

AN INTERACTIVE PHILOSOPHICAL VISION FOR TEXTBOOK DESIGN TO INCREASE INFORMATION VALUE

Khlood Khaled Ahmed 

Higher Institute of Applied Arts, Department of Printing, Publishing and Packaging,
New Cairo, Egypt

Abstract: *This research aims to improve the visual design of information in primary school education by improving the structural and graphic design of the textbook through paper engineering of pop up interactive book based teaching material. The goal of the research is also to find a solution for textbook design that combines the benefits of an electronic book and an ordinary book by displaying images in three dimensions and content in an interactive manner to simplify and facilitate the information. The difficulty for primary school students to understand some curricula through ordinary textbooks is a research problem. In this study, we used a field study with a focus group discussion to achieve our goal, and we chose an informal ordinary book as the primary source, its title (into the crater of doom) and transforming its structure design into a pop-up book to present to primary school students and get their feedback on the method to design the pop-up book to use as an aid means of simplifying information for students, interacting with the book, and presenting the information in an interesting manner. The results of a discussion group with 33 primary school teachers divided into three groups revealed that 92% of them agreed that the design of the ordinary textbook should be updated. By presenting the researcher's pop-up book, all of them prefer to use the pop-up book as an aid in improving students' cognitive and intellectual skills. Furthermore, the results of the discussion groups with the students, a total of 35 students divided into three groups, revealed that all of them preferred to use the pop-up book in all textbooks, particularly science and social studies for 4th grade primary students.*

As well as making recommendations to the Ministry of Education on their performance regarding the positive impact on students of using pop-up books designed by the researcher as an aid means to students in schools and homes.

Key words: Popup book, paper engineering, Ergonomics, Structural design, intellectual skills.

1. INTRODUCTION

Interactive design is a design method that allows children to participate in it personally with the use of different forms of book design, the design of a children's book may have many different ways of presentation (Song, 2021). Interactivity is like games, It is a way that children prefer. Children are easily distracted during the learning process, and the interactive design is more suitable for children (Yan, 2019), they are more active in the process of reading and learning, and are more able to learn actively through the process of interacting with books. Currently, digital displays are used in education, but with elementary school kids, the function of the textbook must be enhanced and an attempt made to improve it to suit the students. Therefore, it is necessary to update the design of the ordinary textbook, particularly with the increasing of smart phones in reading educational content, is a major challenge that has led to shed light on the revival of textbook use. To accomplish this, the graphic design and structural design of the textbook must be updated, taking into account the selection of a standard book size that is appropriate for children of the target age, the use of appropriate colors, whether for text or backgrounds, the use of appropriate font sizes with an interest in clarifying information in the form of 3d images, and the search for solutions for students' interaction with the textbook.

Pop-ups or movable books are three-dimensional books containing pieces of paper that appear or move when the book is opened and fully folded when the book is closed (Conrado et al., 2014). The ones that can make pop-ups appear are various methods of cutting and folding, as well as on the hidden mechanisms behind and under the page. Pop-up books are included in the characteristics of a three-dimensional learning media, therefore, pop-up book included a unique and interesting learning media to help students understand the material that had been taught (Ahmadi & Khasanah, 2018).

1.1 Interactive Design in Children's Books

order to develop age-appropriate content to be used for both the printed pop-up book and the interactive pop-up book, I started by looking at the work of children's authors and artists, including Eric Carle, Sandra Boynton, Emma Quay, Anna Walker, and Eric Hill. There is still a certain difference between interactive design and traditional ordinary printing books. It is different from traditional books in terms of material, structure, and content presentation. It breaks the expression form of flat books and introduces new design methods. This makes this kind of books look "different" from other books (Song, 2021). Books are added with toys, or some foldable cards, etc., so they can attract children's attention and be more acceptable to them. There are also various forms of interactive books. It's flipping form and content presentation can also produce different effects with different design methods and opening methods, which greatly enriches children's visual enjoyment experience. Children can learn knowledge in a more realistic and visual way, and have fun in the learning process.

1.1.1 Pop-up books

Pop-up book mean a book with pages that rise when opened to simulate a three-dimensional form, as shown figure 1. Figuring out the paper mechanics necessary to convert a 2D sheet of paper into a full 3D structure is quite a technical process, and one that will need to be done by a professional designers. They'll know what cuts will need to be placed where, how each piece will need to fit together, and which markings to use in the artwork to indicate this all to a production team (PrintNinja, 2022). Because pop-up books are so unique in their manufacturing, they come with some particular production requirements. Interior Paper Must be sturdy enough to support the pop-up structures, Because of how complex and labor-intensive these projects are to manufacture, the minimum order quantity is 500 units.



