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The AR technologies in educational processes

The PBIS use case

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Abstract. One of the technologies that is significantly influencing the world of education is Augmented Reality. It is slowly creeping into the classroom due to the different benefits derived from its use. It has been applied in most school disciplines but can also be used in behavioural lessons, where behaviour becomes an object of study and is taught to students. This is the case in schools that use Positive Behaviour Intervention and Support (PBIS). In this paper we will introduce some of the possible benefits that can be achieved by the use of augmented reality in education and how it can support the teaching of behavioural skills in PBIS schools.

Key words. Augmented Reality, Education, Positive Behaviour, PBIS

1. Introduction

In recent years, the use of Augmented Reality (AR) in education has increased significantly. There are different factors that have led to this increase such as the spread of mobile devices making the use of AR more accessible in education and the increased interest in active learning and the use of educational technologies in education. In the literature, there are several studies showing that the use of AR has benefits for teaching. For example, it makes lessons more engaging and interactive by allowing students to interact with both visual and audio content in a more immersive way (Drljević et al. (2022); Farella et al. (2021)). It makes abstract or difficult-to-understand concepts more accessible and increases students' engagement by improving their motivation to learn.

There are several examples of using AR in education. In history classes (Challenor & Ma (2019)), teachers can use augmented reality to create interactive visualisations of historical events, allowing students to interact with characters and places from the past in a more immersive way. In science subjects (Arslan et al. (2020); Argo et al. (2019)), teachers can use augmented reality to create interactive visualisations of 3D models of biological organisms, chemical processes and physical phenomena, making concepts more tangible and easier for students to understand. Augmented reality can also be applied to language teaching (Tosto et al. (2021)) where interactive listening and pronunciation exercises can be created, allowing students to practise languages in a more immersive and natural way. In the arts (Huang et al. (2016)), interactive art experiences can

be created, allowing students to interact with works of art in a more immersive way and to discover new artistic techniques. AR can also be applied in Geography (Volioti et al. (2022)), where interactive maps can be created, allowing students to explore places in the world in a more immersive way and to make connections between geographical concepts.

One of the educational contexts in which augmented reality can be applied is in behavior education. However, the use cases of AR in behavioral education at school are very few (Tosto et al. (2022)). This paper will show how Augmented Reality can lend support in teaching behavioral norms.

2. Augmented Reality for PBIS

The behaviour can become a teaching subject on par with subjects such as literature math geography. As such, it is interesting to introduce augmented reality in this context and study its effects. A behavioural expectation can be taught, practiced and empowered. The introduction of AR can play a role in making the behavioural lesson more interactive and immersive. For example, AR can be used in the context of Positive Behavioural Interventions and Supports (PBIS) (on Positive Behavioral Interventions et al. (2000)) to help students understand and follow behavioural expectations in a learning environment. The PBIS is a comprehensive approach to student behaviour management that aims to promote and support positive behaviour and prevent problem behaviour. The PBIS focuses on establishing a positive learning environment in which students feel safe and valued, and in which positive behaviour is encouraged and rewarded.

The PBIS is based on three main components:

- The creation of a positive learning environment by teachers and school staff.
- The use of intervention strategies in which proactive strategies are used to prevent problem behaviours by encouraging positive ones.
- The continuous evaluation in which teachers and school staff continuously assess the effect of intervention strategies and make changes to improve the effectiveness of the intervention solutions.

The PBIS approach is used in many schools and educational institutions around the world and has proven to be effective in improving student behaviour and creating a positive school climate

The visual features of AR can be applied in a PBIS teaching process to model a behavioural expectation with a 3D character showing individual learners how to perform it using mobile devices such as tablets or more immersive ones such as smart-glasses. Interactive games can be created to help students understand and follow behavioural expectations in a specific school setting like classroom, hallway etc. In addition, the use of AR supports students in the process of identifying and managing their emotions more effectively.

3. The PBIS use case

The use of AR in the PBIS is one of the topics addressed by the Horizon 2020 ARETE[1] (Augmented Reality Interactive Educational System) project. Pilot #3 of this project aims to introduce augmented reality into this framework for the first time by supporting teachers during behavioural lessons. The effects and differences between traditional PBIS behavioural lessons and lessons in which augmented reality is used will be studied. For this purpose, an AR system was designed together with PBIS experts, teachers and students. The designed ecosystem consists of an authoring system, MirageXR[2], in which the teacher can create AR learning resources. These resources are collected in a Moodle[3] repository and can be viewed through the PBIS-AR application. This application not only allows students to view the resources created with MirageXR with a simpler interface but also supports the process of teaching, practising and reinforcing ex-

[1] https://www.areteproject.eu/

[2] https://wekit-ecs.com/documents/miragexr

[3] https://arete.ucd.ie/

Fig. 1. Example of PBIS Animations

pected behaviour through playful, reflective, interactive and multi-user activities. Through the use of an Alien called ARPRO, who has just arrived on our planet eager to learn to behave properly, students are involved in practising good behaviour, in particular desirable and undesirable behaviour. Learning takes place through 3 different ways:

- Teaching pupils what behaviour is expected, showing examples.
- Reflecting on learned scenarios/situations.
- Practicing appropriate behaviour, using multi-user interactive tasks.

Using Augmented Reality, scenarios/examples of situations that ARPRO may encounter at school with pupils and teachers are shown. In such scenarios ARPRO behaves appropriately or inappropriately with respect to others and the environment. The examples, visualised through contextualised animations in the environment (Figure. 1), show the correct behaviour. In addition, students are asked to reflect on the visualised situations with reflective quizzes and interactive activities that assign a score to the student in order to create a leaderboard to motivate them.

4. Conclusions

This paper aims to contribute in highlighting possible benefits that the use of Augmented Reality can bring to school lessons and in particular focuses on the use of AR in PBIS (schools where behaviour becomes a subject taught to students). The use of AR to support behavioural lessons is being investigated in the H2020 ARETE project for which an AR ecosystem has been designed and developed to support teachers during lessons. The system is currently being tested in Dutch PBIS primary schools and in the only PBIS primary school in Italy.

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