Investigating User Interaction in User Interface Designs of Educational Websites for 7 to 8 Years Old Children: A Comparative Study

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Abstract— Focusing on UI design for websites targeted at 7-8-year-old students is essential to providing them with a positive, engaging, and educational online experience. Thoughtful design can make learning more accessible, fun, and effective for this young audience. This research delves into the attraction and user interaction of 7-8-year-old children with existing UI designs of educational websites. The study centres around three local websites, aiming to scrutinize children's design preferences. A sample group of 5 boys and 5 girls were selected from local schools. The collection of qualitative data was accomplished through structured interviews employing questionnaires, while the use of audio-visual recordings ensured meticulous and accurate documentation of the gathered information.979 feedbacks were possible to gathered using survey.

The findings indicate that children exhibit a preference for creative websites. The comparative analysis revealed distinct levels of user interaction across the studied websites. One website demonstrated the highest level of engagement, while another exhibited a less favourable performance in this regard. A third website fell in between, with a moderate level of user interaction observed.

In conclusion, these findings emphasize the pivotal role of user preferences and interaction in the design of educational websites tailored for young learners. This highlights the responsibility of UI designers to adhere to appropriate design standards when developing websites for young children. The research assessed various aspects of the selected websites, including user interaction, fonts, colour, user behaviour, gestures.

Keywords— **UI design, User interaction, Educational websites**

I. INTRODUCTION

With the rapid advancement of mobile technology, the use of educational applications by children has garnered significant attention from researchers (Muchagata & Ferreira, 2019, p. 452-459; Pope, Butler, & Qualter, 2012). Designing software specifically for young children poses unique challenges, as it requires addressing various issues related to their interaction with technology (Gyu Park, 2014, pp. 452-462; Duyan & Ünver, 2016, pp. 73-78). Some children may struggle to navigate touch-based interfaces effectively, while others may have difficulty comprehending the language used in applications. Additionally, children often face a dilemma between engaging with video and image content versus seeking out valuable information (Wu, Tang, & Tsai, 2014, pp. 1-14). As a result, there exists a gap between children's preferences for text-based interfaces and graphical interfaces (Joo, 2017). Consequently, software developers must pay special attention to the design of software targeting young children, as its quality can significantly impact their educational experience.

The quality of web software designed for children heavily relies on the user interface (UI) design of websites. Factors such as user interaction, animation, fonts, colours, user behaviour, gestures, navigation, image styling, visual styling, and font size within the web interface play crucial roles in determining whether children will engage with the software for an extended period (Michaels, 2012, pp. 79-87, Pope, Butler, & Qualter, 2012). Specifically, the UI design of educational websites holds great importance in capturing and maintaining children's attention and interaction. Human-Computer Interaction (HCI) has emerged as a well-established discipline in the field of education, recognizing the significance of designing intuitive and engaging interfaces (Gossen, Nitsche, & Nürnberger, n.d.; Duyan & Ünver, 2016, pp. 73-78). Moreover, with the continued proliferation of mobile phone usage and related technologies, interface technologies like UI/UX are expected to experience exponential growth in the future (Muchagata & Ferreira, 2019, p. 452-459).

This research aims to investigate how 7-8-year-old children are attracted to the existing UI designs of educational websites. Focusing on UI designs for websites targeted at 7-8-year-old students is essential due to several reasons. The UI should be intuitive and visually appealing, considering their cognitive and motor skill development. It can engage

them with vibrant colours, interactive elements, and engaging visuals, enhancing their learning experience while

presentation, and prioritizes safety by incorporating age-appropriate content and privacy measures. Parents are reassured by a child-focused UI, which establishes trust and a recognizable platform. Feedback and adaptability, along with ethical considerations, play significant roles. Overall, thoughtful UI design facilitates positive and effective online educational experiences for young learners.

Local websites were selected as the focus of study, and a survey process involving grade 3 students from local schools was conducted. By examining children's preferences and responses, the study seeks to gain insights into designing effective UIs that enhance children's engagement and learning outcomes in the context of educational websites.

