A TACTILE DIGITAL PLATFORM, BASED ON THE COMPLEXITY THEORY, FOR SUBJECTS OF THE AUTISTIC SPECTRUM DISORDER

L. Oliveira[1], J. Colus[2], R. Fontes[3], N. Pellanda[4], L. Pellanda[5]

[1]University of Minho (PORTUGAL)
[2]Alumni University of Minho (PORTUGAL)
[3]University of Vigo (SPAIN)
[4]University of Santa Cruz do Sul (BRAZIL)
[5]Sociedade Psicanalítica de Porto Alegre (BRAZIL)

Abstract

The influence of technological innovation is increasingly significant, development depends more and more on technological tools such as internet, digital applications or digital educational resources.

Autistic Spectrum Disorder (ASD) is a reality for which current society is more aware of. This disorder is known for showing social and behavioural/cognitive characteristics that affect their social development.

Recent studies show ASD children and young people react favourably to the use of digital educational resources (DER's) but also that ASD subjects' will only profit from the advantages of DERs when they are specifically conceived for autistic subjects. We plan on creating a platform based on psychosocial theories: the theory of the Biology of Cognition on the theory of Complexity and on the theory of Second Cybernetics.

We believe that this platform, in its complex construction, will allow new ways of communicating with ASD subjects, and that the result of that communication will be very helpful in understanding their world.

Keywords: digital educational resources, Autistic Spectrum Disorder, Theory of Complexity, digital platform, self-construction.

1 INTRODUCTION

In a world where the influence of technological innovation is increasingly significant, development (be it economical, technological, social or other) depends more and more on technological tools (i.e. internet, digital applications, digital educational resources). We aim at exploring the potential benefits of such tools and use them so as to produce consistent development/improvement.

It is commonly accepted by the scientific community that digital educational resources are very useful tools when it comes to improving both the intellectual and the social development of children and young people. They are also the inevitable path to follow in order to achieve knowledge/education-related evolution.

Our team's starting point was the creation of a digital platform aimed at children and young people diagnosed with Autistic Spectrum Disorder (ASD). This proposal of a platform is intended to be used as a tool which will allow its target users to develop coupling mechanisms and strategies with the world around them. In studies already undertaken [1,2] the use of an iPad proved to be extremely useful for ASD children. The feedback of those studies revealed of ASD children had improved in several areas, namely verbal language, expression of social empathy, and diversification of their interests.

This paper intends to shed a new light on the conception of digital platforms. The concept of the platform we will present is based on the theory of the Biology of Cognition [3], on the Theory of Complexity [4], and on the theory of Second Cybernetics [5].

We truly believe that the existence of such digital platforms will mean a step forward in the creation of environments which will encourage the improvement of verbal language, emotional language, and peer empathy, and which, by so doing, will promote the socialization process among ASD subjects.

2 BODY OF PAPER

Technological evolution is a constant challenge in the construction of today's society. The arrival of Digital Educational Resources (DER) platforms has promoted paradigmatic changes in the school population, in pedagogical practices and in teaching strategies.

They can be defined as digital educational resources as long as they are considered "digital entities produced specifically for support of knowledge and learning" [6], whether we are referring to software, podcasts, blogs, webquests, digital platforms, virtual environments or others.

Coutinho et al. [7] state that a good use of DERs is important in this new digital society - full of opportunities but extremely demanding and unpredictable – in order to raise adjusted, informed citizens, capable of dealing with any challenges and setbacks.

The digital platform we plan on creating is based on the theory of the Biology of Cognition [3], on the theory of Complexity [4] and on the theory of Second Cybernetics [5]. The first defends the notion of the autopoietic process, which consists in the individual construction of every human being, that is, self-construction. This process is the result of constant coupling of human beings with the world around them and is a life-long process. The Theory of Complexity complements the Biology of Cognition, since each individual's autopoietic process turns him into a more complex person, and that complexity is reflected in the evolution of the human being in every field of his life. The human being is in permanent interaction with the social environment around him, by means of a coupling process which increases the human being's complexity; so does society, through the each individual's contributions. Second Cybernetics reinforces the idea of the human being's self-construction, since it defends the existence of observant systems in which the observer takes part in the construction process, being responsible for his own observations (cognitions). This perspective of a system's point of view which could either be an individual system (each human being) or collective (society) and is enrichening and corroborates the vision of Maturana and Varela's Complexity Theory.

