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Research Proposal for The Future of Accessibility and Aging

Envisioning a Stress-Free Digital Learning Environment with Autistic Adolescents: Beyond Performance Metrics

Introduction

According to current psychiatry and cognitive psychology, autism or Autism Spectrum Disorder (ASD) is defined clinically as a permanent neurodevelopmental disorder [1, 2], across behavioral, cognitive and biological levels [3]. Digital technologies have long been invented to assist with the social communication learning for people with autism, including for adolescents who are at a critical learning stage in acquiring social communication skills [7], language learning [8], and school curriculum studies [9]. Most digital learning tools are designed with the objective of improving learning performance and engagement. However, performance-focused learning could be stressful and bring unintended negative experiences, especially for autistic adolescents who show more sensitivity to stress and environment triggers.

Stressful and competitive learning settings and environments (i.e. competitive scoring, ranking, overwhelming notifications/nudges) could potentially bring a negative impact on learning outcome and learners' mental health. These environments prioritize metrics such as speed (completing tasks quickly) and engagement (frequent logins), neglecting the particular needs of adolescent learners with autism. The competitive, distracting, and manipulative elements can overwhelm autistic adolescents, who are sensitive to stress and sensory overload [5, 11].

The existing research in evaluating effectiveness of digital learning technology focuses on such performance metrics [6, 9]. Few studies go beyond traditional performance-centered metrics in designing digital learning environments for autistic adolescents. These metrics, which often emphasize efficiency of learning, can overlook essential design considerations regarding accessibility. Specifically, they may fail to account for the accessibility needs of autistic learners, particularly regarding sensory overload. Many people with ASD are susceptible to sensory overload, which can be accompanied by atypical attention patterns[1]. Individuals with ASD may exhibit various sensory processing differences, such as hyposensitivity, hypersensitivity, and difficulty filtering out multiple sensory inputs. These differences can make it challenging to manage sensory information and contribute to sensory overload [6].

This research aims to make empirical contributions through understanding the current challenges faced by autistic adolescents in digital learning environments, and seeks to explore recommendations of adaptive learning systems tailored to the unique needs of autistic adolescents, with an emphasis on creating a respectful, encouraging, and comfortable learning environment. With these aims, we design the following two research questions in order to better understand the existing challenges and potential adaptation in offering design considerations of digital learning environments for adolescents with autism.

Research Questions

1. How do current digital learning environments challenge autistic adolescents in terms of sensory overload, stress, and other accessibility needs? How do these challenges affect their learning experience, mental health, and overall well-being?
2. What are autistic adults' perspectives on how digital learning environments can be redesigned to better support their stress-free learning?

Method and Research Plan

Our interdisciplinary research team brings together expertise in social science, computer science, and informatics, with experience in learning and education as well as in designing technology for autistic children. In our research, we will adhere to the practice guidelines for conducting research with autistic individuals [10], prioritizing respect and understanding for our participants, ensuring clear communication, and accommodating their diverse needs.

To answer our research questions, we will conduct semi-structured interviews with autistic adolescents. Recruitment will be conducted in cooperation with a local autism charity. We will be sending information ahead of time, addressing sensory preferences, and continuously improving accessibility, to foster a supportive research environment for autistic participants. During the interview, we will first ask our participants to review 3 selected digital learning tools (selection will be based on general popularity) to identify accessibility barriers they perceive in these environments. Then, we will ask the participants to reflect on how these challenges may affect their learning experience and well-being and to imagine redesign ideas for a stress-free learning environment. The qualitative data collected from the interviews will be analyzed to uncover ways to move beyond performance-centric designs towards creating stress-free learning experiences for autistic learners and more.

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Research Proposal for The Future of Learning, Education, and Families

Towards a Stress- free Digital Learning Environment: Design Insights from Autistic Adolescents

Introduction

According to the World Health Organization (WHO), about 1 in 100 children has autism [1]. In the US, the number is much higher: data from the Centers for Disease Control and Prevention (CDC) shows that autism is much more prevalent in America, with about 1 in 36 children having been identified with autism spectrum disorder (ASD) [2]. Since people with ASD present particular needs in learning social communication skills and other social cognitive performances, digital technologies have been designed to provide support in helping autistic learners in acquiring knowledge and necessary skills, while receiving more education opportunities through a digital learning environment. Research shows that digital technologies have been playing a vital role in providing a more comfortable learning environment for autistic individuals [3][4].

However, digital learning technologies and environments may bring new learning challenges. To enhance learning progress and engagement, many digital learning platforms use games, rewards, and notifications to nudge learners [5, 10]. These designs often value a performance matrix based on efficiency (how much learners can complete in a shorter time) and frequency (how often they log in to the platform/software). The competitions, distractions, and manipulations in digital learning environments can cause extra burden and hinder learning interests and outcomes, especially for autistic individuals who are sensitive for stress and sensory overload [5, 11].

