An Analytical Study to Design and Produce "non-official" Pop-up Double Pages for Children's Book at the Faculty of Applied Arts, October 6 University in Egypt

Mohamed Zakaria Soltan
Lecturer at Advertising Department, Faculty of Applied Arts, October 6 University, Giza, Egypt,
mohamed.zakaria.art@o6u.edu.eg

Follow this and additional works at: https://www.jadm.eg.net/journal

Part of the Graphic Design Commons, and the Visual Studies Commons

Recommended Citation
Available at: https://doi.org/10.55554/2785-9649.1007

This APPLIED ARTS - Original Article is brought to you for free and open access by Journal of Art, Design and Music. It has been accepted for inclusion in Journal of Art, Design and Music by an authorized editor of Journal of Art, Design and Music.
ORIGINAL ARTICLE

An Analytical Study to Design and Produce “Non-official” Pop-up Double Pages for Children's Book at the Faculty of Applied Arts, October 6 University in Egypt

Mohamed Zakaria Soltan

Lecturer at Advertising Department, Faculty of Applied Arts, October 6 University, Giza, Egypt

Abstract

One of the most crucial suggestions of this paper is to study is an appeal to the officials of the Ministry of Education in Egypt to use the techniques of the pop-up pages in textbooks at primary schools to improve the quality of the textbook and reach higher levels of comprehension among students. It is a study of an experiment taught by the researcher with his 3rd-grade students, At the Department of Advertising, Faculty of Applied Arts, October 6 University, Book Art 1 Course for the Academic Year 2021/2022, to design and produce non-official pop-up pages for various children's books. The researcher Chose the best work for analysis and study; he did a detailed analysis. Moreover, explained the stages of quantitative production, then studied its statistical impact on the students of the third grade of primary school “Nour Al Salam Private Language School”, Al-Qanater Al-Khairia Educational Administration, in Egypt, to reach the results and the recommendations, most notably: “The pop-up movement mechanism: is attractive on the study sample, where the percentage reached (94.9%) of the study sample”, but it comes in seventh place in the used Questionnaire, It should also be modified to be more attractive on other pages, as well as the ease of reading the font used in the sample came in the sixth place with a relative weight of (2.97) - (97.4%) approval from the study sample, which is indicative Good, however, should be modified to be more accessible in the reading process.

Keywords: Pop-up book, Children's book, Pop-up mechanisms

Introduction

Beneficent monk Matthew Paris, around 1250, was the first to use a “movable book” to keep track of holy days. (Glenn Horowitz Bookseller, n.d.), Early scientific and mathematical studies spawned the mechanical book. Turning discs, or “volvelles,” appeared in literature as early as the Middle Ages for astronomical, geographic, and arithmetic computations (Explore.lib.virginia.edu. n.d., p. walkthrough), A “volvelle,” or revolving wheel, was used in Paris. Ramon Llull introduced volvelles in 1305 in a multi-layered Ouija board style (Glenn Horowitz Bookseller, n.d.), Andreas Vesalius' De Humani Corporis Fabrica Libri Septem, published in Basel in 1543, was the first book to use foldouts and stacked flaps of paper to depict anatomy (Explore.lib.virginia.edu. n.d., p. pop3).

The Showman’s Series, the first movable book created in America, was presented in the 1880s by McLoughlin Brothers, a New York-based
Research Methodology

A descriptive methodology that describes and analyzes educational experiment outputs carried out by the researcher and his colleagues. Then the researcher chose the best models of Pop-up, Double pages. He chose the best of them to focus on and the best one to study and analyze the implementation method under his supervision. He designed a questionnaire to measure the return of the statistical impact on the third-year primary students.

Research Problem

Is it possible to apply pop-up double pages in designing book art within the Faculty of Applied Arts teaching process, October 6 University? What are the best results that the Faculty of Applied Arts Advertising students (Third-Grade Students) have implemented?

What is the method of implementation and design? Moreover, what is the impact on students of the first primary stage?

Research Objectives

1. Documenting the educational experience and its best results
2. Studying the technique of implementation and montage to reach the best methods of quantitative implementation.
3. Studying the impact of the impact on students of the first primary stage to reach the results and recommendations.

Research Limitation

The time of the semester to implement the idea was short, in addition to the difficulty of learning the mechanics of different pop-up techniques because the students firstly made them manually. Then they tried to fix the obstacles to the digital production implementation.

Review of Literature

Pop-ups & Education

Etheredge et al. (2005) discussed the importance and power of using pop-up books in teaching teachers the basics of engineering and design. Rachmawati et al. (2019) examined the difficulties of learning mathematics in a high school in Indonesia and discussed developing a smash book-based pop-up to overcome this problem in earning mathematics. Fazira and Qohar (2021) produced a pop-up book on polyhedron learning material. Even in educating the patients, for example, Cordray et al. (2021) discussed the role of the educational book, which uses the pop-up pages, to educate sick children and help them overcome their fears before surgery. Anggraini et al. (2019), examined students’ responses to a learning media pop-up book that incorporates Al-verses Qur’s and the Physics and materials subjects like the temperature and its variations.

