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An experimental study of the effects of three-dimensional books on creativity and imagination of preschool children

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Abstract: The study explored the effects of three-dimensional books on preschool children's imagination and creativity through experimental and questionnaire methods involving 20 children aged 3 to 6. Results revealed that three-dimensional books significantly enhance children's creativity and imagination, especially in the 4-5 age group. The experimental group outperformed the control group in creativity dimensions such as fluency, flexibility, originality, and imagination dimensions like associative thinking ability and storyline design ability, confirming the potential value of three-dimensional books in preschool education.

Key words: three-dimensional books; preschool children; imagination; creativity

1 Introduction

The preschool stage is a critical period for the development of children's cognition, emotions, and creativity, and educational resources play a significant role in shaping their future growth. As a multisensory interactive tool, pop-up books enhance children's learning interest through visual, tactile, and interactive designs, promoting creativity and imagination development [1]. Although international research exists, studies on their application in China's preschool education, especially regarding the moderating role of family and educational environments, remain insufficient. This study aims to analyze the impact of pop-up books on children's creativity and imagination, providing scientific evidence for early childhood educational practices.

2 Research methods

Data were collected using the Torrance Test of Creative Thinking (TTCT), the Imagination Assessment Questionnaire, and a Family and Educational Environment Questionnaire to analyze the effects of three-dimensional books on preschool children's creativity and imagination. TTCT assessed children's fluency, flexibility, originality, and elaborateness in drawing and storytelling, while the imagination questionnaire evaluated associative thinking ability and imagination levels. The Family and Educational Environment Questionnaire examined children's family backgrounds, parental education methods, and kindergarten environments. The study involved 20 preschool children aged 3 to 6, divided into an experimental group using three-dimensional books and a control group using flat books. The differences between the groups were compared pre-and post-intervention.

3 Results and analysis

3.1 Intervention effect analysis

After intervention, the creativity and imagination scores of the experimental and control groups were compared to evaluate the impact of three-dimensional books on preschool children. The results indicated that the experimental group scored significantly higher on TTCT (45.3 vs.39.8) and the Imagination Questionnaire (38.7 vs 33.2).

T-tests revealed that the experimental group significantly outperformed the control group in creativity ($t = 3.47$, $p < 0.01$, Cohen's $d = 0.76$) and imagination ($t = 4.21$, $p < 0.01$, Cohen's $d = 0.88$). Effect size analysis indicated that the intervention had a moderate impact on creativity and a significant effect on imagination, validating the value of three-dimensional books in enhancing these areas.

3.2 Differences across age groups

To explore the effects of three-dimensional books across different age groups, the experimental and control groups were divided into age groups of 3-4, 4-5, and 5-6 years old. The post-intervention results are shown in Table 1.

Table 1. The post-intervention results

Age Group	EG Mean	EG SD	CG Mean	CG SD
3-4 years	41.6	3.7	39.5	4
4-5 years	44.8	3.9	41.2	4.3
5-6 years	46.2	4.1	42.8	4.5

The experimental group outperformed the control group at all age stages, with differences becoming increasingly significant with age. For the 3-4 age group, the differences were not significant ($p > 0.05$), suggesting that younger children may not fully utilize the potential of three-dimensional books. However, in the 4-5 age group, the experimental group significantly outperformed the control group ($p < 0.05$), indicating that this age is a critical period for cognitive development and children can benefit considerably from pop-up books. In the 5-6 age group, the score differences were the most extensive ($p < 0.01$), suggesting that older children's advanced cognitive and abstract thinking abilities make them more receptive to the intervention effects of pop-up books.

3.3 Changes in creativity and imagination dimensions

To further explore the specific effects of pop-up books, the study analyzed the post-test results of TTCT dimensions (fluency, flexibility, originality, and elaborateness) and the two core dimensions of the Imagination Questionnaire (associative thinking ability and storyline design ability). The results are presented in Table 2.

