

Research on Online Education Web Design for Children with ADHD

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Abstract. The education of ADHD children is one of the hot issues of concern to society. Some studies have found that ADHD children cannot focus on the online learning process, yet the current web design of online education cannot guide the group of ADHD children to focus on the learning process. Therefore, this study focuses on the online learning process of ADHD children's patients for website interface design, based on the learning characteristics of ADHD children and children's aesthetic characteristics, to enhance the online learning experience of this group of children and improve their concentration on learning. The research methodology of this paper is as follows: first, we conducted a participatory observation of the online learning process of children with ADHD, and then interviewed the parents of the children to understand their needs and pain points, and analyzed the design principles of online learning for children with ADHD through the above-mentioned research process, which are: "game-based learning" and "ADHD child-centered", and the design strategies are: "fun", "interactive" and "reading." Based on the findings from the analysis, existing online learning websites were analyzed. The analysis revealed that the page design of the existing online learning websites does not create an immersive learning experience for children with ADHD. Their web design is not designed and optimized for the ADHD child population. Research shows that web design with fun, interactive, game-based online learning sites has a positive effect on the learning of children with ADHD. It is recommended that web designers and front-end development engineers pay more attention to the needs of ADHD children for online learning website design during the design and development process.

Keywords: Web Design; ADHD Children; Online Education for Children; Attention.

1. Introduction

1.1 Research Background

ADHD (Attention deficit and hyperactivity disorder) is one of the most common psychiatric disorders in Chinese children in recent years, and the prevalence of ADHD in the 21st century (6.2%) has increased significantly over time compared to the 1980s (3.7%) and 1990s (4.3%)[1]. Children with this disorder have difficulty concentrating during the learning process; therefore, the disorder has a strong negative impact on patients' learning outcomes and has become a common cause of distress in children's learning today. In particular, under the influence of COVID19, online education has become a mainstream educational model, and as of June 2021, the size of online education users in China has reached 325 million, which is a substantial increase compared to the pre-epidemic period [2]. Screen culture affects children with ADHD more than non-ADHD children. However, the high frequency of use increases the overall risk of ADHD symptoms, and adolescents with ADHD are more likely to become addicted to the Internet [3]. How to properly guide this group of children to learn online has become a hot topic of discussion today. However, the current website design of online education does not meet the need for learning focus for ADHD patients. A literature review revealed that an online survey was administered. Data were collected from 100 mothers using a distributed questionnaire and compared to 184 matched controls from a national survey launched simultaneously. The comparison concluded that the ADHD group had a more limited attention span, spontaneous commitment, and autonomy in distance learning [4]. However, the study ignored the impact of the web design of online learning websites on children with ADHD in distance learning and did not

thoroughly propose a solution. Therefore, this paper employs participant observation and interview methods based on a user-centered design approach to design websites for the online learning process of children with ADHD to enhance their online learning experience and efficiency.

1.2 Psychological Features of Children with ADHD

Children with ADHD are prone to anxiety or depression during school age because of their immature mental development and temporary inability to express their emotions. For these reasons, children with ADHD are often immersed in depression, which mainly manifests itself as worrying about what their classmates and teachers around them think or their learning problems. It also induces mental problems such as forgetfulness and poor organization. Also, because of poor academic performance, children with ADHD experience frequent failures and frustrations, a low sense of self-worth, frequent feelings of powerlessness about being able to change their environment, fragile self-esteem, and frequent emotional instability or emotional instability outbursts [5].

2. Methods

One of the essential components of case studies and qualitative research is participant observation, which is also an essential method of social research studies. It has an applicable effect for studying the socio-cultural context revealed by human life by observing the development process of events, perspectives of people and things from the perspective of the insider, Etc. Nowadays, participant observation is often used in studies to obtain the material and information needed for research design from the observation [6]. Through the characteristics of participant observation described above, the following is a case study of participant observation of children with ADHD conducting online learning.

