

The 2024 15th International Conference on E-Education, E-Business, E-Management and E-Learning (IC4E 2024)

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PRESENTATION ONLY ACCEPTANCE LETTER

(For Non-publication Abstracts)

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Friday, January 19, 2024

To Chia Pin Kao, Hui-Min Chien, Southern Taiwan University of Science and Technology, Cheng Shiu University;

Dear Chia Pin Kao, Hui-Min Chien,

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Paper ID: TB1248-A

Paper Title: Integrating STEAM Education and Digital Storytelling in Preschool Block Play: Effects on Creative Development and Learning Attitudes in Children

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Integrating STEAM Education and Digital Storytelling in Preschool Block Play: Effects on Creative Development and Learning Attitudes in Children

Abstract:

Background: Even though digital technology has its advantages, it is worth exploring how children can benefit from digital media resources to enhance their creativity as well as have their learning attitudes strengthened.

Objectives: This study examined how different instructional strategies affected preschool children's creativity and learning attitudes.

Methods: Using digital storytelling (DST) technology, we developed a comprehensive STEAM education and block play-based learning activity for 30 preschool children aged 5 to 6 who consented to participate. They were given a 10-minute play period to interact with story-related props via blocks, photographs, audio, and video. This study administered the Creativity Assessment Packet (CAP), an analogous scale that assesses their creativity and learning attitudes.

Results and Conclusions: Based on experimental manipulation, the results revealed that children in the experimental group had higher scores than those in the control group for the concerned variables. We further found a moderate positive correlation between creativity and learning attitude. More explicit planning to incorporate DST into block play is necessary for the effective practice that further enhances children's future learning and cognitive growth.

Keywords: STEAM, Attitudes, block play, creativity, digital storytelling

Introduction

It is recognised that technology-empowered learning environments provide children with multiple and flexible learning experiences (Chen et al., 2013; Javora et al., 2019). Pre-school teachers' increasingly frequent use of technology within learning and teaching contexts, along with the pedagogy that embed these technologies has gradually become an emerging trend for developing children's creativity and cognitive development. The pre-school years have been described as a golden age for cultivating creativity (Mottweiler & Taylor, 2014), and children's creative potential is reflected within behaviours and intellectual outputs, such as playing, singing, dancing, drawing, telling stories, and making up riddles. In recent decades, there has

been growing scholarly interest in understanding the development of various aspects of creativity during the early childhood years (Bers et al., 2019; Kim & Kim, 2018), but the intertwined nexus between the implementation of digital technologies and childrens' creativity development remains an under-researched topic. Also with regard to continuous development of digital technology, it is worth exploring how children can benefit from digital media resources to enhance their creativity as well as have their learning motivation strengthened. In this sense, using digital storytelling technology (DST) is considered one of several effective pedagogical strategies, as it promotes children's intrinsic motivation for learning exercises and activates their attentional focus for yielding creative outcomes (Schmoelz, 2018; Smyrniou et al., 2020). Yet, there has been very little research on how DST boosts the creative abilities of children, even though developmental relationships between imagination and expression ability have been investigated from both a general perspective and in the specific context of image-based activities (Pavlou, 2020). This study is one of the first efforts to examine children's creativity by exploring the role of digital storytelling.

Block play has been extensively used in early childhood education and is the most common way through which children explore, discover, question, construct concepts and make sense of the world through an autonomous and authentic approach (Cohen & Emmons, 2017; Schmitt et al., 2018). Various shapes and sizes of wooden blocks can engage children in continuous interactions with learning tasks, content, and contexts, making block playing an ideal teaching medium for promoting the early age learners' literacy skills, social skills, mathematic skills and spatial skills.

Furthermore, research indicates that DST can cultivate children's learning attitudes and enhance learning effectiveness due to its entertaining characteristics, such as the aural and visual stimulus (Duveskog et al., 2012; Ellison & Solomon, 2019). When children are given a chance to ruminate the stories in image-based activities on a digital platform, the enjoyment of using the gamified materials makes them more likely to develop intrinsic motivation for learning and thus develop their expressive ability. Nam (2017) found that DST enhances students' understanding of the curriculum, willingness to explore new knowledge, ability to think creatively, and overall academic achievements. Liu et al. (2019) applied a digital collaborative storytelling activity in an elementary school. They found that children had a high willingness to accept digital narratives and to participate in small group activities. Sarica and Usluel (2016) found that video technology-based education is gradually growing, and DST is among one of the most acclaimed teaching methods in the digital environment.

This paper posits that the teachers' adoption of DST profoundly impacts pre-school children's creativity and attitudes, and that image materials capture the most relevant features of block play related to interest and enjoyment. The aim of the current study is thus to investigate the interrelationships among children's creativity and attitudes in the context of block play-based DST and to develop an empirically validated framework for guiding future research and efforts in pedagogical design in pre-school education. The study attempts to answer the following research questions:

1. What are children's attitudes toward block play-based DST activity?
2. What is the connection between children's creativity and block play-based DST?
3. Are there correlations among the children's emotions?