II. METHODOLOGY AND EXPERIMENTAL DESIGN

This study employed a qualitative research design to investigate the influence of UI design on children's interaction with educational websites. Qualitative methods, specifically interviews, were utilized to gather data.

Grade 3 students selected from the local population of schools. The sample population for this study were 10. The selection process ensured an equal representation of both genders, with 5 girls and 5 boys included in the study. Structured interviews were conducted with the selected participants using a questionnaire. The questionnaire was designed to explore their interaction with educational websites and gather their perspectives on UI design elements. All data collection sessions followed a standardized procedure to maintain consistency and comparability. To ensure accurate data capture, audio-visual recording was employed during the interviews. This recording method allowed for later review and analysis of the participants' responses, gestures, and non-verbal cues.

Three educational websites underwent evaluation, the selection of the websites was driven by distinct reasons for each. Website 1 was chosen for its rich array of features, enabling a comprehensive assessment of user interactions across diverse functionalities. The evaluation of website 2 focused on subject-relevant content, aiming to determine its alignment with learning objectives and educational needs. Website 3 was selected due to school endorsements, indicating its potential conformity with curriculum standards. These choices underscore the impact on student experiences. The diverse motivations

accommodating their attention span. The UI also aids cognitive development through clear information

ensure a holistic evaluation encompassing user interaction and educational relevance.

The first website underwent in-depth examination, scrutinizing 6 specific test cases. Likewise, the second website was subjected to evaluation using 5 chosen test cases, while an extensive 26 test cases were applied to the third website. The selection of these test cases was aligned with the testing areas outlined in Table 1, which were identified based on the distinctive features of the respective websites.

Table 1. Test cases selection criteria

Selected Websites	Testing areas	Number of selected total test cases
Website 01	1. Login to home page 2. Select language 3. Select grade 3 class 4. Enter to grade 3 class page 5. Page selection	6
Website 02	1. Login to home page 2. Access to primary education 3. Enter to grade 3 class page 4. Page selection	5
Website 03	1. Login to home page 2. Test animation 3. Search item on menu bar 4. Recognize icons 5. Select grade 3 class page 6. Test slide show 7. Try calendar 8. Select language 9. Read story 10. Assign tasks 11. Search things using Footer 12. Page selection	26

Indexes for evaluation were meticulously identified from each test case, encompassing various aspects crucial to the assessment process. These indexes include User Interaction, Fonts, Colour, User Behaviour, and Gesture. These categories were chosen to comprehensively analyse the websites' user experience, design elements, accessibility, and overall usability.

Figure 1. Data collection Scale

Given the limited written skills of Grade 3 students, a data gathering scale was employed to facilitate data collection. This scale, as illustrated in Figure 1, involved posing questions to the students through a questionnaire. In response, students expressed their preferences using a scale consisting of five levels: 5 denoting excellent, 4 for good, 3 representing medium, 2 indicating poor, and 1

signifying very bad. To further enhance clarity, a color-coded system was introduced – when a student's preference was higher for a question, a green colour image was assigned, correlating to a rating of 5. This process was consistently applied across all student responses, allowing for a standardized assessment of their preferences and perceptions.

A. Website 01

To collect comprehensive feedback on the UI design elements 06 testing areas were identified from the 1st website, and 198 feedbacks were obtained, considering the same UI design elements.

Table 2. List of selected indexes from 1st website with total count of students' feedback

	Excellent	Good	Medium	Poor	Very Bad	Total
User Interaction	2	29	2	0	0	33
Fonts	3	8	0	0	0	11
Color	17	36	2	0	0	55
User Behavior	8	49	9	0	0	66
Gestures	1	26	6	0	0	33

B. Website 02

05 testing areas were identified from the 2nd website, and 121 feedbacks were collected.

Table 3. List of selected indexes from 2nd website with total count of students' feedback

	Excellent	Good	Medium	Poor	Very Bad	Total
User Interaction	0	0	10	24	10	44
Fonts	0	0	12	10	0	22
Color	0	0	5	17	0	22
User Behavior	0	0	5	17	0	22
Gestures	0	0	2	4	5	11

C. Website 03

660 feedbacks were obtained from the 3rd website. These feedbacks were systematically recorded and documented for subsequent analysis.

