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Report of Skills Needs in ICT sector, VET and Special Education

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Introduction

BIT THE SPECTRUM (BTS) is an Erasmus+ Project that promotes **social inclusion** through the use of the **most modern technologies** in specific and innovative therapies for students with **autism spectrum disorder** (ASD).

The project is unique in its purpose, as it brings together experts in Information and Communications Technology (ICT) and experts working with autism spectrum disorder for increasing the quality of the Vocational Education and Training (VET) teaching process addressed to students belonging to this target group.

BIT THE SPECTRUM focuses on the use of **Augmented Reality (AR)** and **Virtual Reality (VR)** for this aim; tools that are lately becoming more common in learning environments.

Autism spectrum disorder is a developmental disability that can cause significant social, communication and behavioural challenges. There is often nothing about how people with ASD look that sets them apart from other people but people with ASD may communicate, interact, behave and learn in ways that are different from most other people. Therefore, it is essential to make a progress in the standards of the education of people belonging to this social group, in this case focusing our effort on upgrading the skills and tools of the professionals dedicated to their training.

BIT THE SPECTRUM will **impact** different target groups: Schools and VET Institutes, NGOs or associations working with people with ASD, Social Enterprises providing tools for special needs, and end users, learners with ASD.

To achieve this main goal, we have defined some specific **objectives**:

- 1. To increase the quality of the educational and "caregiving" process of staff working with people with ASD.
- 2. To provide innovative and proper tools (AR/VR) to teachers, trainers and other staff members, for reaching the aim 1.
- 3. To increase the quality of the learning process of people with ASD in terms of Literacy and Social Emotion skills.





- 4. To increase the quality of the VET inclusive education in the countries involved.
- 5. To increase the cooperation among different European entities working in the field of inclusive education and technology development.

The project is aimed to create innovative learning pathways that will increase the quality of the work of educators and staff members that deal with learners with autism spectrum disorder.

This process is composed by **5 results**:

R1 – The development of an Open online training related to AR and VR features for teachers on the special needs sector, with the ASD student's approach.

The guideline provided by the online training will be an important tool for staff engaged in educational work (trainers, teachers, etc..) with people with ASD to understand the theoretical aspects of the technology they are going to learn through Bit the Spectrum Project.

The training will be very user-friendly for people who are not used to the study of this kind of subjects and it will provide with basic knowledge about 3D virtual environments, 360^o immersive experiences and Augmented Reality: theory, story, types, main use, etc...

The guide will incorporate introductory aspects from the autism spectrum in order to introduce this disorder to the professionals that are more related to technology or basic training rather than to the disability. Part of the training will come in the form of video pills and interactive content produced by authorizing tools for e-learning.

R2 - The development of a Human Centred Design Methodology that allows to create exercises using Augmented and Virtual Reality for students with ASD.

R3 - The creation of a set of 30 exercises using Augmented Reality for students with ASD to boost literacy and social emotion skills.

R4 - The creation of a set of 5 exercises using Virtual Reality for students with ASD to boost social emotion skills.

R5 - A study of the Impact of the exercises In ASD students (pilot test).





T1.1 Skills needs in ICT sector, VET and special education

As a first step to achieve the right results in the development of the "*Open online training related to AR and VR features for teachers on the special needs sector, with the ASD student's approach*", the consortium needed to discover the skills needs in our target learners, in order to define a rigorous curriculum and deliver the appropriate online course than trains the professionals the best way to boost the use of AR and VR later with ASD students in VET.

Therefore, the first of the activities driven by the consortium has been a *Report on the Skills needs in ICT sector, Vocational Educational Training (VET) and Special Education.*

The partner organizations encompass those target groups which makes easy to understand the needs of knowledge about the technology of non-technical teachers and the needs of knowledge about autism spectrum disorder (ASD) and disability of ICT experts.

However, the *skills needs targeted*, exposed further in this report, are based as well in the feedback of external actors of the project by the distribution of surveys and by the arrangement of focus groups.

During this task, the consortium has analysed the *skills needs in the different target learners*, making special emphasis on the knowledge of special education and VET teachers about Virtual Reality and Augmented Reality and its potential use in the education of people with autism spectrum disorder.

Different instruments of analysis have been used for this aim:

Desk Research

This report has gathered various *Academic Literature and Good Practices* among European Projects and other kind of programs that show positive and effective uses of those technologies (AR and VR) in the support of people with Special Educational Needs (SEN).





The **conclusions** show that AR and VR in the context of education of ASD students has been explored primarily in the field of improving social interaction, such as recognizing emotions from different facial expressions, speech or identifying socially undesirable characteristics. The pre-existing research shows that AR or VR headset devices do not impair learning for ASD but there is no conclusive studies regarding effectiveness of impact.

Some very specific hard/coded simulations e.g., for car driving or practicing crossing the street in safe environments have been developed, but there is basically no pre-existing AR/VR content for wider teaching. There was a VR learning environment developed for first responders but no significant training environments in connection with ASD teaching have been developed.

In summary, using VR/AR training environments for ASD education is still in baby shoes although the research shows that there could be significant potential applying the technology in this field as there is pre-existing evidence that VR/AR technology improves social interaction capabilities. Moreover, there is very little training material in VR/AR available to support VET teachers or others to learn how to work with ASD students in the most effective way. Teachers do not have yet the capacity to produce or co-create their own content in AR/VR, whereas it would bring great benefits to develop this capacity.

These optimistic results entail a starting point of research that is leading the consortium into the development of new and innovative outcomes that will increase the quality of inclusive education and the cooperation between different European entities working on the field of education and technology development.

Survey

The distribution of a surveys was another way of detecting the skills needs we were looking for, where professionals in the field of special education at all levels have been asked mainly about their knowledge and prospective use of Augmented and Virtual Reality in the education of ASD students.





