable insights into the associations between the variables of interest.

Participants

The present study involved a total of 225 female participants who were L2 English language learners and had Persian as their native language. These participants were residing in one of the cities in Iran and had no prior experience of studying abroad. The proficiency levels of the participants were determined through a combination of self-report questions and the administration of the Oxford Placement Test (OPT, Allen, 2004). Based on self-report, 102 participants identified themselves as intermediate, 72 as upper-intermediate, and 51 as advanced. The OPT was employed as an objective measure to validate the participants' self-assessment and enhance the reliability and validity of their proficiency level determination. This multi-method approach, which incorporates both self-report and the OPT, allows for a comprehensive evaluation of participants' language proficiency, thereby strengthening the robustness of the study findings. All participants had utilized the DST strategy as a means of developing their English writing skills. The participants' ages ranged from 16 to 26 years, with a mean age of 22.06 (SD = 1.31).

Procedure and Data Collection

The participants in this study were selected through convenience sampling during a single winter semester when they attended an English writing class at a language institute. Alongside traditional lecture-based instruction, these participants utilized the Storybird website as a technology-enhanced tool for creating digital stories. The website was chosen for its user-friendly interface and visually appealing content, which facilitated engagement and learning for the participants. As part of their assignment on the Storybird website, the students were tasked with completing the 'Friends Forever' activity, which fostered cooperative learning and interaction among classmates and with the instructor. The instructor provided detailed explanations on how to navigate and effectively utilize the Storybird website. Through collaborative learning and interactions with the instructor, participants were encouraged to discuss and revise their group strategies as they worked on the DST task. The primary objective of incorporating the Storybird website was to assist L2 learners in comprehending the intricacies of the English writing system and developing their ability to identify and correct writing errors. It is important to note that learners were expected to apply the knowledge acquired from the instructor's lectures and engage in collaborative practice on the Storybird website.

Figure 1 illustrates the functionality of the Storybird website, which offered learners a range of suggested pictures as prompts for their writing tasks. The learners were required to compose narratives based on the topics depicted in these pictures. The pictures could be sourced from the teacher, the learners themselves, or selected from a collection of existing images. The teacher facilitated the process by creating pre-prepared accounts that provided learners with access to a variety of pictures for their writing endeavors. Additionally, learners had the opportunity to personalize their avatars and establish a virtual library of books they had authored or that had been published by others. The website also enabled learners to save their progress and resume working on their stories at their convenience.

At the end of the semester, participants were required to fill out an online self-report questionnaire and provide written informed consent before sharing the questionnaire. Considering L2 learners' involvement in a writing course, their use of Storybird, and their completion of the questionnaire is justified for a comprehensive understanding of the research context. By examining these factors, researchers can gain insights into the effectiveness of the course, the impact of Storybird as a DST tool, and the participants' engagement. This analysis helps evaluate the instructional strategies, assess the benefits and limitations of Storybird, and establish connections between experiences and questionnaire responses, enhancing the validity and contributing to the existing literature.

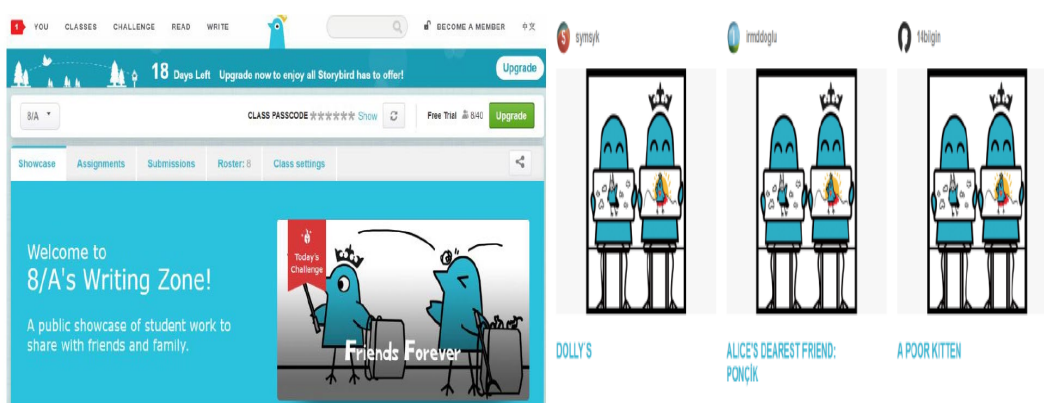


Figure 1. Storybird as a digital storytelling tool.

