7 CO-CREATION OF SERIOUS GAMES TO ACQUIRE A PROFESSIONAL SKILL

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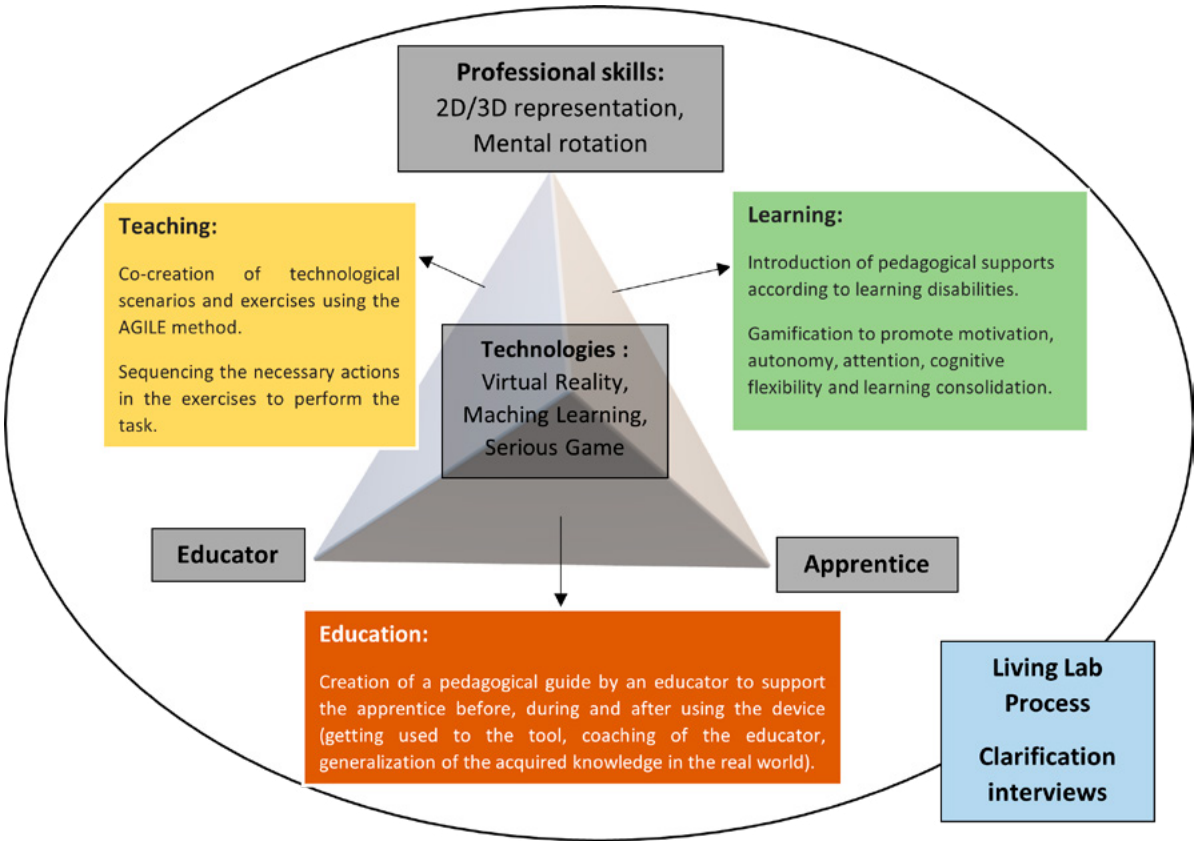
ABSTRACT
ORIF is collaborating with HES-SO Valais-Wallis to co-create formative serious games, using extended reality, driven by machine-learning algorithms, to support vocational training for people with cognitive and/or social issues. The goal of this collaboration is to provide apprentices in the building sector with a virtual space to train their reading of plans and mental rotation, which are essential skills in this domain.



CONTEXT

ORIF (Swiss French Organization for Integration and Training) offers professional integration services to people with health problems and cognitive and/or social disorders. At ORIF, apprentices can train in the building, restaurant, and service sectors. They are supervised by educators who support them in their professional training.

The trainees at ORIF share the common characteristic of presenting learning difficulties that impact their integration into the labor market. Scientific literature shows that vocational training that adapts to each learner's difficulties can improve professional skills and thus employability. In this spirit, ORIF is collaborating with social work and management information technology researchers from the HES-SO Valais-Wallis on a project aiming at creating a virtual learning tool that adapts to each learner's difficulties. The goal is to use a combination of Virtual Reality (VR) and Machine Learning (ML) to facilitate the transmission of professional skills.