Children's attitudes towards block play within digital storytelling

Relevant literature suggests that children's learning attitudes can be used to assess their expressions and emotions about new media. For example, children with more fun experiences are more likely to use digital media appropriately and engage in more happy behaviours (Hynan et al., 2014). This could occur across a variety of block play contexts including when children are provided with developmentally appropriate digital materials to engage in play. Rose and Unni (2020) pointed out, students learn more happily with animation, which can also stimulate their intentional learning and enhance their learning performance. Indeed, image-based materials brings many emotional expressions such as joyfulness and enjoyment to children. First, joyfulness is generally emotive in content with fun experiences in some activities. Tolentino and Lawson (2017) argued that the development of digital technology can effectively promote children's joyfulness. Second, enjoyment is a similar emotion to make associations between cognitive developments that had previously seemed connected. The teaching mode of digital media focuses on emotional development, and the practice of digital content construction in pre-school allows children to develop their enjoyment (Bers et al., 2019; Ferguson, 2011; Strouse et al., 2019). It is argued in this study that block play within digital storytelling designed in operate as joyfulness and enjoyment becomes important emotional variables to enable children to transform the changes and challenges. Therefore, pre-school children's attitudes towards block play within digital storytelling were explored from the perspectives of joyfulness and enjoyment to identify whether it could positively enhance their creativity to find many possibilities in their real lives.

Methodology

This study adopted descriptive and correlational methods to determine children's attitudes and creativity and to reveal correlations between the variables.

Participants and procedure

Participants were 30 pre-school children aged 5 to 6 (18 boys, 12 girls). They were randomly assigned to incorporating block play into digital storytelling. When necessary, pre-school teachers also helped with classroom management, for example, when children required individualized attention due to behavioural issues.

A total of sixty-four 30-minute sessions were conducted over a period of 32 weeks, with two sessions each week. Each session comprised approximately 20 minutes of intervention as well as 10 minutes of drawing time. The following sections introduce the details of the incorporating block play into digital storytelling, and explanations of the drawing activities.

First, the children were asked to draw several pictures so that we could assess their creativity. During the creative process, they created stories about their pictures. They were then asked to create an original story using blocks as props. All of their storytelling episodes were analysed for mean length of utterance and parts of speech. Finally, the children were asked to draw the characters and settings they could remember from their own stories, and then they completed the Creativity Assessment Packet (CAP) as a quasi-experimental pre-test/post-test.

Block building

The children used Lasy building blocks to construct illustrated target structures. The research team developed these structures based on typical structures featured in the pamphlets of various children's building block products. The pre-school teachers guided the children to first build a simple structure, and then to build two more complex structures. They also guided the children to use building blocks to represent animals and understand each of the main steps involved in each role. Complexity was judged based on the number of blocks, how many horizontal levels and vertical planes there were, and whether all blocks were visible across photographs. Once the session was finished, we introduced the next activity.

Storytelling task

The creation of digital storytelling (DST) involves four steps of representation (Ming et al., 2014). The storytelling content was based on a story book called "My Feeling and Your Feeling" edited by an educator from Taiwan. The children listened to the story first and were

encouraged to create their version of the "Party Forest" story together. By collecting the children's ideas, the teachers later rewrote the story and assisted the children in drawing basic storyboards. The children also collaboratively drew nine backgrounds that matched the storyboards for the storytelling photographs. In the preparation stage, the children also created models with Lasy bricks and paper. Despite the fact that they are theoretically related, brick play and digital storytelling are distinct tasks. In block play-based DST, children use both verbal and nonverbal components to act out a story that they made up on their own. On the other hand, in the creative storytelling task, children were asked to verbally respond to visual stimuli provided in a picture book. With the teachers' assistance, the children shot each scene, adjusted the movement, and previewed their own storytelling with a digital camera. After finishing the photograph shooting, the teachers edited the storytelling for the final presentation.

Data Analysis

In this study, after implementation, data were collected and descriptive, *t*-test, and correlational analyses were performed on the quantitative data. Since the data did not have normal distribution according to the children's responses, Spearman's rho was used to determine the correlations. The statistical program IBM SPSS Statistics (version 23) was used for the data analysis. In order to answer the research questions, this study calculated means and standard deviations for the children's attitude by gender and use of storytelling prompts. For those CAP variables considered normal, parametric contrasts were performed in order to identify any differences between the post-test and pre-test scores. Finally, this study explored Pearson's correlation matrixes of the CAP tests, using the post-test and pre-test scores.

Results

Children's learning creativity and attitudes

In this study, children's joyfulness, enjoyment, and creativity in the block play-based DST were determined by an ordinal scale ("I agree," "Neutral," and "Disagree"). Results showed that most of the children had pleasure in the activity. Both boys and girls thought the block play-based DST was interesting and fun ($M = 2.85$, $SD = 0.43$; $M = 2.93$, $SD = 0.31$) and they enjoyed watching it and learning with it ($M = 2.95$, $SD = 0.36$; $M = 2.84$, $SD = 0.42$). The *t* tests also uncovered gender differences, as the boys reached higher means than the girls ($t = 5.12$; $t = 12.60$) for joyfulness and enjoyment.