Mechanisms of Pop-ups

From the research in the literature on the pop-up topic, there are several pop-up mechanisms such as: (V-fold, Pull-strips, Windows, Zigzag, Parallelogram). 1-Piece Technique (Stand, Cut) & multi-piece technique (Parallel Fold, V-fold), Lee, Tor and Soosaid in 1996 about the Pop-up Mechanisms: There is often a slot cut in a page, Rotary motions through crank or pinion mechanisms. Three-dimensional pop-ups are made by folding and unfolding a pop-up piece divided into two kinds: A-the pages and pop-up portions stay planar, and B- the pages and pop-up parts are allowed to bend or warp. Moreover, described a V-fold as having four straight foldable lines, and it must be parallel and concurrent. Etheredge et al. (2005) mentioned that Parallel folds, angle folds, wheels, and pull-tabs are pop-ups’ essential elements and mechanisms. In 2011 Iizuka et al. summarized the mechanisms of Pop-up cards into two categories: 90-degree cards and 180-degree cards.

Integrating Pop-ups with Digital Technology

et al. (2011) showed an interactive system that allows users to design original pop-up cards.

The Analytical and Applied Aspect of the Research

The researcher taught Designing the Art of Book 1 at the Faculty of Applied Arts, October 6 University Academic Year 2021/2022, where the researcher participated in the teaching process. The researcher asked the students of the third grade of the Advertising Dept., Faculty of Applied Arts, October 6 University in Egypt, to design the pop-up double pages for different children's books. The researcher chose the best samples for presentation in this paper, then selected one of them based on determining the criteria for selection to study and analyze in-depth and study the children's impressions statistically for this selected pop-up double page. The following is a presentation of the best results of students' pop-up double pages, Faculty of Applied Arts, October 6 University, “The Design of Book Art 1”, 2021/2022 see Figs. 1–6.

Moreover, other selected Pop-up Double pages for different children's books designed by researcher students, Supervisor by The Researcher, and the Course Team are as follows:

The Case Study of the Best Creative Design & Effective Production Process

The researcher selected the best Pop-up Double Page from what was produced by the Faculty of Applied Arts students, October 6 University, during the first semester of the academic year 2021/2022 and in the subject of “The Design of Book Art 1” and under his supervision. Moreover, the following are the Justifications of the researcher choosing the selected pop-up double page for the study in this paper, from both sides: the know-how and Statistical Analysis.

Justifications for Choosing an Analytical Sample of Artwork

- The achievement of the originality of the artwork in terms of the students' drawing and design.
- The Integration between the book's content and the general atmosphere of the pop-up pages that jump up.
- How do the selected students deal with all the different pop-up parts that will jump up and the relationships of the pop-up parts and answer the following several questions, including Are the pop-up parts moving with an easy movement?
- Does the movement serve the content of the written text?
- Does the movement in “open and close pages” achieve the dramatic atmosphere of the story?

Children's Story Called, “Jack and the Beanstalk” is an English fairy tale. So, the researcher chose the best sample Pop-up Double page of the student “Tasbeeh Mohamed Ahmed” to be the ideal study design and analysis for the research. This paper will analyze the creative design process including three stages as follows:

The Stages of Design and Production of Pop-up Pages

It includes analysis of the steps of the creative process, technical details, measurements, and the productivity of the application aspect. It is divided into three stages:

Fig. 1. The initial pop-up double page prototype & the final pop-up double page by student: “Tasbeeh Mohamed Ahmed”, 3rd - Grade, Advertising Dept., Faculty of Applied Arts, October 6 University. Supervisor by The Researcher and the Course team.

Fig. 2. The initial pop-up double page prototype & the final pop-up double page by student: “Hala Elsayed Mohamed”, 3rd - Grade, Advertising Dept., Faculty of Applied Arts, October 6 University. Supervisor by The Researcher and the Course team.
The First Stage: Making the Initial Pop-up Double Page Prototype
The student made an Initial Pop-up Double Page Prototype test movement mechanisms without obstruction before printing and implementation. (see Fig. 7).

The Second Stage: The Final Graphic design stage and drawing the Die-Cut lines includes (see Figs. 8-17)

A- Graphic design of the book’s pop-up inner pages (both sides of the paper: the front, the back with glue locations) - (see Figs. 8, 10, 12, 14, 16).
B- Drawing the Die-cuts lines for pop-up pages: including cut, fold, and glue areas on both sides of the paper (front and back) - (see Figs. 9, 11, 13, 15, 17).

Fig. 8: The base of the Pop-up Double Page and one of the graphic elements (the house) installed on it with actual size numbers, and the numbered red glue is placed on the front of the paper.
Lef Top: The face of the paper for the base of the pop-up double page: Which will stand all the shapes and the writings on them in proportion to the content of the written text, which is the rectangle (a, b, c, d) 48 cm width and 33 cm height, and there are red areas for glue numbers (1, 2, 3, 4, 5, 6, 7, 8, 9), on which the rest of the parts will be installed.

