



Comunication with screen interface and 3D switches

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Comunication with screen interface and 3D switches in school context.

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Abstract—The research and innovation on education conducted by an interdisciplinary group, promotes the use of the “on screen interface”. This is a software tool meant to facilitate communication to three students affected by mobility impairments and preserved intelligence, cerebral palsy (CP) by means of the use of the computer along with customized push buttons, in their school period. 3D printing techniques are used to personalize switches. Their development undergoes different stages: design, implementation, adjustment and then testing throughout several academic years. Results show a satisfactory development. The students achieve a sufficient level of autonomy in the teaching – learning process. The also prove the need for the personalization of the push buttons. The level of satisfaction is also perceived among the academic staff and even the student’s family. We highlight the assistance these technologies provide to the teachers who have motoric disabled students in the classroom. As a result, we emphasize the importance of prevention at an early age, leading to the development of different resources and personalized devices and their introduction in the educational process in order to promote personal and social autonomy and therefore, inclusion.

Index Terms—On screen interface, Information Technologies, inclusive education, autonomy, learning-teaching.

I. INTRODUCTION

Soro-Camats, Basil y Rosell (2012, p. 56) [1], remark, in relation to the degree of disability that, “not being able to perform a certain action does not depend only on personal limitations but also on the environmental condition around”, this meaning that it is necessary to enforce inclusive environments. Observations conducted by Sevillano and Rodríguez (2013, p. 121) [2] on the use of IT, picture the student as a main actor on the learning process. This motivates the student, awakening interest for learning and understanding and enabling immediate transmission and reception of information and as a result, a more flexible learning pace. Harding, speaking about the ability to interpret children behavior at the early years of their communication skills development: “may be compromised since they do not communicate in a conventional manner o because their expression may be the result of physical rather than communicational factors”. According to Coronas, Rosell y Pastallé (2012 [3]), when discussing about not using conventional keyboards and mice, there is a fair variety of alternatives employing switches of different kind. The degree of autonomy their use provides depends

on the acquisition of specific skills. Changes on technology lead to regular update of the electronic assisting devices and especially in the computer. Improvements on these devices are also driven by changes in student’s capabilities and the appearance of new needs. We propose to take advantage of the characteristics of the on-screen interface [4] (opacity, velocity, size, etc) along with the use of 3D printed switches (versatility, flexibility, fast prototyping, personalization, cost reduction, sustainability and short series), according to Verbeeten y alt (2017) [5]. We consider that the intervention of students with special educational needs requires precise prevention to make the development of self-concept and self-esteem possible. It is also necessary in order to compensate low personal competence and the lack of motivation for learning. Rossato et alt (2014, p.150) [6] “...should support the development of cognitive, sensory, visual and musculoskeletal systems, involving play activities to enhance social integration”. . . .” the environmental enrichment issued to provide physical activity, learning experiences, increased somatosensorial inputs and social interaction. It induces plastic changes in the brain and recovery of sensorimotor function” and “the early stimulation with an enriched environment is able to prevent further deficits on motor skills” (p.156) According to Sakash et atl (2018, p. 136) [7] “Children with CP who do not have impairments in speech or language may be at risk for EF difficulties which may negatively affect social communication, academic performance, and functional independence”.

II. MATERIALS AND METHODOLOGIES

According to McMillan y Schumacher (2010) [8] a case study is characterized by a reliable measurement (many observations as a data collection technique), repetitive measurements (the same feature is measured repeatedly), description of the conditions (as precise and detailed as possible), base line, treatment condition (duration and stability) and one by one variation rule. The initial hypothesis assumes that the use of the on-screen interface and de design, development and adjustment of the personalized switches, from the elementary school, as an educational resource, enhances autonomous learning among students affected by motoric disabilities, enforces self-esteem and improves work environment in the classroom and along with personal and social autonomy. In the first stage stu-

dents are observed, paying attention to their learning progress in relation to different issues such as: mobility, language and communication, cognition, sensorial, social-affective, welfare and health. In the second stage the most difficult tasks are analyzed: assistance requirement, fatigue and attention. In the third stage proposals for new devices are made: on-screen interface (virtual keyboard) and 3D printed personalized switch. Implementation in the classroom comes at the fourth stage. The members of the research group test different types of switches show up in the classroom and assess different options. Time is adjusted to the methodological recommendations for the educational level of the students. In the case of elementary school, it is usually 10 to 15 minutes a day, progressively increasing depending on the student's personal conditions. In the fifth stage, the research team assesses the evolution of the students and the need for an adjustment of the devices.

