TEACHING BEHAVIOURAL ROUTINES USING AUGMENTED REALITY IN THE ARETE PROJECT

Giuseppe Chiazzese
Institute of Educational Technologies
Italian National Research Council
Palermo, Italy
E-mail: giuseppe.chiazzese@itd.cnr.it

Sui Lin Goei
Faculty of Behavioural and Movement Sciences
Vrije Universiteit Amsterdam
Amsterdam, Netherlands
E-mail: s.l.goei@vu.nl

Jeroen Pronk
Faculty of Behavioural and Movement Sciences
Vrije Universiteit Amsterdam
Amsterdam, Netherlands
E-mail: j.pronk@vu.nl

Crispino Tosto
Institute of Educational Technologies
Italian National Research Council
Palermo, Italy
E-mail: crispino.tosto@itd.cnr.it

Luciano Seta
Institute of Educational Technologies
Italian National Research Council
Palermo, Italy
E-mail: luciano.seta@itd.cnr.it

Marco Arrigo
Institute of Educational Technologies
Italian National Research Council
Palermo, Italy
E-mail: marco.arrigo@itd.cnr.it

Davide Taibi
Institute of Educational Technologies
Italian National Research Council
Palermo, Italy
E-mail: davide.taibi@itd.cnr.it

Mariella Farella
Institute of Educational Technologies
Italian National Research Council
Palermo, Italy
E-mail: mariella.farella@itd.cnr.it

Eleni Mangina
School of Computer Science
University College Dublin
Dublin, Ireland
E-mail: eleni.mangina@ucd.ie

KEYWORDS
Augmented Reality, School-Wide Positive Behaviour Interventions and Support, Behavioral Expectations, Students' Prosocial Behaviour, Positive Behaviour.

ABSTRACT

The recent and disruptive introduction of immersive technologies such as Augmented Reality into the educational system has already produced engaging and effective learning content. AR can still fulfil its potential in creating innovative products that increase the educational resources available to 21st century learners. The following paper is based on the work implemented within the Augmented Reality Interactive Educational System (ARETE) European Horizon 2020 project (www.areteproject.eu). The project investigates for the first time the introduction of AR in teaching behavioural routines within the framework of School-Wide Positive Behaviour Intervention and Support (SWPBIS) and how AR impacts students' behavioral management and self-management skills. The paper introduces a set of research methodological and technological assumptions guiding the researcher in the design and development of an AR-PBIS solution. The Augmented Reality PBIS (AR-PBIS) model for designing the AR PBIS software solution is described. Finally, the paper describes the assessment plan for the evaluation of the effectiveness of integrating AR into the PBIS framework.

INTRODUCTION

The last decade an increasing expectation of innovative immersive education with emphasis on Augmented Reality (AR) applications has been observed. The incorporation of AR into the 21st century education system, produces augmentation of learning content aiming to impact students' interest and motivation (e.g. Arrigo et al. 2018; Chiazzese et al. 2018). It is important also to note the significance of emerging education for economic growth and social well-being and especially as an antidote to the impact of the global financial crisis in employment. The performance and quality of education has become a key indicator of a country's capacity to prepare its future economic development. AR can address the knowledge accessibility in the educational value chain by unlocking the substantial potential for innovative new products for the availability of educational resources and the current market has a plethora of efforts with AR-based educational mobile apps.

This paper describes an innovative use of AR technology that seeks to go beyond what has already been implemented in existing educational AR studies, and focuses on an application within the framework of School-wide Positive Behaviour Interventions and Support (abbreviated as SWPBIS) that promotes students' behavioral and cognitive growth. School safety, student behavior, and academic outcomes are priority areas to be addressed in educational agendas (McEvoy and Welker 2000). Challenging behavior presents a barrier for learning (Chitiyo et al. 2011), contributes to poor school climate (Ögülmüs and Vuran 2016), negatively impacts students' quality of life (Emerson et al. 2014), adversely affects peers (Dishion and Tipsord 2011), and contributes to teacher burnout (Brunsting et al. 2014). Schools are

responsible for (a) creating safe, positive, and meaningful learning environments for their students and (b) adopting approaches that respect students' academic and behavioral needs to promote student success.

School-wide frameworks like SWPBIS have surfaced in the last decades and originated from the USA; SWPBIS can be characterized as a school-wide approach to support student behavior by creating safe learning environments (Greenwood et al. 2008; Sugai and Horner 2009). It has been successfully implemented over the past 20 years in many schools throughout North America. Horner et al. (2009) described SWPBIS as a school-wide value-based approach for promoting prosocial behavior by providing a framework for implementing evidence-based interventions that contribute to a safe, positive, and predictable school climate. SWPBIS supports schools in (a) creating multi-tiered systems that establish a positive social culture, (b) implementing a continuum of evidence-based interventions and practices to support student behavior and promote a safe learning environment, and (c) using data to monitor and adjust implementation (Sugai & Horner, 2009). When SWPBIS is implemented with fidelity, students, educators, and schools experience positive outcomes, including increased prosocial skills (Bradshaw et al. 2012), enhanced perceptions of school safety (Horner et al. 2009), reduced problem behavior (Bradshaw et al. 2012; Waasdorp et al. 2012), improved school climate (Bradshaw et al. 2008; Bradshaw et al. 2009; Horner et al. 2010), and increased teacher self-efficacy (e.g. Kelm and McIntosh 2012) and well-being (e.g. Ross et al. 2012).