Fig. 4. The initial pop-up double page prototype & the final pop-up double page by student: “Manar Tarek Fouad Mohamed”, 3rd - Grade, Advertising Dept., Faculty of Applied Arts, October 6 University. Supervisor by The Researcher and the Course team.

Fig. 5. The final pop-up double page by student: “Ali Ayman Barakat”, 3rd - Grade, Advertising Dept., Faculty of Applied Arts, October 6 University. Supervisor by The Researcher and the Course team.

Fig. 6. The final pop-up double page by student: “George Amir Eskander”, 3rd - Grade, Advertising Dept., Faculty of Applied Arts, October 6 University. Supervisor by The Researcher and the Course team.
(c3, c4) to the geometry (c3, d1, d2, d3, c4). The angles used are:

- (135°) like the angle (a1, a2, a3) and others.
- (270°) angle like the angle (a3, b4, a1) and others.
- (90°) angle like the angle (a4, b1, b2) and others,

Moreover, there are red areas. The glue has numbers (1, 2, 10, 11), (1, 2) to fix the house to the floor. (10, 11) to fix the house's walls to the background of the house's roof, which is in the lower left of Fig. (8B).

Right Top: The back of the paper for the base of the pop-ups: Represents the actual surface area of the pop-ups for the actual cut edges.

Right Bottom: The back of the house graphic sheet.

Fig. 10: Some of the graphics illustrated parts for the first pop-up page ("Landscape," paved road, house roof) with actual dimensions red numbered glue spots on the front and the back of the paper.

Left Top: The face of the paper for the landscape of the pop-up double page: It will stand up once the book page is opened and serve as the surrounding landscape of the scene. It is a geometric figure (a, b, c, d, e, f, g, h, i, j, k, l) 48 cm width and 13 cm height (Details of dimensions and angle degrees in Fig. (10A)). Red glue areas No. (3, 4) are adhesive with the same numbers of red glue areas (3, 4) located on the base of the first pop-up page in Fig. (8A).

Left Middle: The face of the paper for the separate top layer of the paved road of the pop-up double page: It is used to suggest that the land has a natural slope. It is spirally shaped like the letter (S). The outer width is 29 cm, and the outer...
length is 14.5 cm. It has the red glue area No. (12) to install the cartoon farmer character.

**Left Bottom:** The face of the paper for the house roof of the pop-up double page: It has the actual dimensions of a rectangular (a, b, c, d) with a width of 20 cm and a height of 13 cm. It is the roof of the house, which is fixed from the bottom with the house’s walls, and on it, there is a red place for glue No. (18) to fix the house’s chimney on it.

**Right Top:** The back of the paper for the landscape of the pop-up double page: The exact geometric inverse will stand up once the book page is opened (a, b, c, d, e, f, g, h, i, j, k, l) to make a delusion that the paved road has a natural slope. It is a spiral resembling an inverted letter (S). The outer width is 29 cm, and the outer height is 14.5 cm. It has two red adhesive areas, No. (13) and (14), to install them in glue areas No. (13) and (14) in Fig. (16A).

**Right Middle:** The back of the paper for the separate top layer of the paved road of the pop-up double page: It is used to make a delusion that the paved road has a natural slope. It is a spiral resembling an inverted letter (S). The outer width is 29 cm, and the outer height is 14.5 cm. It has two red adhesive areas, No. (13) and (14), to install them in glue areas No. (13) and (14) in Fig. (16A).

**Right Bottom:** The back of the paper for the house roof of the pop-up double page: A rectangular (a, b, c, d) width 20 cm and a height of

---

Fig. 8. Pop-up double page, by student: “Tasbeeh Mohamed Ahmed”. Supervisor by The Researcher. (A) On the left side: the face of the paper. (B) On the right side: the back of the paper.

Fig. 9. Die-cuts show the drawing of cut lines (black lines), fold lines (dashed lines), and glue areas (coloured in grey). By student: “Tasbeeh Mohamed Ahmed”. Supervisor by The Researcher.
13 cm is a flip of the house’s roof, which is fixed from the bottom with the house’s walls. On it, there are two areas of red glue No. (10) (11) to install the walls of the house, as shown in Fig. (8A) from the bottom.

**Fig. 12**: Some of the graphics illustrated parts for the first pop-up page (Cartoon Character “Farmer,” Jack, Cow, Spiral Magic Bean, Chimney’s house) with actual dimensions, red numbered glue spots on the front and the back of the paper.

**Left Top**: Consists of two pieces:
1. The face of the paper for the farmer of the pop-up double page: It will stand up once the book page is opened (details of the scales shown in Fig. (12A)), and it has a red glue area No. (12) that sticks after folding in the red glue area No. (12), which appear in Fig. (8A).
2. The face of the paper for the cow of the pop-up double page: It will stand up as soon as the book page is opened (details of the scales appears in Fig. (12A)), and it has a red glue area No. (8) that stick after folding in the red glue area No. (8), which appear in Fig. (8A).