Survey results reinforce the results of the Desk Research. Augmented and Virtual Reality scenarios are not practically in use of ASD teaching anywhere. Moreover, educators and other professionals working in the field need content, tools and training to help them in developing social interactions of ASD students in safe environments, recognizing emotions, motivating students, visualizing concepts, and help in behaving during the occurrence of problem behaviour. However, usually it is not understood well what opportunities AR/VR technologies offer to satisfy these needs as examples are missing.

The possibilities seen in which AR/VR technology can be applied are very concrete:

- Factual transfer of knowledge without social component, allowing to better process visual rather than verbal stimuli.
- Learning everyday skills in a safe environment: role plays, recognition of feelings, reinforcement of behaviour through revision;
- and even gradually exposure to unpleasant stimuli to realize tolerance skills, and safety skills.

These could be involved in many different areas of ASD education. Therefore, teachers yearn for more content and training in order to use and remix content, and create their own. They need tools for this.

Focus Group

Two focus groups have been held during the first phase of the project:

Spain

One at national level in Spain that focused in discovering the needs of both ASD professionals and students.

The focus group started with and introduction to the project Bit the Spectrum, where the aims of the project were presented to the assistants, as well as the prospective results and the research obtained until now. Afterwards, a specific introduction to VR and AR technologies and





their possible use in education was held. The main purpose of the focus group was to understand some of the needs of ASD professionals and ASD students in education.

The main conclusions, very much aligned with the ones of the previous tasks were:

- VET teachers need learning but specifically practical training for the better assistance of ASD people, where most recurrent situations are shown.
- ASD students could benefit a lot from interactive tools as they have attractive scenarios in terms of development (it is like a game).
- Regarding the VR/AR exercises.
 - We must be: CONCISE, DIRECT, VERY VISUAL.
 - We must avoid: AMBIGUITIES, DOUBLE MEANINGS, FREE INTERPRETATION.
- Something helpful for VET teachers is raising scenarios with situations that are going to occur allows to anticipate (fundamental with ASD).
- Some VR environments suggested by the professionals were: performance of usual jobs

Finland

The second focus group was held in Finland, where ASD teachers were asked to brainstorm ideas for future AR or VR exercises. During the focus group there was also a discussion about the needs of ASD students that could be answered with AR and VR technologies.

Teachers brought up many use cases where VR or AR exercise would be useful for the ASD students.

Some of the ideas that came out were:

- Learning to regulate your behaviour.
- Learning how to discuss and help forward discussion.





- Understanding what other person's own space means.
- Getting to know a new environment before entering it.
- Learning how to clean up your room.
- Understanding how the other person feels and putting emotions to words.
- Learning how to clean up a room or how to make a healthy snack.





CONCLUSIONS

First and most importantly, there is a promise in Augmented and Virtual Reality technologies to help students on the Autism Spectrum to learn better.

After some first months of work, we have completed an extensive *Desk Research* on the topic as well as conducted *Survey* research targeted to people working on the ASD field. Moreover, we have held *Focus Groups* to quantitatively verify the initial research findings and hypotheses.

Based on the work we have been doing we believe that there is very high potential in using AR/VR to support special needs teaching. Prior research has focused on improving social interaction and proving that technology is not harmful.

As it is usual in a developing field, people always fear the new technology. It is also very understandable considering the nature of this particular user group. Therefore, it is not surprising to find that first research has focused on examining whether immersive technologies are harmful for the learning of ASD students. The pre-existing research shows that AR or VR headset devices do not impair learning for ASD but there is no conclusive studies regarding effectiveness of impact. The latter observation is partly explained by the facts that there is very little immersive content for teaching special needs students, and this content needs to be built first in order to evaluate its impact properly.

Augmented and Virtual Realities in the context of education of ASD students has been explored primarily in the field of improving social interaction, such as recognizing emotions from different facial expressions, speech, or identifying socially undesirable characteristics. There is evidence supporting that social interaction can be improved through AR/VR technology. With simulations in VR students can practice everyday tasks or social interactions, or seeing the others' point of view without any actual social pressure in the learning event. This is in particular useful for students on the Autism Spectrum.

Moreover, there is very little training material in VR/AR available to support VET teachers or others to learn how to work with ASD students in the most effective way. Teachers do not have





yet the capacity to produce or co-create their own content in AR/VR, whereas it would bring great benefits to develop this capacity.

Augmented and virtual scenarios are not practically in use of ASD teaching anywhere. Moreover, educators and other professionals working in the field need content, tools and training to help them in developing social interactions of ASD students in a safe environment, recognizing emotions, motivating students, visualizing concepts, and helping during the occurrence of problem behaviour. However, usually it is not understood well what opportunities AR/VR technologies offer to satisfy these needs as examples are missing.

As a conclusion, the skills' needs identified have led us to the completion of a curriculum that covers all the areas of knowledge involved. The curriculum consists of 4 Units and 8 Learning Outcomes:

Learning Outcome	Introduction to Technology of Information and Communication Applications of ICT to special education/ of ASD		UNIT A: The use of Technology in Special Education	
	students			
Learning Outcome	Special Educational Needs		UNIT B: Special	QUALIFICATION: AR AND
Learning Outcome	Autism Spectrum Disorder		Educational Needs and Autism	VR FEATURES FOR VET
Learning Outcome	Human Centered Design Methodology	U	NIT C: Methodologies for	SPECIAL EDUCATION
Learning Outcome	Specific HCDM for this project		exercises	APPROACH
Learning Outcome	Augmented Reality		NIT Di Extended Bealities	
Learning Outcome	Virtual Reality	own D. Extended Realities		







THANK YOU







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