Furthermore, a series of *t* tests was performed on the gender differences of children's mean and SD scores for the Creativity Assessment Packet (CAP). The scores on the Challenge scales

did not show significant differences, which implies that both boys and girls tended to have similar thinking about block play-based DST. Among the variables examined in the study, except for "Challenge" and "Adventure," significant gender differences were found on the scales of children's Creativity Assessment in block play-based DST ($p < 0.001$). Therefore, it indicated that, compared with the girls, the boys in this study were more oriented to show the "Fluency" "Flexibility," "Multiple," "Originality," "Elaboration," "Curiosity," and "Imagination" abilities when learning block play-based DST.

After receiving the teaching program of block play-based DST, the children were tested using the Creativity Assessment Packet (CAP). The descriptive statistics including means (M) and standard deviations (SD) of the participants' creativity scores in the pre-test and post-test for the eight assessment variables of Fluency, Flexibility, Originality, Elaboration, Adventure, Curiosity, Imagination, and Challenge. This table also shows the paired-samples t -test results. The means of Fluency ($t = 3.73, p < .001$), Originality ($t = 3.75, p < .001$), Elaboration ($t = 2.38, p < .01$), Curiosity ($t = 3.47, p < .001$), Imagination ($t = 5.14, p < .001$) and Challenge ($t = 6.46, p < .001$) in the post-test were all higher than the means in the pre-test. The results revealed that the children were infused with Fluency, Originality, Elaboration, Curiosity, Imagination, and Challenge, which aroused and sustained their interest in the block play-based DST. Also, the statistical results of the Flexibility scores revealed that the interaction of the pre-test and the learning strategies was not significant ($t = -.23$), which means that the data met the requirement for homogeneity of variance. By contrast, the means of Adventure ($t = -3.09, p < .001$) in the post-test were lower than those in the pre-test. In other words, if Adventure is significantly greater than the children's creative skill level, they could experience anxiety. On the other hand, if Adventure is significantly less than the children's creative skill level, they could become bored.

Discussion and Conclusion

This study explored children's creativity, attitudes towards, and impressions of block play incorporated into a digital storytelling-based learning environment. Assessment during each session was performed on eight dimensions: Fluency, Flexibility, Originality, Elaboration, Curiosity, Adventure, Challenge, and Imagination. The research results ascertained that the developed block play-based DST could be used to assess the creativity of the 6-year-old pre-school children. However, the instrument requires further validation, and predictive validity should be determined. Test-retest reliability could also be evaluated, and the relationship between this instrument and other general creativity measures could be examined in further

studies. Other studies may investigate different samples using block play-based DST. Thus, we believe that block play-based DST could be a valid way to assess whether pre-school pupils' creativity can be promoted with a specific intervention programme, and to determine which factors influence the development of pre-school pupils' creativity.

Findings revealed that block play-based DST had a positive effect on children's Creativity Assessment. The purpose of this section is to make conclusions and suggestions based on the study results, which can help integrate images/information technology into pre-school teaching implementation, in correspondence with the literature (Strouse et al., 2019). Additionally, block play-based DST is a learning style that is loved by children and benefits children's learning, but because of the multi-faceted ability needed by children before completing the final works, pre-school teachers' modest guidance and assistance is very important. Some research has revealed that hearing voices and encountering such an activity are important factors related to children's delight (Bers et al., 2019; Ferguson, 2011). This is consistent with our result as most of the children revealed attitudes of delight toward the learning activity.

The findings of this study conform with the argument that the creative (or divergent) thinking of pre-school-age children can be enhanced with playing activities implemented through storytelling-based learning (Ponticorvo et al., 2020). The results of the study indicated that Divergent Feeling is negatively related to children's creative features such as after block play-based DST. The finding is not consistent with Taranu et al.'s (2019) research, which found that when creating handiwork, the divergent feelings of creativity had a positive influence on the divergent feelings of manual skills. This implied that pre-school teachers push block play-based DST to acquire information for children, which may negatively affect their Divergent Feeling such as Adventure, Curiosity, Imagination, and Challenge. Finally, the Pearson correlation coefficients indicated that the scales of creativity, attitudes toward and impressions of block play within a digital storytelling-based learning environment were significantly positively correlated with each other, except for the result that no statistical correlation was found among the scales of Creativity, Joyfulness, and Enjoyment. These results in general support Ferguson (2011) whose studies found that students' positive learning experiences displayed in a challenging digital environment with clear goals resulted in small to moderate positive correlations. As a result, it is suggested that effective block play-based DST requires to be incorporated as part of a creative learning process, which could then provide an enhanced learning medium. Children could benefit from engaging with moving image education as long as learning materials are well planned.

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