III. RESULTS

After the implementation of the on-screen interface and the personalized switches over the course of three academic years we encountered:

- The three students under test have the feeling of a well.
- enables results in an enhanced self-esteem and the perception of a better personal competence.
- assess their results applying normalization criteria.
- Both the on-screen interface and the 3D printed switches become the tools that enable the realization of the necessary adjustments for the student's evolution in terms of mobility, cognition, perception and sensorial.
- These resources are meant to prevent learning and motoric difficulties inherent to students affected by CP.
- They also prevent further problems on students affected by learning and mobility impairments.
- These tools have helped to overcome fear of failure and enforced desire for self-improvement.
- Interest on self- achievement, motivation and satisfaction for the knowledge acquired has also been obtained.
- Through the fine tuning of the switches students have been able to initiate in the acquirement of literacy skills.
- The academic results obtained by the students have been perceived highly satisfactory by the academic staff, families, and the leading team of the school. They have been assessed by means of interviews and tutorials.
- Other schools, hosting students with similar characteristics, have shown great interest on the tools proposed in this work.

IV. DISCUSSION AND CONCLUSIONS

Referring to the progressive elimination of assistive devices, Soro-Camats, Basil y Rosell (2012) [9] suggest that there are two ways for the kid to achieve autonomy: attenuation (gradual reduction of the intensity of the assistance provided) and structured wait (should the student fail, the aids are reinforced to regain success). The process would begin with physical assistance, and then move to verbal instructions. They may also be combined. It is necessary to change the perception

of the individual affected by motoric disabilities unable to displace or manipulate objects autonomously, not being able to perform other tasks requiring movement. Ochoa (2010) [10] argues that, although technology is present in many areas, it has not spread enough, maybe due to the difficulty in its use, compatibility issues, or the different criteria applied to the design. On-screen interface along with personalized switches have enabled students to perform tasks autonomously, and improve self-esteem. The academic staff is aware of the benefits of IT and knows the important role they should play in the teaching – learning process. Nevertheless, they blame the lack of training and time to think about the precise needs to address. Training is available but, usually not connected with the needs and the conditions in the classroom. It is a shared endeavor that demands a large amount of dedication on each one. Families are usually willing to collaborate in the implementation of the resources. We could sustain that motoric disability does not depend solely on physical limitations, but also on the situations that emerge from the interaction between that personal limitations with the barriers present on the environment. For Pereira et al (2018, p.46) [12] “The existence of rules and routines promotes autonomy and the sense of responsibility, especially regarding school demands”. To recap, Garcia [11] states that education must not respond only to the impositions of the market since it implies promptness and benefit. We defend a slow and sensible learning, emerging from participative and collaborative environments. It is most important the sense of what we do and the student's perception of being learning. (2013, p. 113)

REFERENCES

- [1] Soro-Camats, E., Basil, C., y Rosell, C. (2012). Pluridiscapacidad y contextos de intervención. Barcelona: Universitat de Barcelona- Institut de Ciències de l'Educació.
- [2] Sevillano, M.L. y Rodríguez, R. (2013). Integración de tecnologías de la información y comunicación en educación infantil en Navarra (Spain). *Píxel-Bit. Revista de Medios y Educación*, 42, 75-87
- [3] Coronas, M., Rosell, C. y Pastallé, N. (2012). Productos de apoyo y su uso para la participación, la educación y el juego. (pp. 5-32). Barcelona: Universitat de Barcelona- Institut de Ciències de l'Educació.
- [4] AA.VV. (2012). Interfaz en pantalla. <http://www.interfazenpantalla.com/caracteristicas.html>
- [5] Verbeeten, W.M.H. y alt. (2017). Laboratorio 3D de la Escuela Politécnica Superior. <http://hdl.handle.net/10259/4400>
- [6] Rossato, M. et al. (2014). Beneficial effects of early environmental enrichment on motor development and spinal cord plasticity in a rat model of cerebral palsy. *Behavioural Brain Research* 263, 149-157.
- [7] Sakash, A., Broman, A., Rathouz, P., Hustad, K. (2018). Executive function in school-aged children with cerebral palsy: Relationship with speech and language. *Research in Developmental Disabilities* 78 136-144.
- [8] McMillan, J. H. y Schumacher, S. (2010). Investigación educativa. Madrid: Pearson Addison Wesley.
- [9] Soro-Camats, E., Basil, C., y Rosell, C. (2012). Pluridiscapacidad y contextos de intervención. Barcelona: Universitat de Barcelona- Institut de Ciències de l'Educació.
- [10] Ochoa, E. (2010). Nuevos avances en la accesibilidad TIC. 25 Años de Integración Escolar en España: Tecnología e Inclusión en el ámbito educativo, laboral y comunitario. Murcia: Consejería de E, Formación y Empleo.
- [11] García, T. (2013). Experiencias y posibilidades de articulación entre Universidad-Escuela-Comunidad. *Revista Interuniversitaria de Formación del Profesorado* 78 (27.3), 201-206..

- [12] Pereira, A ; Magalhaes, C ; Magalhaes, P ; Lopes, S ; Sampaio, A; Magalhaes, C ; Rosario, P. (2018). Why is he special? The importance of educational diet in children with Hemiplegic Cerebral Palsy: a case study. *European Journal of Investigation in Health Psychology and Education*, 8, 1, 37-51.