2.1 Participant Observation

In the ADHD online community, some of the parents posted messages about their child's learning. Through this community, in August 2022, the author met a parent of a child with ADHD who is eight years old, in the second grade, and male in gender. Due to the influence of COVID-19, the child began taking lessons at home in September 2022 using an online educational website. Home visits were conducted three times a week to observe the child's learning in English classes through the online platform. The online learning process for this child included: previewing before class, learning the points in class, listening to the teachers explain the topics, and submitting assignments. The following results were obtained based on the above learning process and participant observations.

Previewing before class: In the beginning, it was difficult for the child to find the teacher's online classroom entrance because he was unfamiliar with the web design of the online platform, and the platform lacked guidelines. As a result, child was not very motivated to study.

Learning the points in class: At the beginning of the school year, the child could barely keep up with the teacher's pace in class. However, because the web page design of the online study platform lacked interaction between teachers and students, the child couldn't have a conversation with the teacher directly compared to the offline class. By the end of September, the child's knowledge was declining compared to the beginning of the school year.

Listening to the teachers explain the topics: Due to the simple design of the online learning website, when opening and entering the classroom learning page, the child could only see the interface of the teacher's lecture and the number of people online, lacking content such as children's favorite colors and cartoon images. After attending the class for ten minutes, the child became inattentive and started walking around the room or clicking on other video sites to watch cartoons.

Submitting assignments: Lack of audio feedback when the child completed an assignment for submission, e.g., "Assignment submitted, you're great!", "Completed all assignments, good job !" Etc. As a result, there was no emotional feedback when the child completed the assignment and submitted

it, which affected the child's learning motivation in the long run. By the end of September, the child appeared to be procrastinating, late, or not turning in homework.

Through a month of observation, the child with ADHD tended to be immersed in his world during the learning process, ignoring the influence of their surroundings, such as a 40-minute class, which allowed very little time for concentration. He tended to click on other web pages to watch cartoons and thus ignored the content of the class. It also found that the ADHD child had not fully grasped the main functions and interface operations of the online learning website's page design. The interface design of the online learning website was too monotonous and lacked interactive links between teachers and students. There was a lack of positive feedback from the child after completing and submitting homework.

2.2 Interview

Some of these issues were identified through my observations of the learning process of children with ADHD. However, the method is only for the children themselves. This subsection also interviews parents of ADHD patients to obtain more details about the patients' and parents' needs and pain points. Therefore, at the end of a month of participant observation of online course learning, an interview was conducted to the child's parent to ask her about the problems she encountered while her child was doing online education. The results of the interview were as follows.

Interviewer: What problems did you and your child encounter after a month of online learning?

Respondent: Due to the epidemic, my child had to start an online class at home. Several problems emerged and bothered us during this period:

1. When learning on the online platform, the brightness was too high; despite adjusting the display's brightness, the brightness was still high. The brightness had an impact on the child's eyesight. For a long time, the child was resistant to online learning.
2. The lack of introductory guidelines. Since it was the first time my child and I contacted the online class platform, we were unfamiliar with the operation of the page. We failed to complete the preview assignments and submit assignments assigned by the teacher in time because of the operation.
3. The platform lacks elements to attract children's attention, such as cartoons and colors, and the page design was too simple. My child could not focus on the page for a long time to learn. After ten minutes of classroom learning, he started to play with his stationeries on the desktop or click on other video sites to watch cartoon videos.
4. The platform lacked hints or buttons for interaction with the teacher. If the teacher wants to ask the child a question, the child's attention is sometimes not on the page, and it is easy to ignore the teacher's question, which impacts the child's interactive learning.

Interviewer: Do you have any suggestions for the design of the website?

Respondent: I hope the web design of the online education platform can meet the learning needs of ADHD children as much as possible. In the early stage of use, I hope to add some operation guidelines to the web page to reduce the child's trouble in operation. The web page design can add cartoon animation and cute elements that children like according to age. Improve the web page's interactivity, hoping there can be substantial interaction between teachers and students.