Instruments

Multiple questionnaires were employed in the present study, utilizing a 5-point Likert scale ranging from 1 (*Strongly Disagree*) to 5 (*Strongly Agree*). To prevent any potential misunderstandings, all questionnaires were translated into Persian, the mother tongue of the participants. This translation aimed to ensure clarity and comprehension of the items, thereby facilitating accurate responses from the participants.

Learning experience scale

In order to evaluate the experiences of L2 learners in DST, the researcher opted to employ the learning experience scale developed and validated by Eppmann et al. (2018) in its English version. This scale consists of 27 items, such as "while playing the game, I felt creative," and encompasses six subscales, namely, enjoyment, flow, creative thinking, activation, absence of negative effects, and dominance. To ensure the reliability of the scale within the context of this study, Cronbach's alpha coefficient was calculated, resulting in a value of $\alpha = .91$, indicating high internal consistency.

Perceived instructional support scale

The selection of this scale was influenced by the research conducted by Rhoades et al. (2001), which originally included four items, such as "My instructor cares about my opinion." These items were adapted to suit the specific educational context of the present study. To assess the reliability of this adapted scale within the current context, Cronbach's alpha coefficient was computed, yielding a value of $\alpha = .89$, indicating a high level of internal consistency.

Group engagement scale

To investigate the group engagement of L2 learners in relation to their writing skills, the researcher employed Macgowan's (2000) scale for group climate. This scale consists of 37 items, including statements such as "The member helps others achieve the group's purpose." In order to ensure the reliability of the scale within the specific context of this study, the researcher calculated Cronbach's alpha coefficient, which yielded a value of $\alpha = .94$, indicating a high level of internal consistency.

Flow scale

In order to evaluate participants' flow experiences during the implementation of the DST strategy, the researcher utilized a flow questionnaire developed by Egbert (2003). This questionnaire consisted of 14 items, such as "*This task made me curious.*" To ensure the reliability of this scale within the specific context of the study, the researcher calculated Cronbach's alpha coefficient, which yielded a value of $\alpha = .93$, indicating a high level of internal consistency.

Data Analysis

To address the potential issue of common method variance (CMV) and ensure that any shared variance among the variables was not solely attributed to the measurement method, the researchers initially employed the Harman single-factor test (Podsakoff et al., 2003). The purpose of this test was to control for potential bias resulting from shared methodological aspects. By including this test, the researchers were able to accurately assess the correlation between the DST strategy and L2 writing performance while mitigating the potential effects of CMV. The integration of the Harman single-factor test not only strengthens the methodological rigor of the study but also enhances the understanding of the impact of the DST strategy on L2 writing.

Following data collection, the obtained data were subjected to descriptive statistics to provide a summary and description of the variables under investigation. Pearson correlation analyses were conducted to explore the relationships among these variables. To ascertain statistical significance, confidence intervals were generated through bootstrapping estimates, employing a resampling technique repeated 5000 times. Subsequently, serial multiple mediation effect analyses were carried out using the PROCESS macro for SPSS 22.0 software (model 6; Hayes, 2013). This analytical approach enabled the examination of the mediating effects in a sequential manner, allowing for a comprehensive understanding of the underlying mechanisms at play in the research context.

