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Support for fitting Chromebooks to the child with cerebral palsy: A practical study on incorporating advice from ICT specialists

Tomohito YAMAZAKI[a*] & Toyokazu MIZUUCHI [b*]
[a] *Faculty of Economics, Asahikawa City University, Japan*
[b]*Faculty of Human and Culture, The University of Shimane, Japan*
*yamazakitmht@live.asahikawa-u.ac.jp

Abstract: An ICT specialist provided guidance for a fitting process aimed at enhancing Chromebook usability for a child with cerebral palsy. By gathering feedback from the children and observing their interactions with the device, adjustments were made using accessibility functions to improve ease of use. Expert advice addressed challenges beyond accessibility improvements, resulting in a successful fitting process.

Keywords: cerebral palsy (CP), Chromebook, fitting, accessibility, special support education

1. Introduction

The GIGA School Initiative has provided one device per student in schools across Japan, including those for special needs. A report indicates that ChromeOS constitutes 40.1% of these devices, implying widespread use. However, adapting Chromebooks for students with cerebral palsy is challenging due to their unique physical limitations. Tanioka et al. (2008) stated, " In general, physically disabled people with cerebral palsy may have involuntary actions, so when they consciously try to move one point on their body, they may not be able to move it properly due to the force of their entire body. " He mentioned that a system that enables text input and PC operation by voice has been developed. However, there are differences in the devices and their OS installed in special-needs schools in each of the local municipalities, and the state of children itself varies, it is difficult to construct a system tailored to each child as Tanioka has suggested. In addition, lack of teachers' knowledge of ICT devices may lead to the possibility that many special-needs schools do not take advantage of the acessibility functions of their devices. In this study, therefore, with the advice of experts, a fitting was conducted using accessibility functions to make the Chromebooks easier to use for children with cerebral palsy.

2. Purpose & Method

2.1 Purpose

The purpose of this study aimed to enhance Chromebook usability for a child with cerebral palsy through expert-guided customization, focusing on the fitting process to facilitate the child's effective usage.

2.2 Subject

The study focuses on X, a junior high school student with cerebral palsy and intellectual disability at Z Special Support School. X utilizes a school-provided Chromebook for various

activities both at school and home. However, due to involuntary movements, she encounters difficulties like unintended taps on the screen or unintentional dragging while using the device.

2.3 Procedure

Fittings were conducted four times for a total of 15 minutes per session. The effectiveness of the fitting and its effective method will be evaluated by analyzing the videos taken of the fitting and the episodes from interviews with X after the fitting.

2.4 Ethical Consideration

The research involved in this presentation has been conducted with appropriate ethical considerations and handling of personal information, and consent has been obtained from the individual, parents/guardians, and the head of the school to which the subject belongs.

3. Results

3.1 Fitting #1

During the session 1, X was interviewed about her challenges with using the Chromebook and her interactions with the device were observed. In a previous instance, when submitting an assignment on Google Classroom, X encountered difficulties tapping the touch display accurately, resulting in multiple submission attempts. In a subsequent task, she attempted to use the touchpad for clicking, occasionally applying excessive pressure. Additionally, she demonstrated the ability to search the internet using a combination of touch and keyboard inputs, although the small size of search elements caused her to often tap the wrong areas, leading to frustration. Lastly, updating an "Open Diary" created with Google Spreadsheet proved troublesome for X, as the small columns for typing comments and selecting dates presented tapping challenges.

3.2 Fitting #2

During the second session, efforts were made to address X's struggle with display size. After testing various sizes, a 110% display was selected as the most suitable for her. To address difficulties in clicking, the "auto click" function was introduced, with a one-second delay between clicks to accommodate X's preference and involuntary movements. The pointer position correction function was also implemented. Adjustments were made to the mouse pointer's size, color, and speed based on X's input. The pointer size remained default, the color was changed to red (her favorite), and the default speed was retained for comfortable use. Following these adjustments, it was decided that X would continue using the customized settings until the next session.

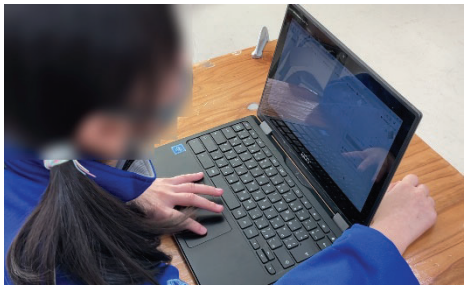

Fig. 1 Using a touch pad alone.

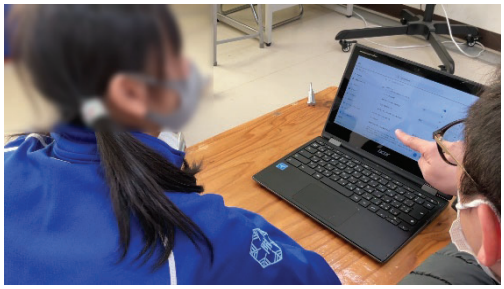

Figure 2. Adjusting functions with teachers.

3.3 Fitting #3

During the third session, an expert in Chromebook manufacturing and sales provided online professional guidance for further fitting adjustments. X shared her concerns about image searches, where her fingers struggled to move accurately, leading to incorrect clicks. The expert taught her to use the tab key for selection, aiding her in choosing the desired image. Techniques for easily navigating selections, even with paralysis, were demonstrated using the Shift and tab keys. X also received guidance on typing comments in the "Open Diary." The expert advised using the adjacent menu column to simplify sheet selection for changing dates, which X found preferable over horizontal scrolling. After the fitting, X consulted the specialist, who taught her sheet-switching shortcuts. However, due to her palsy, she found it challenging to press multiple keys simultaneously and opted against using shortcuts.

3.4 Fitting #4

In the fourth session, X expressed her satisfaction with the customized Chromebook, finding it much easier to use than before. She highlighted the convenience of the physical keyboard, the one-handed display adjustment, and the option to rest her hand on the display's bezel while touching it. As a result, she intends to continue using the Chromebook.

Figure 3. Online advice from an advisor.

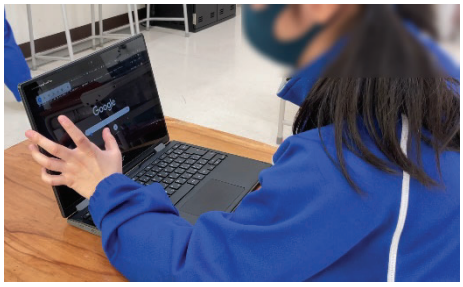

Figure 4. Tapping with a finger on the display

4. Discussion

By addressing X's issues and observing her use of the Chromebook, effective fitting was achieved. Altering the display size improved tapping accuracy, while the automatic click function aided clicking despite finger paralysis. Adjusting the mouse pointer's color and speed, based on X's preferences, not only enhanced usability but also fostered attachment to the device. Expert guidance on tab and shortcut keys resolved challenges not solvable by accessibility features alone. The fitting process's success stemmed from understanding the children's problems, adjusting equipment based on their input, and seeking expert advice for issues beyond accessibility improvements.

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