Figure 1: Pop-up book

1.1.2 Characteristics of Children's pop-up books

The success of pop-up books within the word of infant literature seems to suggest that they were designed specifically for children. However, in their beginning, these books were aimed at reaching adult audiences. Originally, the purpose of the pop-up book was as a type of pedagogical resource. As such, these books made it easier to understand and explain theories. It wasn't until the 18th century when the same technique extended into the world of entertainment literature, especially for children (youaremom, 2022).

In the whole childhood, children's unintentional attention has reached a high level of development and occupies a dominant position. Intuitive stimuli or sudden changes in stimuli will cause children's unintentional attention. As everyone knows, children generally have the nature of playing. The love of play here refers to the love of doing things and discovering some novel things. Interactivity is just in line with this feature, which is not only in line with children's psychological characteristics, but also can increase the interactivity of books. This is a very appropriate thing (Yan, 2019).

1.2 Ergonomics Principles in Book Design

The principles of ergonomics ensures that the design complement the consumer ability strengths for and strives to minimize the effort and limitations while using the product rather than forcing them to adapt. Ergonomics is widely implemented in different industries effecting the creative sector. Many designers believe ergonomics is only considered in product design. However, designers in different fields such as

graphic and interactive design are required to consider ergonomics in their design projects. For example, the interactive designers should consider the user experience research as an essential stage in designing mobile applications, user interfaces, and book design (Elmansy, 2015).

1.2.1 Children's Book Sizes

Book size, also known as trim size, is the actual book dimensions. Book size is measured in length by height. A trim Size in inches 8.5 x 11 (would be a portrait orientation, while) 11 x 8.5 would be a landscape orientation. Book size measures the interior of a book, also known as the book block. For a paperback book, the book cover size will be the same as the trim size. For hardcover book, the book cover size will be larger than the trim size to accommodate for the hardcover case that wraps around the book block. The hardcover will typically add extra .125 to the top, bottom, and right side of a closed book (Vitale, 2020).

The best portrait children's book sizes in inches: (7 x 10), (7.5 x 9.25), (8 x 10), and (8.5 x 11).

The best square children's book sizes in inches: (8 x 8), (8.5 x 8.5), (9 x 9), (10 x 10).

The best landscape children's book sizes in inches: (10 x 8), (11 x 8.5).

1.2.2 Readability

The ultimate purpose of book design is to learn and read a good book is not complicated. Human beings should find its concise expression in a variety of design methods. At this age, children's cognitive level is still relatively limited. They may not be able to fully understand things that are too complex. Only simple and easy method is the best (Song, 2021). In the process of reading books, students aged 10 to 12. Accuracy of reading was measured by the average of error that students made when reading the text, while reading speed was determined by the time it took students to read the text. Therefore, font sizes 14 and 16 point are readable for readers aged 10 to 12 and over (Abubaker & Joun, 2021).

2. METHODS

The research method that used in this research is a research and development (R&D) method that can be interpreted as a scientific way to research, design, and produce, this section of the study summaries the tools and materials used to implement the research idea. When developing the initial mocks for the printed pop-up book, I started by looking at the work of David A. Carter and Robert Sabuda, two well-known pop-up book artists. Both artists' work helped to shape my decisions when it came to building pop-up book functionality that enhanced the story. Initially, a structural design proposal based on paper geometry with the same graphic design for the book (into the crater of doom) shown figure 2.

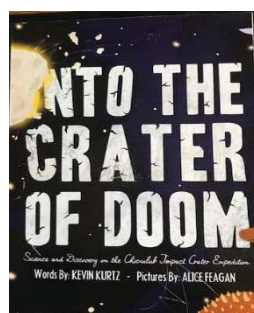


Figure 2: The cover of the book into the crater of doom

Preliminary research revealed that the textbook's design requires development in terms of graphic and structural design, and the researcher focused on practical application of structural design through the use of paper engineering in displaying images in a pop-up style. A book was chosen in the crater of death, To learn more about the mass extinction that introduces children to the asteroid impact 66 million years ago that caused the extinction of dinosaurs and many other species. This book was chosen because it requires imagination and understanding through the use of three-dimensional images.

With the same graphic design, the structural design of the internal book pages was changed. First, a prototype of 250g Canson paper was created, and the pop-up images shown in Figure 3 were created using paper engineering. The background, text, and images were then printed while keeping the same cover to create the pop-up book shown in Figure 4. Following that, the proposed book was presented to the students, as shown in Figure 5, and their reactions were recorded as shown in Figure 6.