Results

In order to answer the research questions first Harman single factor analysis was used to assess the common method bias. It was suggested from the results that the first factor was less than 41% which accounted for a 28.21% variance. Accordingly, we assured the data was not biased by a common method. In addition, results suggested that the one-factor model did not fit the data well through confirmatory factor analysis: $\chi^2 = 11,476.22$, $df = 424$, $\chi^2/df = 23.228 > 5$, $CFI = .628 < .91$, $TLI = .604 < .91$, $RMSEA = .113 > .07$, $SRMR = .111 > .07$ (Hoyle, 2012). This means that, the results of the confirmatory factor analysis indicate that the one-factor model did not fit the data well. Multiple fit indices, including the chi-square statistic (χ^2) divided by degrees of freedom (df), comparative fit index (CFI), Tucker-Lewis's index (TLI), root mean square error of approximation (RMSEA), and standardized root mean square residual (SRMR), did not meet the recommended thresholds. These findings suggest that the one-factor model is not a suitable representation of the relationships among the variables in the data.

Table 1 presents the bivariate correlations of all the variables analyzed through Pearson correlation analysis. It is apparent from this table that the mean scores of the learning experience, perceived instructional support, group engagement, and flow ($M = 3.78, 3.65, 3.91, 3.81$; $SD = .35, .76, .84, .91$) were approximately high among L2 learners during DST-based writing class. Furthermore, the result suggested a significant and positive correlation between learning experience, perceived instructional support, group engagement, and flow with each other. Therefore, the demographic variables were used to analyze further chain mediating effects. From the table, it is evident that the mean scores of learning experience, perceived instructional support, group engagement, and flow were relatively high among L2 learners during DST-based writing classes, with mean scores ranging from 3.65 to 3.91. The standard deviations indicate that

there was some variability in the scores, suggesting that not all participants had identical experiences, perceived support, engagement, and flow levels. Furthermore, the results indicate significant and positive correlations between learning experience, perceived instructional support, group engagement, and flow. This suggests that as one of these variables increases, the others also tend to increase. The presence of significant positive correlations suggests that these variables are interconnected and may influence each other within the context of DST-based writing classes.

Given these findings, it is reasonable to explore the potential mediating effects of demographic variables further. By analyzing the demographic variables in relation to the chain mediating effects, researchers can gain a deeper understanding of the complex relationships among learning experience, perceived instructional support, group engagement, and flow. This analysis could provide insights into how demographic factors may influence or interact with these variables, shedding light on potential mechanisms and factors that contribute to the observed relationships.

TABLE 1

Pearson Correlation, Means, and Standard Deviations among Variables (N = 225)

Variables	1	2	3	4
1. Learning Experience	-			
2. Perceived Instructional Support	.36**	-		
3. Group Engagement	.41**	.43**	-	
4. Flow	.51**	.30**	.32**	-
Mean	3.78	3.65	3.91	3.81
SD	.35	.76	.84	.91

** $p < .05$

All the variables were standardized to avoid multicollinearity prior to the analysis. Then, the mediating role of learning experience and perceived instructional support in the relationship between group engagement and flow after controlling for the effect of majority, grade, gender, using experience, and using frequency (see Table 2). It was depicted in Table 2 that learning experience had a significantly positive prediction effect on group engagement ($\beta = .41, t = 3.24, p < .005$), flow ($\beta = .51, t = 4.69, p < .005$), the majority ($\beta = .18, t = 2.75, p < .005$), and using frequency ($\beta = .26, t = 3.21, p < .005$). In addition, perceived instructional support had a significantly positive prediction effect on flow ($\beta = .41, t = 3.99, p < .005$), group engagement ($\beta = .31, t = 2.64, p < .005$), the majority ($\beta = .17, t = 1.65, p < .005$), and using frequency ($\beta = .08, t = 3.61, p < .005$).

These results suggest that both learning experience and perceived instructional support play important mediating roles in the relationship between group engagement and flow. They indicate that a positive learning experience and perceived instructional support can enhance group engagement, flow, and other related variables. These findings highlight the significance of creating supportive learning environments and providing effective instructional support to promote engagement and flow among learners. It is important to note that the beta coefficients (β), t-values, and p-values reported in the results provide information about the strength, significance, and direction of the relationships between the variables analyzed.