Children and young people diagnosed with Autistic Spectrum Disorder have social and behavioral cognitive characteristics that are very peculiar and make their social development hard, either individually or collectively. ASD subjects show specificities in three particular areas: language, socialization and behavior [8]. ASD subjects show sensorial hypersensitivity, that is, they are oversensitive to sound, smell, touch and sight [9]. They also show some comorbidities such as anxiety and depression, among others [10]. These children and young people are often misunderstood, segregated and ostracized by society in general. All these circumstances lead a huge majority of ASDs to social isolation. Their specificities require a different approach, one that takes into account ASD children and young people's specific needs. The above-mentioned theories show the construction which we consider best suited for these subjects, since they take into account their singularity, self-construction, subjectivity and neuroplasticity as complex human beings.

Recent studies show ASD children and young people react favorably to the use of digital educational resources [11, 12, 13].

According to Barbosa [11], ASD subjects will only profit from the advantages of DERs when there are specifically conceived specifically for autistic subjects. According to the same author there are now are several autism-conceived DERs in use, namely ZAC Browser, Sc@ut – Sistema de Comunicação Aumentativa e Adaptativa, CPA – Comunicador para Autistas, Tartalogo, among others.

DER "MinhaRotinaEspecial" and "FirstThen" are used to help ASD subjects in organizing their routines so they can grow their sense of independence and diminish anxiety [14]. The same authors refers to the "Desenha e Aprenda a Escrever" as a DER that helps develop language and motricity. The "Go Sequencing" helps ASD subjects to develop their reading, narrative and everyday language [15].

For Pires [12], the use of digital educational resources encourages the inclusion of ASD subjects since they promote knowledge acquisition, their social abilities, in one word, their general development.

Limberger et al. [16] state that technological resources are valuable allies in the search for quality education and that the use of iPad games increases cerebral plasticity and promotes the process of behavior change towards knowledge.

We aim at building a digital touch platform that takes the assumptions of autopoiesis, subjectivity and neuroplasticity of ASD subjects into account. It is our belief that ASD individuals are gifted individuals, with complex brains capable of self-organization and neuroplasticity; They are capable of building alternative neuronal circuits by means of coupling with the technological environment, thus

overcoming genetic limitations; These human beings are autopoietic, that is, they are biologically able to assert themselves as the authors of their own lives, as long as a suitable environment is available. Technology provides the opportunity of building a constructive cognition/subjectivation-oriented environment, because it heightens human abilities; a multi-function digital environment can be a powerful ontogenical-cognitive tool; a cellphone selfie or a video telling your own life are powerful cognitive-ontogenical tools.

According to F. Flores et al. [17], "The creation of a new device or systematic domain can be highly significant; it can create new ways of being which did not exist previously and a background for actions which made no sense before." [p.235]

This platform intends to promote the use and development of the five senses, the ability of self-narration promoting self-construction of complex and individual reality for each ASD subject.

On the digital touch platform, new tools such as webcasts, podcasts, chats, etc., will be available.

The aims of this platform consist in combining separate dimensions of reality which are common in the general educational process; building an authoral environment, with the constitution of autonomous subjectivities in which subjects can feel comfortable, where they can listen to themselves, giving room for self-narratives which may not be only verbal but also bodily or mediated by to a technical object; providing a subject/machine interaction leading to cognitive/ontogenical mobilization; creating a holistic environment within which the subject may feel part of the universe and its four elements: earth, air, fire and water; contemplating each individual's search for self-organization by creating unsettling situations in order to have the subjects learn to live in the vital flux that leads you from chaos to order; working with a cognition conception as something inseparable from living and with a conception of learning neither representational nor adaptive - a coupling one; creating a relaxation app (yoga, meditation, music, breathing, mandalas) as means of integration with the subject's self through bodily awareness.

We trust that this platform, in its complex construction, will allow new ways of communicating with ASD subjects, and that the result of that communication will be very helpful in understanding their world. As in any other circumstance, only by understanding can you help or help construct effectively.

3   CONCLUSIONS

Digital educational resources are today's undeniable reality, and they are updated by the minute. The world we live in is set by the digital age, namely by Web 2.0. This reality can and should be used in order to help us make the best of our lives, as well as of the lives of those who, for some reason or another, are not able to fully profit from them. It is our task to monitorize them and establish their complementarity so they can be used healthily, usefully as well as altruistically.