**Left Middle**: Consists of two pieces:
1. The face of the paper for “Jack” Cartoon Character of the pop-up double page: It will stand up as soon as the book page is opened (details of the scales appears in Fig. (12A)), and it has a red glue area No. (9) that stick after folding in the red glue area No. (9), which appear in Fig. (8A).
2. The face of the paper for the cow of the pop-up double page: It will stand up as soon as the book page is opened (details of the scales appears in Fig. (12A)), and it has a red glue area No. (8) that stick after folding in the red glue area No. (8), which appear in Fig. (8A).

**Left Bottom**: The face of the paper for the house chimney of the pop-up double page: It has the actual dimensions of a geometric shape (a, b, c, d, f, g), it has a place for red glue No. (18) to be glued to the red area No. (18) and

Note: It does not have red glue areas on it. Moreover, the story expresses the magic beans that Jack planted in his garden, which is growing.
located on the roof of the house located in Fig. (10A).

**Right Top:** Consists of two pieces:

1. The back of the paper for the farmer of the pop-up double page: It has a red glue area No. (21) that sticks after folding in the red glue area No. (21), which appears in Fig. (16A).
2. The back of the paper for the spiral magic bean of the pop-up double page: It has a red glue area No. (7) that sticks after folding in the red glue area No. (7), which appears in Fig. (8A).

**Right Middle:** Consists of two pieces:

1. The back of the paper for “Jack” Cartoon Character of the pop-up double page: It has a red glue area No. (17) to stick in the red glue area No. (17), which appears in Fig. (16A).

2. The back of the paper for the cow of the pop-up double page: It has a red glue area No. (15) to stick in the red glue area No. (15), which appears in Fig. (16A).

**Right Bottom:** The back of the paper for the house chimney of the pop-up double page.

**Note:** It does not have any glue places.

**Fig. 14:** Some of the graphics illustrated parts for the first pop-up page with actual dimensions include: (A non-glued movable paper-based came out from the right edge of the base of the first pop-up page and wrote on its text from the story’s events. Additionally, another movable paper-base that is non-glued comes out of the left edge of the base of the first pop-up page, and on it is written another text of the story).

**Left Top:** The face of the paper for a non-glued movable paper-based came out from the right edge of the base of the pop-up double page: Written on its text from the story’s events. Its dimensions are 19 cm in width by 15.8 cm in height, as shown in Fig. (14A).

**Left Bottom:** The face of the paper for a non-glued movable paper-based came out from the left edge of the base of the pop-up double page: Written on its text from the story’s events. Its dimensions are 19 cm in width by 15.8 cm in height, as shown in Fig. (14A).

**Right Top:** The back of the white paper: A non-glued movable paper-based came out from the right edge of the base of the pop-up double page as one of the elements.

**Right Bottom:** The back of the white paper: A non-glued movable paper-based came out from the left edge of the base of the pop-up double page as one of the elements.

**Fig. (16):** Some of the graphics illustrated parts for the first pop-up page with actual dimensions include: (A non-glued movable paper-based came out from the front edge of the base of the first pop-up page and wrote on its text from the story’s events, stuck paper piece to stick: a graphic piece as a stuck paper piece to connect the paved road with another layer for that paved road to make an impression that the ground has a natural slope, a lifting arm (1) to raise the cow and attach it to the...
“Landscape,” a lifting arm (2) to raise the character “Jack” and attach it to the cow, a lifting arm (3) to raise the cartoon farmer and attach it to the “Landscape.” Moreover, the numbered red glue spots on the front and back of the paper. Furthermore, Table No (5) shows the contents of Fig. (16) (A, B).

Left: It consists of five graphic pieces arranged from top to bottom:

- The face of the paper to stick: Stuck paper piece to stick the paved road of the main page through the glue spots No. (5, 6) with the glue spots No. (13, 14), which on another separated background layer for that paved road. So that takes the form of the paved road to make an impression that the ground has a natural slope.

- The face of the paper for a lifting arm (1) to raise the cow: It is three cm long arm (and 1 cm at the beginning of the arm and 1 cm at the end of the arm in the places of attachment) that lifts the cow and attaches it to the “Landscape” at glue spot No. (19) and installed in the back of the cow at the glue spot No. (15).

- The face of the paper for a lifting arm (2) to raise “Jack”: It is three cm long arm (and 1 cm at the beginning of the arm and 1 cm at the end of the arm in the places of attachment) that it picks up Jack’s character and attaches him to the cow at glue area (20) and pinned to Jack’s back at glue area (17).

The paper’s face for a lifting arm (3) to raise the farmer: It is an eight cm long arm (additionally 1 cm at the beginning of the arm and
1 cm at the end of the arm in the places of attachment). It picks up the farmer, attaches him to the landscape at glue spot (16), and pin it to the farmer’s back at glue spot (21).

