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DESIGN OF CHILDREN'S SCIENCE POPULARIZATION PICTURE BOOKS: MODERN APPROACHES

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The paper investigates the design of popular science picture books for children based on literature analysis and market research. It is determined that important characteristics of science popularization books are the correspondence of the level of knowledge presentation to the age characteristics of children, interactivity and broad cultural representation. Strategies are proposed for children of different age groups, which include the adaptation of visual content to the stages of cognitive development, the integration of multi-sensory and interactive elements, as well as the use of multicultural narratives. The implementation of these approaches increases the cognitive effectiveness of popular science illustrated books, contributing to the development of creative thinking and cross-cultural perception in children.

Keywords: science popularization book, picture book, book for children, interactive design, cognitive development, interactivity.

INTRODUCTION

Within the context of STEAM education's progressive globalization, children's scientific illustrated publications exert direct causal influences upon the efficacy of initiatory scientific pedagogy through their design integrity. However, current science-themed picture books exhibit notable design deficiencies [1, 2]. First, a misalignment exists between knowledge presentation and cognitive development stages, manifested through the lack of tiered design in information density. Second, insufficient interactivity and suboptimal engagement mechanisms weaken experiential learning outcomes. Third, monocultural visual-textual representations limit cross-cultural interpretability. These issues collectively reduce children's average reading retention duration, thereby diminishing the educational potential of science popularization materials. Grounded in analysis design practices in children's popularization picture books, this study investigates design methodologies better aligned with child development principles, seeking to enhance the pedagogical utility of science picture books.

PURPOSE

The aim of this study is to propose optimized design strategies that enhance the scientific rigor and artistic visual representation of children's scientific picture books, while addressing current deficiencies such as the lack of targeted design for



graded reading, weak interactivity, and the homogenization of cross-cultural elements.

RESULTS AND DISCUSSION

In order to guarantee cognitive accessibility of science-themed illustrated publications, content architecture should be meticulously calibrated according to age-specific cognitive developmental phases. For 3-6-year-old children illustrated publications typically employ visually enriched schematics paired with linguistic simplicity. Whereas illustrated publications designed for 9-12-year-old cohorts systematically integrate elaborated scientific axiomatics [3]. The strategic implementation of contextualization methodologies enables the effective transmission of complex scientific tenets into narratively engaging frameworks, either through didactically structured plotlines or intentionally embedded hermeneutic cues. This mechanism guides young learners towards multi-level conceptual internalization, thereby facilitating knowledge acquisition. The picture book *Where Has the Moon Gone?* [4] created by Japanese illustrator Hiroyuki Arai, with its exquisite illustrations and captivating colors, draws children's attention and cultivates their observational skills (fig. 1). Through its playful narrative, the book encourages children to ask questions and solve problems, making it suitable for developing early logical thinking and teamwork skills.

To enhance sensory experiences and interactivity, picture books should use vividly contrasting colors and graphic designs to strengthen visual stimulation while providing a coherent storyline [5]. Specific pages can be equipped with sound-trigger mechanisms that activate sound feedback linked to the visuals when children turn to the targeted pages, enhancing the integrity of the narrative environment through synchronized audiovisual perception. For example, the picture book *Sounds of the Wild* illustrated by American artist Stephanie Fizer Coleman [6] incorporates an integrated sound button module. Children can press these buttons while reading to hear authentic animal sounds (fig. 2), paired with detailed illustrations of natural scenes, thereby enhancing the auditory experience and interactive engagement of the children.



Fig. 1. Where Has the Moon Gone?



Fig. 2. Sounds of the Wild

Enhancements in interactivity are achieved by incorporating page-turning mechanisms such as sliding, spinning, or pulling elements, allowing children to



actively participate in advancing the storyline while reading. London illustrator Amy Grimes's book, *Pop-Up Peekaboo! Tree* [7], uses pop-up pages and hidden elements as a playful method to guide children in actively learning about animals during their search process (fig. 3). This approach breaks away from the traditional format of flat scientific picture books, allowing children to observe animal figures while learning related knowledge, significantly enhancing their interest in learning.

The enhancement of cultural diversity within science-themed picture books necessitates the strategic incorporation of globally renowned scientific achievements and distinctive cultural elements from various nations. This objective can be effectively realized through a narrative approach that illuminates multicultural appeal for young readers. For instance, Chitra Soundar's illustrated work *We All Celebrate* [8] systematically examines festive traditions across civilizations (fig. 4), thereby educating children about cultural variance while fostering intercultural appreciation. A similar approach is evident in Margarita Engle's *All the Way to Havana* [9], which meticulously documents diverse transportation methods worldwide (fig. 5), concurrently providing geographical insights and sociocultural perspectives that broaden children's comprehension of global communities. These literary endeavors illustrate how integrating scientific knowledge with culturally-specific narratives can cultivate cross-cultural awareness.

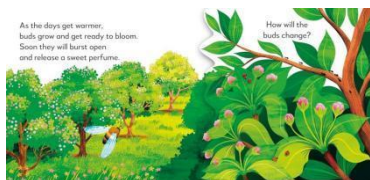


Fig. 3. Pop-Up Peekaboo! Tree

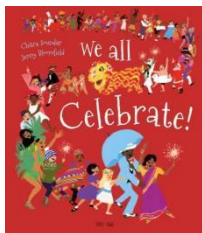


Fig. 4. We All Celebrate

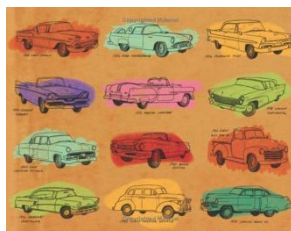


Fig. 5. All the Way to Havana

CONCLUSIONS

This study investigates design deficiencies in contemporary children's science-themed picture books, with particular focus on age appropriateness of content, effectiveness of interactive mechanisms, and integration of culturally inclusive narratives. Three targeted optimization strategies were proposed: visual content tiering aligned with cognitive developmental stages; contextualized design integrating interactive experiences and multisensory stimuli; narrative frameworks incorporating multicultural elements. These strategies enhance the visual engagement and narrative dynamism of science-themed picture books, and demonstrate significant efficacy in stimulating imaginative thinking and fostering creative cognition in juvenile readers.



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ЛІНЬ Іфен, ГЕРАСИМЕНКО О. ДИЗАЙН НАУКОВО-ПОПУЛЯРНИХ ІЛЮСТРОВАНІХ КНИГ ДЛЯ ДІТЕЙ: СУЧАСНІ ПІДХОДИ

В роботі досліджено дизайн науково-популярних ілюстрованих книг для дітей на основі аналіз літератури та дослідження ринку. Визначено, важливими характеристиками таких видань є відповідність рівня подачі знань віковим особливостям дітей, інтерактивність та широка культурна репрезентація. Запропоновано стратегії для дітей різних вікових груп, що включають адаптацію візуального контенту до етапів когнітивного розвитку, інтеграцію багатосенсорних та інтерактивних елементів, а також використання мультикультурних наративів. Впровадження цих підходів підвищує пізнавальну ефективність науково-популярних ілюстрованих книг, сприяючи розвитку у дітей творчого мислення та крос-культурного сприйняття.

Ключові слова: науково-популярні книги, ілюстровані книги, книги для дітей, інтерактивний дизайн, когнітивний розвиток, інтерактивність.