Though ASD is a lifelong experience and autistic individuals present various learning needs at all ages, learning research predominantly explores early childhood interventions and college education [11, 12]. Adolescenthood is an important stage for learning and transitioning into adult roles in society [11], yet previous research does not pay enough attention to researching digital learning experiences of autistic adolescents. Depending on the specific accommodation needs, autistic adolescents may have diverse preferences and face unique challenges in navigating smoothly in a digital learning environment to achieve the desired learning outcomes. Without appropriate and careful design, the digital learning environment

might fail to support them and result in a stressful and unpleasant learning experience. Therefore, this lack of focus on autistic adolescents necessitates further exploration [4, 5, 7].

The proposed study has the potential to fill this gap by collecting insights on improving the design of the digital learning technologies with a goal of establishing a stress-free learning environment for autistic adolescents. This study aims to make an empirical contribution by understanding the issues autistic adolescents face and potential recommendations for design considerations on accommodating adolescents with autism [5].

Through the proposed efforts, we hope to not only inform designers about design opportunities, but also to raise attention from teachers and parents of autistic adolescents on the adverse consequences of a performance-centric digital learning environment. We believe autistic adolescents have opportunities to thrive in digital learning environments with more accessible, customizable, and user-centered designs, enabling functions such as text-to-speech reading support [13], visual task organizer [5], adjustable learning pace, and encouraging notification.

Research Questions

1. What challenges do autistic adolescents face within digital learning environments, and how do they perceive these challenges impact their learning motivation and outcomes?
2. How do autistic adolescents envision a learning environment that fosters effective and encouraging learning experiences without adding undue stress?

Method and Research Plan

To answer the research questions, we begin by sharing a survey that targets adolescents learners with ASD. In this survey, autistic adolescents will be asked to answer open-ended questions related to their experiences in a digital learning environment. Specifically, we will ask the participants to write down what they think are the most useful and the least useful features in terms of their learning motivation, progress, and outcomes. After analyzing the results we collected from the survey, we will focus on identifying the prominent challenges from the learners. In addition to handing out surveys to autistic adolescents, we will invite a smaller number of respondents to participate in in-depth interviews to elaborate their needs and recommendations for improvement. Research studies have shown that autistic adolescents mostly favored electronic, written methods as their preferred medium of communication [7].

Considering this preference, we provide an option for them to do the in-depth interviews through an instant messaging application plus a text-to-speech service [5].

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Reflection

The structure of the two proposals is consistent, reflecting the same research topic they address. The specific research questions are slightly different with different focus of their respective calls and the interests of their target audiences. When the Accessibility proposal focuses more on well-being of autistic adolescents during learning, the Learning proposal places specificity on challenges towards their learning effectiveness and outcome.

The research method and plan sections are similar while the Learning proposal aims at a more specific exploration of design suggestions for digital learning environments and the Accessibility proposal seeks more general implications for shifting away from performance-centric digital learning environments. We have intentionally planned open-ended questions to ensure that, through the careful design of the study procedure, we can collect data from the same group of participants to answer the research questions outlined in both proposals. However, the two proposals still differ in specific method design while the Learning proposal utilizes survey and optional in-depth interviews in accommodating the communication needs of autistic adolescent learners, and the Accessibility proposal uses interviews as the primary method and consult experts in ensuring an open and safe interview environment for the participants.

The two proposals draw on a range of shared research literature on autism and learning, including knowledge of behavior characteristics, environmental triggers, and learning applications for autistic individuals. The Accessibility proposal references more articles in design and technology for autistic adolescents beyond the application area of learning. The Learning proposal borrows from software design guidelines and online education studies for ASD in presenting the background and status quo of digital learning environments for autistic individuals. When introducing the problem of interest, the Learning proposal focuses specifically on the learning context, highlighting the consequences of a stressful learning environment on autistic adolescents' learning motivations and outcomes. The Accessibility proposal put more focus on the general challenges faced by autistic groups when learning in a digital environment, and learning context is just one of many scenarios where autistic adolescents may encounter social, behavioral, sensory, and cognitive challenges.

When highlighting the significance and contributions of the study, the Accessibility proposal places greater emphasis on broader implications for finding ways to create a stressless

digital learning environment for autistic adolescents. Less stressful learning environment will benefit not only the learning experience of autistic adolescents but also their psychological and behavioral development. Conversely, the Learning proposal targets to improve current challenges in the digital learning environment encountered by autistic adolescents, identifying re-design opportunities for digital learning platforms and designers.