**Right:** It consists of five graphic pieces arranged from top to bottom:

- The back of the white paper: A non-glued movable paper-based came out from the front edge of the base of the pop-up double page as elements.
- The back of the white paper (stuck paper piece to stick) suggests that the land has a natural slope and does not have gum places.
- The back of the white paper for a lifting arm (1): raise the cow and not have gum places.
- The back of the white paper for a lifting arm (2): to raise “Jack” and not have gum places.
- The back of the white paper for a lifting arm (3): to raise “The Farmer” and not have gum places.

*Fig. 13. Die-cuts show the drawing of cut lines (black lines), fold lines (dashed lines), glue areas on the front of the paper (coloured in grey), and glue areas on the back of the paper (coloured in grey with hash). By Student: “Tasbeeh Mohamed Ahmed”. Supervisor by The Researcher.*

### The Third Stage

The digital montage stage includes designing page elements (17 illustrated parts) within the page layout (front and back), using design economics calculations to save the waste of paper and printing materials. Table No (6) shows the used areas of paper and the final wasted paper ratio according to the montage sheet, F. (18) (A, B) (see Fig. 18).

The Table 1 shows that the percentage of wasted paper from the used montage for one pop-up page was 30.33%, which is a large percentage. So, the researcher mentioned here that the students must make the montage sheets for many pop-up parts from different pop-up pages, not from only one pop-up page, to reduce this wasted paper ratio and positively affect the total cost of mass production.

### The Final Project

The student made the final Pop-up Double Page after making the tests and the digital montage. (see Fig. 19).

### Discussion

#### Research Hypothesis

**H1:** “The Mechanism of the pop-up movement will be the first item in the attraction of Children in Pop-up Pages”.

**H2:** “The Used Font & Calligraphies will be the second priority to read the book after The Mechanism of the pop-up movement”.

**H3:** “The Design Elements like Colors, Shapes, and Drawings will attract the children to the pop-up pages”.

**H4:** “The Pop-up pages will be very preferred to use in Primary School books”.

**H5:** “Use of games in schoolbooks with Pop-up pages will be very preferred in School books”.

**H6:** “There is no difference between female & male children's attitudes toward Pop-Up Double Page attraction”.

The researcher designed a questionnaire Table 2 to be presented to the students of the
3rd grade of the primary school at “Nour Al Salam Private Language School”, Al-Qanater Al-Khairia Educational Administration, in Egypt.

Let the Researcher’s Student “Tasbeeh Mohamed Ahmed” get the children students’ impressions (39 Students, N = 39) about her Pop-Up Double Page Design. There is an official letter approved by the dean (October 6 University, Faculty of Applied Arts), and approved formally from “Al-Qanater Al-Khairia Educational Administration, Private Education Sector” to collect the responses of the children’s impressions on the design (Appendix 1).

The Questionnaire contained demographic data (Student’s gender and the study group). Moreover, the researcher used the 3-point smiley face-Likert scale on the rest of the Questionnaire’s elements. The researcher used these simple facial symbols to facilitate the child’s understanding and ease of extracting the impression to be measured with ease — a way to activate Communication between researcher and children.

**Procedures: Psychometric Properties of the Questionnaire**

**The Validity of the Questionnaire using EFA**

There is a strong correlation between variables, as shown in Table 3. Fig. 20 shows that only one Eigenvalue is important (see Table 4).

The saturation ranged between (0.552: 0.900); Which indicates the validity of the Questionnaire as shown in Table 5.

---

**Fig. 14. Pop-up double page, by student: “Tasbeeh Mohamed Ahmed”, Supervisor by The Researcher. (A) On the life side: the face of the paper. (B) On the right side: the back of the paper.**
The reliability of the questionnaire

In several ways: Cronbach's Alpha \( \alpha \) for the Questionnaire all was (0.933), And the Split Half values: Pearson's Correlation Coefficient was (0.877), Spearman-Brown Coefficient was (0.936), Gutman (0.920). These values indicate that the Questionnaire has reliability, can be trusted and is valid for application.

The internal consistency of the questionnaire

Table 6 shows the correlation coefficients. All items are statistically significant at the level (0.01), so the Questionnaire has internal consistency.

Statistical Analysis of the Questionnaire

The researcher used the 3-Likert scale, where scores were given (3-2-1) for the responses (agree, neutral, disagree), using the SPSS Ver.22 statistical package, classified the estimates of the study sample into three levels: High Level: (From 3.00 to 2.34), Medium Level: (From 2.33 to 1.67), Low Level: (From 1.66 to 1.00), 1. the length of the period used here is \( (2/3) \), that is, about (0.66).

The Questionnaire gets a high level of satisfaction considering the Student's opinions of the research sample (the third-grade primary school students). The relative weight of the Questionnaire is (2.99), which is a high level. It included (7) Items; the relative weights ranged from (2.95) to (3.00). (see Table 7).

- Gender Variable:

Mann-Whitney U test was used for two independent groups, and its significance for the difference between the male and female group scores to determine their direction between the two groups:

From Table (8), there is no significant difference at the level (0.05) between the two groups (male group) and (female group) in the used Questionnaire.