Our work group has ascertained that the use of digital tools is valuable for ASD individuals [1, 2, 16]. ASD children included in our study showed clear progress in terms of expressing feelings, verbalization, writing, physical contact (hugs) and smiling. These findings tend to confirm the belief which led us through the work we undertook – we firmly believe in the harmonious development of social behaviour and individual, complex self-construction as described in Maturana and Varela's Complexity Theory (1990).

We believe very successful results may be achieved through the use of the digital platform we now present. Its conception reflects our convictions and aims. It takes into account the respect for the individual's dignity in his uniqueness and singularity, regardless of their shape and expression.

ACKNOWLEDGEMENTS

REFERENCES

[1]   N. M. C. Pellanda & K. R. A. Demoly, As tecnologias touch: corpo, cognição e subjetividade. *Revista de Psicologia Clínica*, vol. 26, no. 1, pp. 69-89, 2014.

[2] L. E. C. Silva & N. M. C. Pellanda, A ontoepistemogenese de crianças autistas através da utilização de tecnologias touch, *V Congresso Brasileiro de Informática na Educação*, CBIE 2016, Uberlândia, MG, Brasil, outubro 2016.

[3] H. Maturana & F. Varela, *Autopoiesis and cognition.* London: Reidel, 1980.

[4] F. Varela, Conhecer: As ciências cognitivas, tendências e perspectivas. Lisboa:Instituto Piaget, 1990.

[5] H. Von Foerster, *Understanding, understanding*. New York: Springer, 2003.

[6] J. L. Ramos, V. D. Teodoro & F. M. Ferreira, (2011) Recursos Educativos Digitais: reflexões sobre a prática. *Cadernos SACAUSEF* VIII pp. 11-34, 2011.

[7] C. Coutinho & E. Lisbôa. Sociedade da informação, do conhecimento e da aprendizagem: desafios para educação no século XXI. *Revista de Educação*, vol. XVIII, no 1, pp. 5 – 22, 2011.

[8] L. Wing, Asperger's syndrome: a clinical account. *Psychological Medicine*, vol. 11, pp. 115-129, 1981.

[9] T. Attwood, *Asperger's syndrome, a guide for parents and professionals.* London and Philadelphia: Jessica Kingsley, 1998.

[10] C. Gillberg, *Transtorno do Espectro do Autismo.* [Lecture] INCOR, XXIII Congresso Brasileiro de Psiquiatria. São Paulo, Brasil, outubro 2005.

[11] H. F. A. Barbosa, *Análise do recurso a novas tecnologias no ensino de autistas.* [Presentation], Tese de Mestrado, Instituto Superior de Engenharia do Porto, Porto, novembro 2009.

[12] R. P. Pires, *O Impacto das TIC no Sucesso Educativo de Alunos com Autismo.* [Presentation], (Tese de Mestrado). Escola Superior de Educação João de Deus, Lisboa, abril 2014.

[13] L. R. Santos, M. M. Saraiva & B. P. André, É jogando que se aprende: o uso de jogos educativos digitais e a aprendizagem de crianças autistas. *Anais do XII congresso latino-americano de humanidades*, Campos de Goytacazes, vol. 1, no 1, pp. 159-169, 2016.

[14] C. Cassemiro et al*. A tecnologia como ferramenta para a aprendizagem das crianças com síndrome de Asperger no ambiente escolar*, Available from: http://www.psicologia.pt/artigos/ver_artigo.php?a-tecnologia-como-ferramenta-para-a-aprendizagem-das-criancas-com-sindrome-de-asperger-no-ambiente-escolar&codigo=A1065 (Acessed: 27 August 2017)

[15] Ana Leite, "Go sequencing: aplicativo para habilidades de linguagem e sequência desenvolvido por fonoaudióloga", *reab*, 6 July, 2016. Retrieved from: http://www.reab.me/go-sequencing-aplicativo-para-habilidades-de-linguagem-e-sequencia-desenvolvido-por-fonoaudiologa/

[16] L. S. Limberger & N. M. C. Pellanda, O iPad e os aplicativos de jogos como instrumentos complexos de cognição/subjetivação em autistas. *Revista Jovens Pesquisadores*, vol. 4, no. 1, pp. 149-158, 2014.

[17] F. Flores & T. Winograd, *Hacia la Comprensión de la Informática y la Cognición.* Barcelona: Espano-Europea, 1989.