Table 4. List of selected indexes from 3rd website with total count of students' feedback (a)

	Excellent	Good	Medium	Poor	Very Bad	Total
User Interaction	9	46	73	9	6	143
Fonts	11	38	72	10	1	132
Color	5	61	72	5	11	154
User Behavior	7	27	74	13	22	143
Gestures	0	11	45	22	10	88

Totally, 979 feedbacks were gathered from the testing data, encompassing user interaction, fonts, colours, user behaviours, and gestures categories. These feedbacks were collected to provide a comprehensive understanding of children's preferences and experiences with different UI design elements.

The data collected from children's questionnaire responses were inputted into the JASP statistical tool to conduct a thorough analysis. This analysis encompassed descriptive statistics of the sample, variance analysis of educational websites, and correlation analysis of the indexes.

III. RESULT

The results of testing student preferences with the selected websites revealed interesting findings. Here is a summary of the key findings:

A. Website 01

Table 5. Student preference percentage (%) with their rating for 1st website

	Excellent	Good	Medium	Poor	Very Bad
User Interaction	6.060606	87.87879	6.060606	0	0
Fonts	27.27273	72.72727	0	0	0
Color	30.90909	65.45455	3.636364	0	0
User Behavior	12.12121	74.24242	13.63636	0	0
Gestures	3.030303	78.78788	18.18182	0	0

1) *User interaction:* The website also received a high good response rate of 87.9% for user interaction, suggesting that the students had a positive experience interacting with the website.

2) *Fonts:* The website received a high good response rate of 72.3% for fonts, indicating that the students found the font choices on the website highly appealing.

3) *Colour:* The response rate for colour was 65.5%, indicating a good level of satisfaction with the colour scheme on the website.

4) *User behaviour:* 74.2% of the students gave a good response for user behaviour, indicating a positive perception of how the website responded to their actions.

5) *Gestures:* The website received a good response rate of 78.8% for gestures, indicating that the students found the interactive gestures on the website intuitive and engaging.
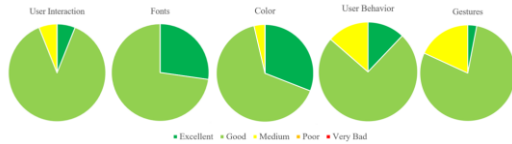
Figure 2. Indexes Percentage for website 1

B. Website 02

Table 6. Student preference percentage (%) with their rating for 2ⁿᵈ website

	Excellent	Good	Medium	Poor	Very Bad
User Interaction	0	0	22.72727	54.54545	22.72727
Fonts	0	0	54.54545	45.45455	0
Color	0	0	22.72727	77.27273	0
User Behavior	0	0	22.72727	45.45455	31.81818
Gestures	0	0	18.18182	36.36364	45.45455

1) *User interaction:* The results showed that the 2ⁿᵈ website received a relatively poor response rate of 54.5% for user interaction, indicating that the students had a less favourable experience interacting with the website.

2) *Fonts:* The response rate for fonts was 54.5%, indicating a neutral opinion regarding the font choices on the website.

3) *Colour:* The website received a poor response rate of 77.3% for colour, indicating that the students were dissatisfied with the colour scheme on the website.

4) *User behaviour:* 45.5% of the students gave a poor response for user behaviour, suggesting a highly negative perception of how the website responded to their actions.

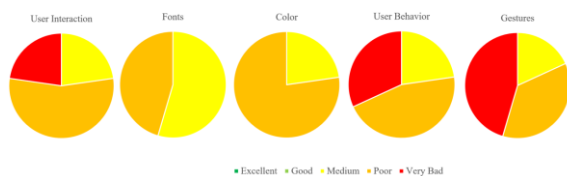5) *Gesture:* 45.5% very bad responses were received for the gesture of the 2ⁿᵈ website.