From the interview results, it is clear that children with ADHD are more likely to be distracted and unable to focus during the learning process than normal children, such as when studying online, and are prone to distractions and hyperactivity in class. However, observation found that exciting things appealed strongly to them. The interface design of the former online learning website did not better capture the attention of children with ADHD. Lack of proper guidance and interaction with the teacher.

3. Results

3.1 Principles of Online Learning Website Page Design for Children with ADHD

Under the influence of COVID19, online education has become a mainstream mode, such as online classrooms, online tutoring, Etc. As of June 2021, the scale of online education users in China has reached 320 million, a significant increase compared to the pre-epidemic period. However, the current offline educational website design cannot meet the learning needs of children with ADHD. The following are principles and design strategies for designing online learning websites for children with ADHD.

3.1.1 Game-based Study

Studies have found that children with ADHD are more disruptive, less focused, and less self-controlled than children of the same age, which leads to low learning ability and unsatisfactory performance. These problems affect the later development of children with ADHD regarding social adjustment and learning [7]. Based on the psychological characteristics of children with ADHD, children's online learning web design can incorporate games into learning. The traditional monotonous web design can be abandoned by creating a relaxing and enjoyable learning environment for ADHD children through games. As shown in Figure 1, PBS KIDS has divided the web page into "VIDEOS" and "GAMES," so children can play games and learn English simultaneously. The game is not only fun for children but also motivating. The site sets children's homework tasks into small stages and rewards them when they complete the stages, thus increasing the interest of children with ADHD in learning.

3.1.2 Designing Online Learning Web Pages Focus on Children with ADHD

Children with ADHD have a limited attention span, so they need to see and focus on the information on the learning website's pages so that the pages' design is rich but not complicated. For example, Figure 1 shows the PBS KIDS website, whose homepage uses various colors to differentiate the different functional sections. The design of the homepage is simple and functionally oriented.

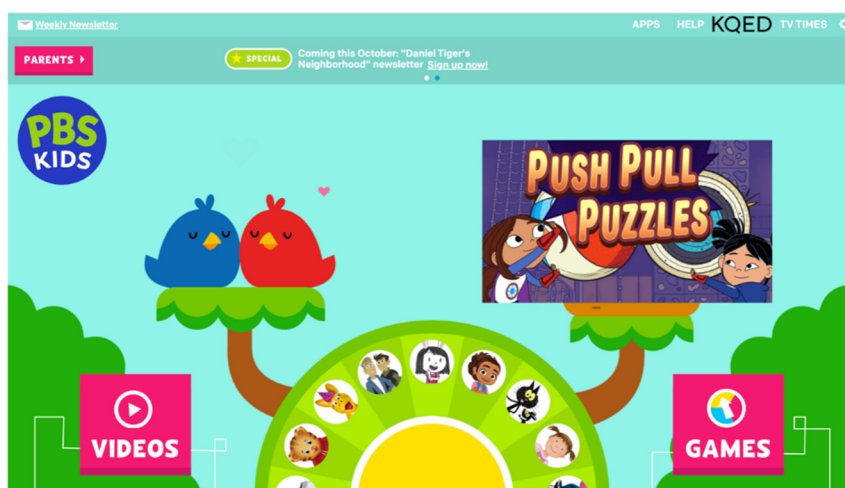


Fig 1. PBS KIDS

3.1.3 Reduce the Text Output of Web Pages

Compared with adults and ordinary children, children with ADHD are less capable of receiving text, and too much text on the page may make these children bored with learning. Non-text content such as cartoon drawings and videos can be added appropriately to enhance these children's learning pleasure.

3.1.4 Web Pages Need to have Learning Time Reminder Information

The page design of the online learning website needs to set the time for online learning according to the age of ADHD children. It helps children to complete the learning tasks within the specified time to improve the motivation and initiative of ADHD children in learning.