Results

From analyzing the following graphs Figs. 21 & 22.

- Refused H1: Because Item (04), “Mechanism of the pop-up movement: the pop-up movement is attractive”, is ranked number seven, the relative weight of (2.95), an indicator of high-level satisfaction from the point of view of the sample members (children's students). Refers to that Faculty of Applied Arts' Student used the attractive Mechanism of the pop-up movement to make the children happy. Still, it needs to be modified to be more attractive on other pages. The sample members' approval percentage (39 students in the primary stage - third grade) in the exploratory Questionnaire was (94.9%).

- Refused H2: Because Item (03), “Used Font & Calligraphies: The text is easy to read,” is ranked number six, the relative weight of (2.97), an indicator of high-level satisfaction from the point of view of the sample members (children's...
students). Refers to that Faculty of Applied Arts's Student used suitable font and calligraphy to let the children understand. Still, it needs to be modified to be more accessible in the reading process. The percentage of approval from the sample members (39 students in the primary stage - third grade) in the exploratory Questionnaire was (97.4%).

- Accept H3: Because The Design Elements: Item (01) “The Pretty Colors”, & Item (02) “The Shapes and Drawings”, Having a relative weight of (3.00) is an indicator of high-level satisfaction from the point of view of the sample members (children's students). That indicates the sample of tested Pop-up success in choosing colours, shapes, and drawings suitable for children, and those design items affect the acceptance of the pop-up pages, upwards to the students. The percentage of approval from the sample members (39 students in the primary stage - third grade) in the exploratory Questionnaire was (100%).

- Accept H4: Because Item (06) “Use of Pop-ups in schoolbooks: Would you prefer to use Pop-ups in School books?” is ranked number four, the relative weight of (3.00), an indicator of high-level satisfaction from the point of view of the sample members (children's students). The sample members' approval percentage (39 students in the primary stage - third grade) in the exploratory Questionnaire was (100%). Refers to that kind of children's book is very attractive to children, and we can use that in making some of the schoolbooks to encourage the children to read and gain the different knowledge in Egypt.

- Accept H5: Because Item (07) “Use of games in schoolbooks: Would you rather have these pop-ups be used in School books”. It is ranked number five, relative weight of (3.00), an indicator of high-level satisfaction from the point of
view of the sample members (children’s students). Refers to that kind of children’s book is very attractive, mainly when it includes games. We can use that in making some of the schoolbooks to encourage the children to read and gain different knowledge in Egypt. The sample members’ approval percentage (39 students in the primary stage - third grade) in the exploratory Questionnaire (100%).

which is evident from the following Fig. 22:

- Accept H6: Because Item (08) “There is no difference between female & male children’s attitudes toward Pop-Up Double Page attraction” as shown from Fig. 22, there is no statistically significant difference between male and female children in the preference for pop-up pages.

Recommendations
At Level of Faculty of Applied Arts, October 6 University:

- “The Design of Book Art 1” course content and “The Design of Book Art 2” should be developed to include the teaching of pop-up pages in all their forms.

Students must use a digital montage for the different pop-up parts of pages without being bound by page arrangement in the pop-up book. That will reduce the cost of production, which will positively affect the book’s price if they go to the production phase in their professional life.

- Make this session a source of income for the units of a unique nature at the Faculty of Applied Arts, University of October 6, by developing the educational policies.

At Level of Egyptian Ministry of Education:

- We hope that the officials in the Ministry of Education in Egypt will develop the textbook for the first years of primary schools, including the pop-up pages, to improve the textbook’s level to accommodate the study materials for students for many subjects like Science & Mathematics for example.

Conclusions & Future Work
The researcher believes that designing children’s books using pop-up pages is a fertile place for study. Moreover, that kind of book won the admiration of children in the early school stages of their life (the primary stage). Furthermore, this is a good indication of continuing development to meet this need in Egypt. Also, the researcher sees that More future research should be done in this direction. Adding interactive technologies and augmented reality to the Egyptian Children’s Book is a must, and doing more future research work in this direction.
Fig. 18. The digital montage. by student: "Tasbeeh Mohamed Ahmed", Supervisor by The Researcher. (A) On the life side: the face of the paper. (B) On the right side: the back of the paper.

Table 1. Shows the wasted paper ratio.