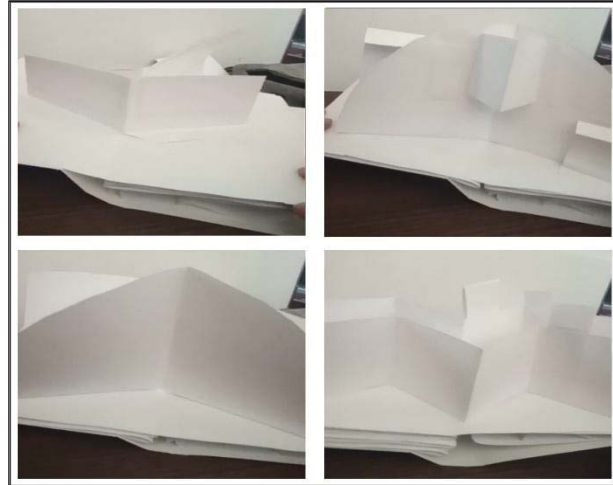


Figure 3: The suggested pop-up book's initial prototype



Figure 4: The suggested pop-up book



Figure 5: Student feedback on the suggested book and compare it to other books



Figure 6: Students' opinions on the suggested book that appears are positive

The ordinary structural book design was developed in order to measure the effect of the structural design of the book on students' comprehension, and it evaluated through a focused group discussion of teachers and students At the Egyptian International School, 33 primary school teachers participated in a focused group discussion, They were divided into three groups and a series of questions were given to them to gauge how well students understood the topics included in the book, how well they accepted the book's structural design, and how well the pop-up book's structural design affected their understanding of the subject. Additionally, through a focus group discussion with 35 primary school students who were separated into three groups with the assistance of the responsible teachers. Before they read the content, they were shown the pop-up book the researcher had suggested in order to get their thoughts on it and gauge how well they understood the topic.

3. RESULTS

According to the researcher's observations of the focused discussion with the fourth primary stage students after presenting the proposed book design with the pop-up images, it was discovered that most of the students interacted with the book and understood what the book contained through the three dimensional images that were designed through the paper engineering, they see that it is a successful way to understand the topics and that this The method is interesting and fun. One of the students commented that the size of the textbook and its dimensions are very large and inconvenient to use, and that there are some Subjects in which the font size very large and others are small, so the size of the font in all Subjects should be fixed to be suitable for reading, shown table 1.

Table 1 (part 1): An overview of the opinions of teachers and students on the pop-up book design as an aide schoolbook

Primary school teachers' questions	Responses, refer to Number (percentage %)	
Do you notice that the majority of students refuse to use the schoolbook?	YES , 25 (75.75%)	NO , 8 (24.24%)
	Most teachers believe that the majority of students refuse to use the schoolbook.	
Do you think the ordinary schoolbook's design should be updated?	Strongly agree , 31 (93.93%)	Agree , 2 (6.06%)
	Most teachers Strongly agree that the ordinary schoolbook's design should be updated.	
Do you believe that using pictures in a textbook helps students understand the text more effectively?	YES , 33 (100%)	
	Everyone agreed that using images in textbooks is extremely effective.	
What are the challenges that primary school students face of designing a textbook?	<ul style="list-style-type: none"> - Most teachers believe it is uninteresting for students. - Others think the text must be as interesting as the images. - Some books are quite large and heavy. - Some books are lack imagination & lack interactivity. - There is no idea in the design of the book. - Students are dissatisfied with book design. - The schoolbook's lack of color. 	
Have you heard of a popup book?	YES , 33 (100%)	
Is it preferable, in your opinion, to use a pop-up book as an aide book with a schoolbook?	YES , 33 (100%)	
	Everyone strongly agree that the pop-up book system should be used as a textbook or a specific book, especially for topics that are difficult for students to understand or imagine.	

Table 1 (part 2): An overview of the opinions of teachers and students on the pop-up book design as an aide schoolbook


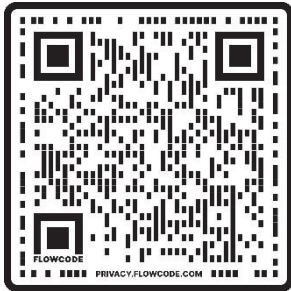

<p>By displaying the proposal of the pop-up book figure 7 to a group of fourth year primary school students, Would you prefer to use the popup book style as a structural design for the textbook?</p>  <p>Figure 7: The proposal's structure design book with pop-up</p>	<p>Everyone strongly agreed that using Popup images in textbooks and using pop-up books as an aid in some textbooks was a good idea. By scanning the QR code shown figure 3 , you can watch a video of students' opinions about the pop-up book</p>  <p>Figure 3: Students' opinions about the proposal Pop Up book</p>
<p>What entices the student to use the suggested book?</p>	<p>3D image display method and their understanding of the subject through the use of pop-up images prior to reading the text. By scanning the QR code shown figure 4, you can watch a video of One of the students' opinions about the Popup book & Compare it to ordinary books.</p>  <p>Figure 4: One of the students' opinions about the Popup book</p>
<p>According to students, Is the popup book design improves cognitive and intellectual skills?</p>	<p>Everyone strongly agreed that the popup book design improves cognitive and intellectual skills, on other hand The use of popup books improves content knowledge of the subject and improves the retention of knowledge</p>