3.2 Website Page Design Strategies for Children with ADHD in Online Study

When designing online learning websites for children with ADHD, children's aesthetic psychology needs to be considered. Children are in the symbolic awareness stage when they are 2-7 years old. During this stage, children gradually grasp the meaning of various symbols, such as images, gestures, sounds, numbers, Etc., and their ability to identify symbols on their increases. However, the young age and lack of related knowledge make it difficult for children to grasp the overall characteristics of art. At the age of 7-9 years, children's aestheticians have a more significant change than at the age of 2-7 years and begin to have the ability to think independently [8]. One of the most important signs of the development of children's aesthetic psychology is the development of the ability to evaluate children's aesthetic abilities, which comprehensively and objectively shows the development of children's aesthetic psychology. The development and perfection of the aesthetic and psychological structure correspond to and are the same as the development process of aesthetic education. Refining the aesthetic and psychological structure is essential in children's aesthetic psychology development. Refining the aesthetic and psychological structure enables us to understand better the structure, process, characteristics, and developmental laws of children's aesthetic and psychological development. It provides educators with theoretical bases and methods of education and teaching [9]. According to the children mentioned above's aesthetic and psychological characteristics, combined with the psychological characteristics of ADHD children, the design strategies of online learning website pages are proposed.

3.2.1 Give Children Positive Feedback on Learning Through Different Forms of Interaction

Interactivity improves the visual optimization of the page, which is conducive to increasing the user experience of ADHD children in online learning. Interactive modules can be appropriately added to the pages. For example, use AI to track the progress of children's online learning courses and add questioning sessions appropriately during the learning process to improve the interactivity with children; second, add a voice prompting function. When children in this category finish answering questions, give voice encouragement, such as: "You got it right! You are great!" "You are incredible!", "Wrong answer, think again" and other voice announcement functions. As shown in Figure 1, voice feedback will appear when "VIDEOS" and "GAMES" are clicked.

3.2.2 Pay Attention to the Design and Typography of Text and Drawings to Improve Readability



Fig 2. National Geographic Kids

Children have curiosity about cute elements and are happy to explore them. Cartoon elements can be added to the text and drawings in web design, and the choice of fonts can be different from general web fonts to attract children's interest in reading. Too many complicated drawings should be avoided in the graphics, and cute and cartoonish forms can be used to improve the graphic reading ability of this type of children. As shown in Figure 2, National Geographic Kids Edition provides children with content such as learning natural geography. The font design style is lively and combined with cute patterns.

3.2.3 Design the Page in a Responsive Layout

Responsive layout design (Figure 3) enables a better user experience. The web pages can be viewed on multiple devices, such as cell phones, tablets, laptops, or desktop computers [10]. With a responsive layout design for online learning website pages, ADHD children are not confined to the same terminal for learning, which increases the number of online education sessions for these children, encourages them to learn new knowledge, and stimulates their interest in learning.



Fig 3. Responsive Web Design

4. Conclusion

First, the number of children engaging in online education is increasing due to the epidemic, yet today's web designs tend to be universal and consistent. Second, the number of children with ADHD is relatively tiny about the total number of children. The lack of awareness and understanding of this group of children has led to neglecting the needs of children with ADHD for online education. Based on the psychological characteristics of ADHD children and the aesthetic needs of children, this paper conducted an observational study of ADHD children and an interview study with parents to derive design principles and strategies for this patient group. Subsequently, by comparing existing online learning websites, we found that the page design of today's online learning websites has not yet met the needs of the ADHD children's group for online learning. Therefore, this paper tries to output corresponding design strategies through user research to provide a reference for subsequent design interventions in ADHD children's education. At the same time, this study hopes to strengthen designers' attention to ADHD children and hopes that web designers and front-end development engineers will pay more attention to the needs of ADHD children for online education in their future design and development.

This study also has shortcomings. First, the research sample is single, and it is a lack of data on demand for online learning websites from the ADHD children group. Secondly, there is a lack of comparison between domestic and international website designs, and there are not many cases to better analyze the existing problems.

This study analyzes the pain points and needs of online learning for ADHD patients through research and eventually comes up with complementary design strategies. Looking ahead, we hope that front-end development engineers and web designers will cooperate with each other to use more emerging technologies, such as artificial intelligence and big data, to track the learning of online education for the ADHD children group and develop and design web pages that better meet the learning needs of this group.

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