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Fig. Number</th>
<th>Dimensions (W cm by H cm)</th>
<th>Area of the Fig. cm²</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Fig. 18A</td>
<td>48 cm * 33 cm</td>
<td>1584 cm²</td>
</tr>
<tr>
<td>02</td>
<td>Fig. 18A</td>
<td>48 cm * 13 cm</td>
<td>624 cm²</td>
</tr>
<tr>
<td>03</td>
<td>Fig. 18A</td>
<td>48 cm * 13 cm</td>
<td>624 cm²</td>
</tr>
<tr>
<td>04</td>
<td>Fig. 18A</td>
<td>29 cm * 14.5 cm</td>
<td>420.5 cm²</td>
</tr>
<tr>
<td>05</td>
<td>Fig. 18A</td>
<td>20 cm * 13 cm</td>
<td>260 cm²</td>
</tr>
<tr>
<td>06</td>
<td>Fig. 18A</td>
<td>5.4 cm * 9.4 cm</td>
<td>50.76 cm²</td>
</tr>
<tr>
<td>07</td>
<td>Fig. 18A</td>
<td>11.5 cm * 11.5 cm</td>
<td>132.25 cm²</td>
</tr>
<tr>
<td>08</td>
<td>Fig. 18A</td>
<td>5.4 cm * 8.5 cm</td>
<td>45.9 cm²</td>
</tr>
<tr>
<td>09</td>
<td>Fig. 18A</td>
<td>10 cm * 8 cm</td>
<td>80 cm²</td>
</tr>
<tr>
<td>10</td>
<td>Fig. 18A</td>
<td>11.5 cm * 8.2 cm</td>
<td>94.3 cm²</td>
</tr>
<tr>
<td>11</td>
<td>Fig. 18A</td>
<td>19 cm * 15.8 cm</td>
<td>300.2 cm²</td>
</tr>
<tr>
<td>12</td>
<td>Fig. 18A</td>
<td>19 cm * 15.8 cm</td>
<td>300.2 cm²</td>
</tr>
<tr>
<td>13</td>
<td>Fig. 18A</td>
<td>25 cm * 12 cm</td>
<td>300 cm²</td>
</tr>
<tr>
<td>14</td>
<td>Fig. 18A</td>
<td>13.5 cm * 3 cm</td>
<td>40.5 cm²</td>
</tr>
<tr>
<td>15</td>
<td>Fig. 18A</td>
<td>5 cm * 1 cm</td>
<td>5 cm²</td>
</tr>
<tr>
<td>16</td>
<td>Fig. 18A</td>
<td>5 cm * 1 cm</td>
<td>5 cm²</td>
</tr>
<tr>
<td>17</td>
<td>Fig. 18A</td>
<td>10 cm * 1 cm</td>
<td>10 cm²</td>
</tr>
</tbody>
</table>

The sum of the printed used areas of paper 4876.61 cm²
Printing paper area width 100 cm by height 70 cm
The wasted paper area 7000 cm²
The wasted paper ratio 30.33%
Fig. 19. The final pop-up double page by student: “Tasbeeh Mohamed Ahmed” Supervisor by The Researcher, and the Course team.

Table 2. The Questionnaire by the researcher.

<table>
<thead>
<tr>
<th>Questionnaire Items</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1- Used Colors of the Design: Pretty Colors?</td>
<td></td>
</tr>
<tr>
<td>2- Used Shapes and Drawings in the design: Beautiful Shapes and Drawings</td>
<td></td>
</tr>
<tr>
<td>3- Used Font &amp; Calligraphies: The text is easy to read</td>
<td></td>
</tr>
<tr>
<td>4- Mechanism of the pop-up movement: the pop-up movement is attractive</td>
<td></td>
</tr>
<tr>
<td>5- Student’s comprehension of the content: did the use of pop-ups movements directly affect the child’s comprehension of the content of the page</td>
<td></td>
</tr>
<tr>
<td>6- Use of Pop-ups in schoolbooks: Would you prefer to use Pop-ups in School books?</td>
<td></td>
</tr>
<tr>
<td>7- Use of games in schoolbooks: Would you rather have these pop-ups be used in School books?</td>
<td></td>
</tr>
<tr>
<td>8- The gender of the Student:</td>
<td>Male/Female</td>
</tr>
</tbody>
</table>

Table 3. EFA: Exploratory factor analysis.

<table>
<thead>
<tr>
<th>KMO (Kaiser-Meyer-Olkin)</th>
<th>Bartlett’s Test</th>
<th>df</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.842</td>
<td>312.754</td>
<td>21</td>
<td>0.000</td>
</tr>
</tbody>
</table>

Table 4. Shows the factor analysis revealed one factor, Value = 5.047, other items are neglected.

<table>
<thead>
<tr>
<th>Factors</th>
<th>Eigen’s Values</th>
<th>% Of variance</th>
<th>Extraction of eigenvalues</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Value</td>
<td></td>
<td>Value</td>
</tr>
<tr>
<td>1</td>
<td>5.047</td>
<td>72.094%</td>
<td>5.047</td>
</tr>
<tr>
<td>2</td>
<td>0.622</td>
<td>8.885%</td>
<td>—</td>
</tr>
<tr>
<td>3</td>
<td>0.535</td>
<td>7.644%</td>
<td>—</td>
</tr>
<tr>
<td>4</td>
<td>0.330</td>
<td>4.713%</td>
<td>—</td>
</tr>
<tr>
<td>5</td>
<td>0.277</td>
<td>3.983%</td>
<td>—</td>
</tr>
<tr>
<td>6</td>
<td>0.139</td>
<td>1.983%</td>
<td>—</td>
</tr>
<tr>
<td>7</td>
<td>0.051</td>
<td>0.731%</td>
<td>—</td>
</tr>
</tbody>
</table>
Fig. 20. Shows the graph of the initial eigenvalues.