TARGETED ISSUE

Among the skills to be acquired in the training offered by ORIF, reading plans and mental rotation pose a real problem for a majority of learners in 5 building sectors (sanitary, tiling, carpentry, metal construction and masonry). Several studies also highlight difficulties in reading 2D/3D representations for many adults in the building domain, as well as the inadequacy of traditional pedagogical tools to work on these skills for apprentices who have learning disabilities [1]. It is therefore necessary to rethink the teaching method by using a virtual environment known to promote the cognitive flexibility essential to problem-solving, as it allows qualitative and quantitative complexity in learning contexts [2].

The combination of virtual reality and machine learning has a real potential to enhance learning activities and facilitate the transmission of skills (...) for a population with learning disabilities.

Thus, this project objective consists in co-creating a technological tool that uses Virtual Reality (VR) and machine learning algorithms, proposing exercises which enable apprentices in the 5 building sectors to train these two skills while assimilating the necessary action sequences to complete a project. This tool must also provide a learning space containing adapted supports, while having a gamification aspect that promotes the learner's motivation.

Our goal is to improve the efficiency of pedagogical devices on attention, motivation, autonomy, feedback, consolidation, and adaptation of assistance to the learner's level of acquisition.

PROPOSED SOLUTION

In order to co-create this virtual environment and the exercises to be carried out, we used the AGILE method. Sprints of 3 weeks were held in the form of meetings between educators and researchers to achieve the following objectives:

- Identify the learning difficulties of young people in the targeted skill;
- Co-create technological scenarios containing different types of exercises with increasing levels of difficulty in order to work on the targeted skill;
- Determine support principles using technology to overcome learning difficulties (sequencing, highlighting with colors, etc.);
- Test the tool with the educators and a sample of apprentices and discuss the implementation progress and elements to be modified.

Thus, the close collaboration between researchers and educators from 5 building sectors should allow true co-construction of a tool, which is both pleasant and educational, and is centered around the users' needs, namely young people facing difficulties. Through continuous exchanges between researchers and educators, innovative technological and pedagogical solutions based on the difficulties of young people can be developed.

Furthermore, in a living lab perspective [3], apprentices are part of the co-construction process by testing the tool and taking part in an interview [4] with researchers to explain their experience and feelings regarding the virtual environment, tool usage, performed exercise, and proposed aids.

RELEVANT INNOVATION

The innovation of our solution is the combination of virtual reality and artificial intelligence to provide a new educational tool that adapts to the user's learning characteristics in order to improve the employability and integration of young people with health issues into the Swiss job market.

Indeed, a training tool comprising 5 sectors of the construction industry has been co-created to work on a common professional skill, namely 2D/3D representation and mental rotation. This is an innovative educational tool to help the acquisition of this skill thanks to specific exercises. In addition, scaffolding principles have been selected and introduced in virtual reality to provide adapted assistance to a heterogeneity of apprentice profiles presenting learning disabilities (autism spectrum disorder, attention disorder, hyperactivity, dyspraxia, etc.). The coloring of important elements, vocal assistance, pictograms, the 3D representation of the completed work as well as a sequencing of actions are among the proposed aids.

In addition to technological innovation, a pedagogical support guide has been developed using the pedagogical tetrahedron for the integration of technologies [5] to frame the tool use by the educator and the apprentice, as the developed tool is used in the classroom as an additional tool in the apprentice's training.

Finally, the tool gamification wants to promote the learner's motivation and accelerate the learning process.

PROJECT OUTCOMES & RESULTS

Currently, a first version of the virtual tool has been developed in the form of an exercise for each sector of the construction industry, with a defined sequence of actions. It contains the following elements:

- A home screen where the apprentice selects exercises,
- A warehouse where the apprentice must select the necessary tools to perform a task,
- A workshop where the apprentice performs the task, which is sequenced in the form of a list of tasks to be performed and validated.

The tool has been tested on 2 apprentices per field, who were observed and coached by the relevant educator. The apprentices' and educators' opinions on the tool, as well as the suggestions for improvement, were collected during interviews (clarification interviews for the apprentices). These interviews served as a basis for discussion between the researchers and educators to improve the tool. A second test is planned to follow this improvement.

CONCLUSION

The combination of virtual reality and machine learning has a real potential to enhance learning activities and facilitate the transmission of skills such as 2D/3D representation and mental rotation, for a population with learning disabilities. Additionally, gamification introduced in vocational training can increase the apprentices' motivation.

PERSPECTIVES & NEEDS

The first objective is to find funding to keep improving the tool by testing it with more apprentices. And the final aim is to use this tool in other sectors as well as in a wider audience such as adults in professional retraining or even thousands of neurotypical apprentices with real difficulties, following an ordinary learning path.

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