TABLE 2
Multiple Linear Regression Results among Variables (N = 225)

Variables	Learning Experience			Perceived Instructional Support		
	β	SE	t	β	SE	t
Group Engagement	.41	.22	3.24**	.31	.21	2.64**
Flow	.51	.08	4.69**	.41	.07	3.99**
Majority	.18	.12	2.75**	.17	.14	1.65**
Grade	.04	.04	1.06	.06	.05	1.00
Gender	.13	.03	1.24	.15	.03	1.14
Using Experience	.15	.06	1.03	.17	.08	1.13
Using Frequency	.26	.03	3.21**	.08	.04	3.61**
R ²	.06			.21		
F	6.06**			18.97**		

Table 3 represents the results of the chain mediating effect of learning experience and perceived instructional support. The indirect effect on the group engagement → flow path was .03, accounting for 4.73% of the total effect, while the 95% CI was [.007, .042]. The indirect effect on the learning experience → perceived instructional support → flow path was 0.05, accounting for 13.82% of the total effect, while the 95% CI was [.031, .101]. The indirect effect on the perceived instructional support → group engagement → flow → learning experience path was .08, accounting for 1.40% of the total effect, while the 95% CI was [.001, .013]. The total mediating effect was .09, accounting for 19.44% of the total effect, while the 95% CI was [.054, .133]. All indirect effects were significantly positive as the 95% CI in all paths did not overlap with zero.

TABLE 3
Chain Mediating Effect of Learning Experience and Perceived Instructional Support in the Relationship of Group Engagement and Flow (N = 225)

	Effect	Boot SE	Boot LLCI	Boot ULCI
Total effect	.46	.04	.000	.401
Direct effect	.37	.06	.000	.307
Indirect 1	.03	.01	.007	.042
Indirect 2	.05	.04	.031	.101
Indirect 3	.08	.01	.001	.013
Total indirect effects	.09	.02	.054	.133
Comparison 1: Indirect 1 – Indirect 2	.02	.02	.085	.001
Comparison 2: Indirect 1 – Indirect 3	.04	.09	.001	.035
Comparison 3: Indirect 2 – Indirect 3	.06	.01	.028	.093

Moreover, Table 3 displays the result of the comparison of the mediating effect. The mediating effect of the learning experience was weaker than perceived instructional support in the relationship between flow and group engagement, with a 95% CI [.085, .001]. The mediating effect of group engagement (95% CI was [.001, .035]) or flow (95% CI was [.028, .093]) are both stronger than their interaction. It can be suggested that flow and group engagement play a mediating role between the learning experience and perceived instructional support. We established the chain mediating model through the above analysis (see Figure 2).

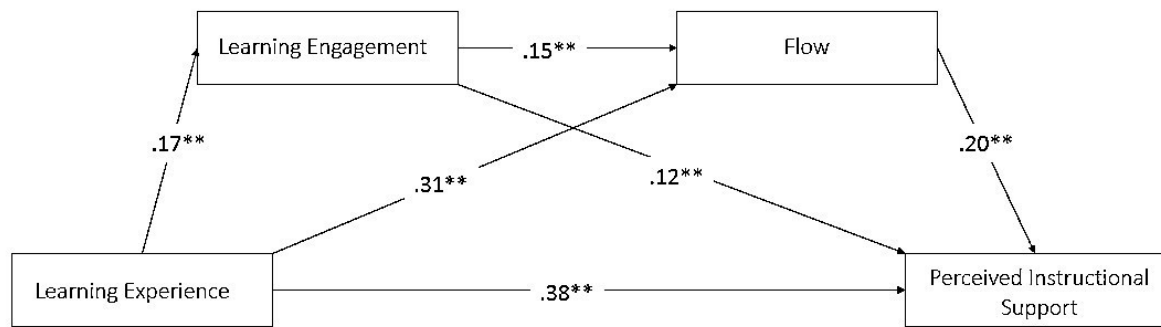


Figure 2. Chain mediating model testing group engagement and flow as mediators between perceived instructional support and learning experience (** $p < .05$).