Figure 3. Indexes Percentage for website 2

C. Website 03

Table 7. Student preference percentage (%) with their rating for 3ʳᵈ website

	Excellent	Good	Medium	Poor	Very Bad
User Interaction	6.293706	32.16783	51.04895	6.293706	4.195804
Fonts	8.333333	28.78788	54.54545	7.575758	0.757576
Color	3.246753	39.61039	46.75325	3.246753	7.142857
User Behavior	4.895105	18.88112	51.74825	9.090909	15.38462
Gestures	0	12.5	51.13636	25	11.36364

1) *User interaction:* The 3ʳᵈ website received a medium response rate of 51%. This indicates that the students' interaction with the website was moderate.

2) *Fonts:* The response rate for fonts was 54.5%, indicating a medium satisfaction with the font choices on the website.

3) *Colour:* The website received a medium response rate of 46.8% for colour, suggesting that the students found the colour scheme visually pleasing.

4) *User behaviour:* 51.7% of the students gave a medium response for user behaviour, indicating a moderate level of satisfaction with how the website responded to their actions.

5) *Gestures:* The website received a neutral response rate of 51.7% for gestures, indicating that the students found the interactive gestures on the website intuitive and easy to use.
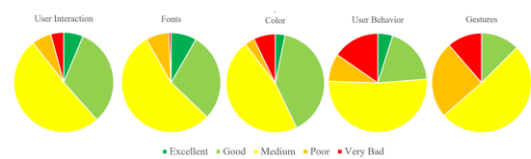

Figure 4. Indexes Percentage for website 3

IV. DISCUSSION AND CONCLUSION

The findings of this qualitative research study provide valuable insights into the influence of UI design on children's interaction with educational websites. The evaluation of three websites revealed distinct differences in their effectiveness in engaging and satisfying students.
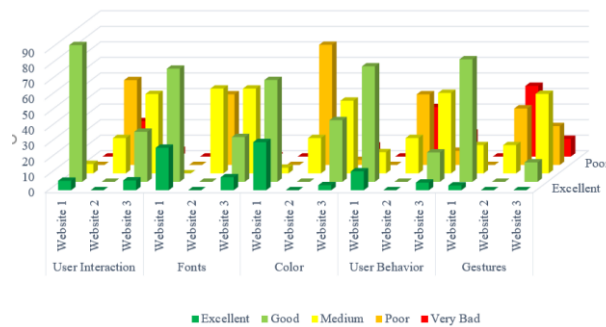
Figure 5. Comparison between 3 websites

The 1st website emerged as the top performer, receiving excellent and good ratings in various UI design elements such as fonts, user interaction, colour, user behaviour, and gestures. These positive responses indicate that the website effectively utilized these design elements to create a positive user experience and foster student engagement. The high level of interaction with gestures suggests that the interactive gestures on the 1st website were intuitive and appealing to the students. These findings highlight the importance of well-designed UI elements in educational websites.

On the other hand, the 3rd website demonstrated a moderate level of user interaction and received positive responses for animation and gestures. However, it fell behind the 1st website in terms of font ratings and overall user interaction. The 3rd website performed poorly across all indexes, indicating a lack of engagement and satisfaction among the students. These findings emphasize the need for improvement in UI design elements on the 2nd and 3rd websites to enhance user experiences.

The conclusion drawn from this study is that UI design elements significantly influence children's interaction with educational websites. The 1st website serves as an exemplary model, effectively utilizing fonts, colours, gestures, and user interaction to engage and satisfy students. The 3rd website shows potential for improvement, while the 2nd website requires substantial enhancements to meet students' expectations.

In conclusion, this qualitative research study highlights the influence of UI design on children's interaction with educational websites. The findings demonstrate that the 1st website excelled in various UI design elements, effectively engaging and satisfying students. The 3rd website showed potential for improvement, while the 2nd website performed poorly across all indexes, indicating the need for substantial enhancements.

However, it is important to acknowledge the limitations of this study, including the small sample size, limited survey population, and the exclusion of international schools. Future research should aim to address these limitations and expand the evaluation of UI design elements to provide a more comprehensive understanding of children's preferences and experiences. The findings of this study can serve as a basis for further research and the development of design models for successful educational websites catering to young children.

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ABBREVIATIONS AND SPECIFIC SYMBOLS

UI - User Interface

HCI - Human Computer Interaction

UI/UX - User Interaction / User Experience

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