Table 5. Shows the saturation of the questionnaire expressions on the factor.

<table>
<thead>
<tr>
<th>NO.</th>
<th>Q. Expressions</th>
<th>SAT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>0.900</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>0.833</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>0.605</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
<td>0.589</td>
</tr>
<tr>
<td>5</td>
<td>5</td>
<td>0.772</td>
</tr>
<tr>
<td>6</td>
<td>6</td>
<td>0.796</td>
</tr>
<tr>
<td>7</td>
<td>7</td>
<td>0.552</td>
</tr>
</tbody>
</table>

Table 6. The correlation coefficients by the Items.

<table>
<thead>
<tr>
<th>Item</th>
<th>Correlation coefficient</th>
<th>Item</th>
<th>Correlation coefficient</th>
<th>Item</th>
<th>Correlation coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.943**</td>
<td>4</td>
<td>0.765**</td>
<td>7</td>
<td>0.749**</td>
</tr>
<tr>
<td>2</td>
<td>0.906**</td>
<td>5</td>
<td>0.882**</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td>0.787**</td>
<td>6</td>
<td>0.889**</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

** Significant at the level (0.01).

Table 7. Statistical analysis of the Questionnaire.

<table>
<thead>
<tr>
<th>Expression</th>
<th>Freq.</th>
<th>Responses</th>
<th>Mean</th>
<th>SD</th>
<th>Order</th>
<th>AVAL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>%</td>
<td>D</td>
<td>NAT</td>
<td>A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Freq.</td>
<td>0</td>
<td>0</td>
<td>39</td>
<td>3</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td>%</td>
<td>0.0</td>
<td>0</td>
<td>100.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Freq.</td>
<td>0</td>
<td>0</td>
<td>39</td>
<td>3</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td>%</td>
<td>0.0</td>
<td>0</td>
<td>100.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Freq.</td>
<td>0</td>
<td>1</td>
<td>38</td>
<td>2.97</td>
<td>0.160</td>
</tr>
<tr>
<td></td>
<td>%</td>
<td>0.0</td>
<td>2.6</td>
<td>97.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Freq.</td>
<td>0</td>
<td>2</td>
<td>37</td>
<td>2.95</td>
<td>0.223</td>
</tr>
<tr>
<td></td>
<td>%</td>
<td>0.0</td>
<td>5.1</td>
<td>94.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Freq.</td>
<td>0</td>
<td>0</td>
<td>39</td>
<td>3</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td>%</td>
<td>0.0</td>
<td>0</td>
<td>100.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Freq.</td>
<td>0</td>
<td>0</td>
<td>39</td>
<td>3</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td>%</td>
<td>0.0</td>
<td>0</td>
<td>100.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Freq.</td>
<td>0</td>
<td>0</td>
<td>39</td>
<td>3</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td>%</td>
<td>0.0</td>
<td>0</td>
<td>100.0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The Questionnaire as a whole 2.99 0.270 High

N = 39.
Acknowledgements

Thanks to the 3rd Grade students of Adv. Dept. at the faculty of applied arts, October 6 University, provided the researcher with their pop-up double pages to study and analyze the creative process and the results in this paper. Special thanks to the “Nour Al Salam Private Language School” Management, Al-Qanater Al-Khairia Educational Administration Management, in Egypt for allowing my student “Tasbeeh Mohamed Ahmed” to take the children’s impressions on her pop-up double page based on the Researcher Questionnaire and analyzed the results by the researcher, No Financial Support, Also Thanks to the colleagues who participated with me in teaching the course and the teaching assistant.

Appendices (1)

The Original Letter was Signed by the researcher as a supervisor of the faculty-

| Table 8. Mann-Whitney U test was used for two independent groups, “Female Children” & “Male Children”. |
|---|---|---|---|---|---|
| G. 1 Male | G. 2 Female | (U) | (W) | (Z) | Sig |
| average rank | ranks sum | average rank | ranks sum | |
| 19.80 | 455.50 | 20.28 | 324.50 | 179.500 | 455.500 | –0.278 | 0.781 |

It is not significant at 0.05 level.

Fig. 21. A graph of the averages of the questionnaire items’ responses.

Fig. 22. A graph of the averages of males and females on the used questionnaire.
student and signed by the Dean of Faculty of Applied Arts, October 6 University, also Signed and stamped by Al-Qanater Al-Khairia Educational Administration to approve on a collection of the data from the students at “Nour Al Salam Private Language School”, Al-Qanater Al-Khairia In Egypt to implement this paper results.

Appendix 1. The Official Letter, from The Faculty of Applied Arts, October 6 University to “Nour Al Salam Private Language School”, Al-Qanater Al-Khairia in Egypt, Approved from Al-Qanater Al-Khairia Educational Administration.

References