Table 1 (part 3): An overview of the opinions of teachers and students on the pop-up book design as an aide schoolbook

Is the Pop-up book design making the subject more interesting and enjoyable to learn?	<p>Everyone agreed that the popup book design makes the subject more interesting and enjoyable to learn, and it also improves self-directed learning on the topic.</p> <p>By scanning the QR code shown figure 5, you can watch a video of students' opinions about their thoughts on the pop-up book feedback.</p> <div> </div> <p>Figure 5: Students' opinions about their thoughts on the pop-up book</p>
Is the Pop-up book design improves Eye tracking and interactive?	<p>Everyone agreed that the pop-up book design improves eye tracking and instructiveness, as well as promoting student interaction with one another. It also aids in memory improvement.</p>
<p>At the end of the focus group meeting, teachers and students were asked the same question:</p> <p>What are the curricula that require the use of the pop-up method from their perspective?</p>	<ul style="list-style-type: none"> - Science and social studies were mentioned by the majority of students and teachers. - Retelling detailed stories in a sequential manner, science topics (characteristics of various organisms), and social studies topics (intercultural themes). - In the opinion of one of the teachers, it will be most useful for explaining scientific objectives. It will make the concept almost tangible, giving students more hands-on experience.

Following the great responses to the printed interactive book the researcher presented the project idea to second-year students at Higher Institute of Applied Arts, Department of Printing, Publishing and Packaging, in book design course to create graphic designs and apply interactive methods and pop-up images in the design of the science and social studies book to solve the problem of curriculum difficulty on the students, as shown in Figure 8, then presenting it to those responsible and interested.



Figure 8: Samples of the covers book and pop-up inside pages for social studies and science.

4. DISCUSSION

Based on the result of the interview, the design of the children's textbook must conform to the characteristics of children at this age and children's nature. Children's books should not only maintain the readability of ordinary books, but also have innovative forms, so as to highlight the distinctive characteristics. For example, in order to meet the characteristics of children's love of play, books can be designed into various folding methods, which will greatly enhance children's interest in reading and learning, and make children love learning more. In line with the characteristics of less literacy and easy reading, it is necessary to use pictures to convey language, put more pictures and fewer words as much as possible, and use bright colors and Pop up picture forms to stimulate children's brain, and enhance memory, which is also helpful for children's learning. By changing the forms of books, children can participate in the interaction. This interactivity is a process that allows children to use their brains, eyes, hands and other aspects to experience comprehensively. In the whole reading process, this method can make children more focused. This approach was successful in creating positive reactions from the focused group discussion of students and teachers by using interactive methods in suggested book design to overcome the boredom of using the ordinary book, among the beneficial outcomes of the usage of interactivity in the design of a children's book, as shown in Table 2.

Table 2: interactivity in the design of ordinary book versus suggested book

Significance of Interactive children's book Design	Suggested book	Ordinary book
Design Breaks the Single Mode of Book Design	√	×
Design in Line with the Characteristics of Children	√	×
Improving Children's Self-learning and Practical Ability	√	×
Promoting the All-round Development of Children	√	×
Expression of interactive characteristics	Suggested book	Ordinary book
Visual Interactive Experience	√	×
Tactile Interactive Experience	√	×
Inner-page Folding Experience	√	×
Flipping Experience	√	×
Game Interactive Experience	√	×

5. CONCLUSIONS

As a final result, the researcher can conclude the importance of Interactive Design in Children's Books, especially in schoolbooks. Book content and interactive form become more colorful, powerful and interesting. It allows children to participate and interact with books, which not only improves children's practical ability and learning efficiency, but also improves children's autonomous learning ability.

As a result, the role of academic institutions in solving societal problems is represented in this research through innovative ideas for designing the textbook to be more interactive with students and to simplify difficult-to-understand information through pop-up images and interactive methods in the book. To activate the role of academic institutions in solving societal problems, the researcher focused on designing a textbook for the primary stage after conducting preliminary studies to learn about the problems that students faced in the primary stage, the majority of which were in science and social studies for the fourth primary stage. In focus group discussion, the researcher presented the notion of an interactive printed book to students and teachers, this led in really good comments. By conducting usability testing throughout the creative process of the printed pop-up book, I found that it helped produce constructive feedback, which helped to inform the content of the written story.

For the fourth primary stage, it is recommended to use pop-up images and interactive techniques in the science and social studies textbooks. It is also recommended to lower the size of the book to suit students.

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