Discussion

The present study has contributed significant insights into the enhancement of writing skills among L2 learners through the implementation of the DST strategy. This was accomplished by investigating the mediating influences of flow, group engagement, and perceived instructional support. Building on existing literature, the study aimed to bridge a gap in the L2 writing context by employing a mediation model to explore the factors that promote DST engagement among learners with diverse proficiency levels. The findings of this study have provided empirical evidence supporting the efficacy of team-based learning approaches in fostering positive outcomes in both teaching and learning contexts.

The findings of our study align with prior empirical research, emphasizing the significance of flow as a predisposing factor in L2 learners' engagement with the DST strategy in writing classes (e.g., Tanrikulu, 2022; Yang et al., 2022). Flow offers learners the opportunity to take creative risks and explore their interests within a structured and secure environment that facilitates the acquisition of new learning experiences. When learners are exposed to challenging and authentic problems, they tend to exhibit higher levels of engagement, intrinsic motivation, and flow within instructional settings. Consequently, an increased level of flow can positively impact future commitment, performance, and motivation among L2 learners.

Moreover, our findings provide support for the role of perceived instructional support in fostering L2 learners' interest in utilizing the DST strategy in writing classes. An unexpected observation was that perceived instructional support effectively promoted positive emotional experiences without exhibiting a positive correlation with negative emotions. This discovery aligns with previous research that has demonstrated the efficacy of perceived instructional support in enhancing positive emotions. Additionally, perceived instructional support facilitated learners' experience of flow and prevented their attention from being diverted, which corresponds with existing literature. The perceived instructional support component of creative thinking nurtured L2 learners' exploratory and imaginative capacities. These outcomes are likely linked to prior research suggesting that perceived instructional support can augment L2 learners' sense of control while engaging in the DST strategy.

Perceived instructional support plays a pivotal role in fostering the academic achievement of individual students and identifying those who may require specialized educational services. Its utilization in the context of the DST strategy can yield substantial benefits in enhancing L2 writing skills. Instructional support encompasses the implementation of positive intervention and assessment techniques, with the objective of alleviating behavioral or educational barriers for all students. This process necessitates collaborative teamwork to establish clear goals, identify individual student needs, and develop targeted intervention plans to facilitate the attainment of those objectives.

Previous research, such as the study conducted by Baek and Touati (2017), has demonstrated that incorporating technology into educational settings can enhance the learning experience through the influence of flow on perceived learning outcomes. The present study further corroborates these findings by affirming the positive impact of flow experiences on perceived learning outcomes, which could potentially extend to L2 learning outcomes. Additionally, group engagement and perceived instructional support were identified as significant factors influencing learners' experiences of flow and satisfaction levels during the implementation of the DST strategy. Notably, in the current study, all learners demonstrated improvements in their learning through the utilization of the DST strategy and were able to provide critical evaluations of its effectiveness. Consequently, the interplay of the three factors—flow, group engagement, and perceived instructional support—can contribute to learners' satisfaction with the efficacy of the DST strategy.

This study has provided empirical evidence supporting the assertion that group engagement serves as a partial mediating factor in the relationship between the learning experience and perceived instructional support, specifically with regards to negative affect, enjoyment, and creative thinking. These findings are consistent with prior research, such as the study conducted by Fu (2022), which suggests that perceived instructional support can foster group engagement, leading to enhanced positive emotions characterized by the absence of negative affect, increased enjoyment, and facilitated creative learning. However, it is noteworthy that perceived instructional support did not result in an increase in learners' sense of dominance or flow. This could be attributed to the fact that learners do not have complete control over digital tools and instead need to coordinate their efforts with their teachers and peers, as highlighted by Wouters and Oostendorp (2013).