Table 2. Post-test results of TTCT dimensions and the two core dimensions of the Imagination Questionnaire

Dimension	EG	EG	CG	CG	t	*p*	Cohen's d
Fluency	23.4	2.5	19.8	3.1	4.21	<0.01	0.85
Flexibility	18.7	2.2	16.1	2.8	3.34	<0.01	0.68
Originality	21.5	2.6	17.3	3	4.68	<0.01	0.92
Elaborateness	15.2	1.8	13.5	2.1	3.01	<0.05	0.57
Associative Thinking Ability	22.3	2.7	18.6	3.3	4.05	<0.01	0.8
Storyline Design Ability	24.8	2.9	20.1	3.4	4.72	<0.01	0.94

*EG: Experimental Group, CG: Control Group

The experimental group scored significantly higher than the control group across all TTCT and imagination dimensions, with all differences being statistically significant ($p < 0.05$). Among these, the improvements in originality and storyline design ability were the most pronounced (Cohen's $d = 0.92$ and 0.94, respectively), indicating that three-dimensional books strongly stimulate innovative thinking and complex story creation. Significant improvements in fluency

and associative thinking ability (Cohen's d = 0.85 and 0.80) demonstrate that the multisensory interaction of three-dimensional books enhances children's ability to generate diverse and coherent ideas. From a theoretical perspective, Piaget's cognitive development theory suggests that children's thinking development relies on sensory and interactive processes, and three-dimensional books provide opportunities for exploration and association through dynamic design and 3D presentation. Additionally, Vygotsky's sociocultural theory emphasizes that interaction with parents and educators enables children to achieve higher levels of creativity within their zone of proximal development, as evidenced in this study. In summary, three-dimensional books not only significantly enhance the overall creativity and imagination in preschool children but also have a profound impact on specific dimensions.

4 Conclusions and recommendations

4.1 Conclusions

This study explored the effects of three-dimensional books on preschool children's creativity and imagination. Based on differences between the experimental and control groups in creativity dimensions (e.g., fluency, flexibility, originality, elaborateness) and imagination dimensions (e.g., associative thinking ability, storyline design ability), it was found that pop-up books significantly enhance creativity and imagination, particularly in children aged 3-6 years. The findings support Piaget's cognitive development theory and Vygotsky's sociocultural theory, highlighting the roles of multisensory interactive design and social support in children's mental and emotional development. Compared to traditional flat books, three-dimensional books offer advantages in interactivity and contextual immersion, with especially notable effects during critical developmental stages [2]. This study innovatively combines experimental evaluation and questionnaire analysis, expanding existing literature on the specific impacts of preschool educational tools.

4.2 Recommendations

Based on the results, it is recommended that kindergartens and early education institutions promote three-dimensional books in language, art, and science education. Open-ended questions and contextual discussions can be used to stimulate deep thinking and creative expression. Parents can enhance intervention effects through shared reading and role-playing activities that foster parent-child interaction. Policymakers should support the development and distribution of three-dimensional books, particularly in under-resourced areas, ensuring broader access for children [3]. Future studies can evaluate the long-term effects of three-dimensional books, explore AI-based personalized designs, and examine the influence of cultural and socioeconomic contexts to optimize their application in early education and unlock their full potential.

Conflicts of interest

The author declares no conflicts of interest regarding the publication of this paper.

References

[1] Hidayah A. 2020. The effect of pop up book activities on group A's early childhood creativity. *Early Childhood Research Journal*, 3(1): 30-40.

[2] Khairunnisa A. 2022. The effect of pop up book on 5- 6 years old children's listening skill. *Journal of Early Childhood Care and Education,* 4(1): 31-37.

[3] Sari NE, Suryana D. 2019. Thematic pop-up book as a learning media for early childhood language development. *JPUD - Jurnal Pendidikan Usia Dini*, 13(1): 43-57.

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