The SWPBIS framework allows school leaders, teachers, and educators to establish a school-wide positive social culture in which academic outcomes are maximised and positive behaviours are proactively promoted (Sailor et al. 2008). There is abundant research on the effects of SWPBIS providing evidence on the effectiveness of PBIS in improving learning engagement and outcomes and reducing challenging behaviours across different grade levels (Freeman et al. 2016). The evidence for the effectiveness of PBIS in diverse settings and contexts across the USA is sound and growing (Benedict et al. 2007). From the midst of the 2000s onwards, research across the European continent on the effects of SWPBIS has been building and is mainly dependant on initiatives of national youth organizations, academic universities and universities of applied sciences, and national and European funding of collaborative university and school partnerships (Goei and DePry in press). Moreover, a network of European schools applying SWPBIS representing amongst others Finland, Turkey, Portugal, Hungary, and the Netherlands conducted research on the implementation of SWPBIS at their schools (Goei et al. in press), exploring the cultural challenges in adopting and adapting the U.S framework to the local cultural context of schools and national policies (Goei and Depry in press; Nelen et al. 2020; Wienen et al. 2019; Narhi et al. 2015).

AR technology may provide students with an attractive and functional learning environment where knowledge and skills can be practised with increased motivation (Tosto et al. 2020; Ozdemir et al. 2018). Some studies have identified that AR technology can be used to promote exploratory behaviour and develop a positive attitude within the teaching and learning of science (Alalwan et al. 2020). While research has recently begun to study the effect of AR solutions in promoting consumer's behaviour (Cehovin and Ruban 2017) and prosocial behaviour (Alrowaily and Kavakli 2017), no studies has yet addressed the potential role of AR technology in enhancing effectiveness of interventions provided within the broad framework of SWPBIS.

Within the ARETE H2020 project, a specific pilot will evaluate the introduction of AR solutions within the SWPBIS approach. It is expected to strengthen the already proven effectiveness of SWPBIS implementation in preventing and reducing challenging behaviour and promoting academic engagement. ARETE PBIS Pilot study aims to develop and evaluate multi-user interaction through augmenting the human interaction with different groups. Within SWPBIS systems are created for addressing behavioural challenges based on shared values (e.g., school-wide establishment of school values and a PBIS leadership team). PBIS provides schools with accurate systematic implementation and use of evidence-based practices related to behaviour management in a multi-tiered system of behaviour support. Usually when an initial school-wide PBIS system is implemented within a school, the team of teachers teach the values and behavioural expectations and acknowledge the expected behaviour. This means establishing clear expectations, the use of positive reinforcement, and systematically teaching the behaviour.

The implementation objectives within this work include:

- Capturing and defining requirements for the development of AR for a PBIS system of teaching values and expectations.
- Working with leadership PBIS teams in order to develop pedagogical methods.
- Setting up and implementing all PBIS pilot-specific components.
- Conducting the pilots on a phase introduction basis to ensure the effective operationalization and management.
- Capturing and analysing the AR PBIS pilots' performance (i.e. via user [teachers and students] quantitative and qualitative feedback).

The following sections of this paper are structured as follows: Section 2 describes the PBIS framework and the behavioural expectations and routines to be simulated within the AR ARETE framework. Section 3 is about defining the assessment strategy within the PBIS pilot. Section 4 concludes with next steps for the implementation of the pilot study within school environments.

PBIS FRAMEWORK AND BEHAVIOURAL ROUTINE

SWPBIS is a schoolwide, value-, evidence- and research-based framework to prevent behavioral and discipline problems, such as violent and disruptive classroom behavior, as much as possible in order to create a safe and positive school climate and to promote students' achievement (Horner et al. 2009; Sugai et al. 2000). SWPBIS is based on a public health prevention model. Interventions used at SWPBIS-schools are based on behavior research and translated into practical interventions. Sugai et al. (2000) proposed that social-behavior interventions be integrated into a three-tiered system of behavior support (Walker et al. 1996; Greenwood et al. 2008). The first tier includes primary interventions that are provided to the entire school population. The second tier focuses on individuals or groups of students with common needs, and the third tier provides individualized treatments.

SWPBIS practices include establishing and explicitly teaching school-wide behavioral expectations based on values, systematically acknowledging desired student behavior, effectively and equitably responding to challenging student behavior, and using behavioral data to identify students who require additional support and enhance implementation (Nelen et al. 2020).
ARETE explores for the first time the introduction of AR in a series of behavioural lessons within the SWPBIS framework and how AR impacts students' behavioral management and self-management skills. A set of research methodological and technological assumptions have been identified in order to guide the researcher in the designing and development of an AR-PBIS solution.