The findings of this study affirm that group engagement, observed within the L2 course, plays a crucial role in facilitating learning outcomes through the implementation of the DST strategy. These results align with the research conducted by Tong et al. (2020), where active participation in WeChat discussions resulted in a significant increase in learner motivation. It was observed that the mediation effect of learner engagement became more pronounced and intricate when it followed a higher level of flow and perceived instructional support. Moreover, existing literature suggests that a heightened level of engagement can generate a positive motivational boost among learners, ultimately leading to higher levels of achievement (e.g., Tong et al., 2020).

While this study's findings cannot establish causal relationships, it is recommended that the utilization of worksheets or DST can significantly assist L2 learners in identifying and rectifying their own writing mistakes. Furthermore, it was observed that flow, group engagement, and perceived instructional support during the DST had a positive impact on L2 learners' writing skills. This finding broadly supports the notion that perceived instructional support is crucial for enhancing L2 learners' experience of flow, as this factor plays a significant role in increasing learners' engagement with the task at hand. Previous research has indicated that learners' flow tends to improve when they receive guidance from instructors. Therefore, it is suggested that effective implementation of perceived instructional support can intensify learners' flow experiences and group engagement. Additionally, the findings point to a mediation model based on flow and perceived instructional support.

In sum, the adoption of the DST strategy can enhance L2 learners' writing skills by fostering positive emotions and enjoyment, providing a means to escape distractions in their surroundings, and cultivating their exploratory and imaginative abilities, while also instilling in them a sense of control over the task. Enhanced DST techniques in Asian EFL education can engage learners, foster flow and immersion, and improve writing skills. Integrating DST into the curriculum creates a dynamic learning environment that cultivates creativity, critical thinking, and effective communication. Group engagement is crucial, as collaborative learning environments encourage peer interaction, idea exchange, and collaborative writing projects, enhancing writing skills and developing important social and communication skills. Perceived instructional support, including guidance, feedback, and scaffolding, plays a significant role in Asian EFL education, positively influencing writing skills. By incorporating DST strategies that promote engagement, collaboration, and effective instructional support, educators empower Asian EFL learners to succeed in developing their writing abilities.

Conclusion

The current study contributes to the existing body of research on the utilization of DST in L2 writing classes by offering valuable insights into the significance of group engagement as a prerequisite for the effectiveness of DST. This study is particularly valuable as it explores strategies for promoting DST engagement within writing classes, building upon prior research that has validated the efficacy of flow and perceived instructional support in the learning process. In this study, a double-mediation model was employed to elucidate how group engagement and flow amplify the relationship between perceived instructional support and learners' writing achievement within the DST strategy.

The present study holds both theoretical and pedagogical implications. The theoretical contributions lie in the realm of DST strategies and their impact on English language learning, specifically in relation to the debates surrounding overflow, group engagement, and perceived instructional support, and their influence on L2 learners' writing skills. Pedagogically, given the widespread use of DST strategies, this study offers valuable insights for teachers seeking to enhance L2 learners' writing skills within a DST environment, thus benefiting L2 educators. Although the focus of this study was limited to L2 learners in a specific city Shahrekord, the insights gained have the potential to inspire teaching practices and contribute to similar programs in diverse contexts. Furthermore, we recommend that future researchers undertake larger-scale qualitative studies and multiple-case investigations to address the limitations outlined in the methodology section. Additionally, future studies could explore other language skills, such as reading, examine the role of gender in research design, and investigate how different motivations can enhance the use of DST in an L2 context. These avenues of research would further enrich our understanding of DST strategies and their applications in language learning.

This study has a few limitations that should be considered. Firstly, due to time constraints, the data collection period was limited, potentially constraining the depth and breadth of the findings. Secondly, the study focused on participants with a specific level of proficiency in the target language, which may limit the generalizability of the results to individuals with different proficiency levels. Lastly, the research primarily targeted participants within a specific age group, potentially limiting the applicability of the findings to individuals outside this age range. Despite these limitations, the study's findings still provide valuable insights into the research topic, and future research can address these limitations to further enhance the understanding of the phenomenon under investigation.

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