- AR technology is robust enough to create an augmented reality space where to live a behavioural learning experiences interacting with AR object;
- An AR behavioural learning experience should create environments to increase the likelihood students learn and behave;
- Designing of behavioural learning scenario leveraging on the valuable learning occurs during the interaction of AR content as well as in using the AR application itself. Introducing of new form of multi-user interaction with the AR object within a specific school setting (classroom, hallway entrance) where the behaviour is expected;
- AR makes it possible to enrich the real setting with objects and characters motivating the learner to interact and learn with them, transforming the real scenario in a training ground for learning positive behavioural routines;
- Visuals is one of the strong points of AR and also is one the most accessible behavioural management strategies to apply within the PBIS-framework[1] and the augmented reality can be used as visual trigger to reinforce learning
- Marker-based and markerless activation allows children to augment the physical environment as a classroom with 3D AR contents and interact there and learn;
- Video Modelling (VM) is an effective evidence-based teaching practice in SWPBIS for teaching pro-social skills for all students; it entails showing the participant a video segment that demonstrates how to perform a task or behaviour. The participant is expected to learn by observing the instructional video segment and repeating the modelled behaviour; AR can be introduced to support this teaching practice and facilitate the learning or practicing of a behavioural routine;
- 3D augmented reality characters can be used for showing the performance of simple positive behavioral routines to the children are claimed to be particularly attractive and motivating to young students.

3D AR characters affect the behaviour of children and can be used as leverage for strengthening the learning process.
The following diagram introduces the Augmented Reality PBIS (AR-PBIS) model for designing an AR PBIS software solution.

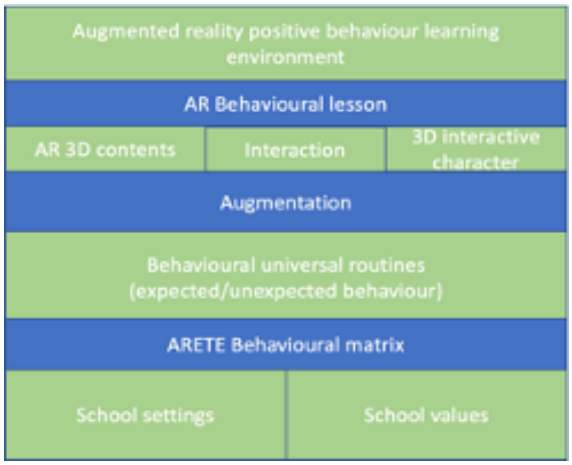

Fig. 1 The AR-PBIS model

The green colouring of the model represents an input/output element for the designing process represented in blue. The first process at the bottom of the diagram is the development of the ARETE behavioural expectations matrix which leads to a set of behavioural routines based on a set of 3 to 4 school values and settings.
The development of the *ARETE behavioural expectation matrix* was based on a purposeful literature review of the research literature of SWPBS, ideas of PBIS-experts, and a range of expectation matrices developed by schools captured by a search of the internet. The literature review identified the values most chosen by SWPBIS-schools, e.g., Respect, Responsibility, and Safety, and the behavioural expectations that go with these values, such as 'Use your speaking voice' or 'Keep hands and feet to yourselves'. The values and expectations were listed in a so-called Behavioural Expectation Matrix for ARETE. The behavioural expectation matrix for ARETE has identified the more common set of behavioural expectations and school settings where the behaviour is expected. Next the behavioural expectation matrix was further simplified in order to define a first set of behavioural routines useful to the next step of the augmentation development process.
Behavioural routines are defined by a set of actions performed by people and according to a goal and situations (Hodgson 1997; Taylor 1950). They can be acquired, learned, and developed through repeated practice (Martin 2008; Ronis et al. 1989). In a designing perspective the behavioural routine describes the steps the subject has to undertake in order to act out the expected behaviour in a specific school setting (playground, hallway, classroom). The behavioural routine includes all elements (characters, furnitures) useful for applying the next *augmentation* designing process aimed to produce a 3D character that shows to the learner how to perform expected behaviour interacting with the different AR objects and other characters on the augmented real scenario. The scenario composed by different behavioural routines will be used for the last development stage aimed to create the behavioural lessons on the base of augmented behavioural learning scenario and the behavioural routines. At this stage a small team of primary school teachers develop behavioural lessons to teach the behavioural routine and the augmented reality resources for creating a new augmented reality positive behaviour learning environment that may further facilitate students' acquisition of behavioural management skills as

promoted within the PBIS approach. The AR may provide students with an engaging learning environment where the behavioural routines can be practised with increased motivation. Moreover, visuals provided by AR can represent effective environmental cues for learning and reinforcing of positive and expected behaviours.

ASSESSMENT STRATEGY

As stated above, the ARETE PBIS pilot study seeks to investigate the effectiveness of integrating AR into the traditional PBIS educational framework. More specifically, the main aim of the ARETE PBIS pilot study is to evaluate whether PBIS enhanced with AR is more effective than traditional PBIS in promoting students' positive behavior and self-management skills. We are particularly interested to explore how AR can be effectively used within the PBIS framework to create new mobile interactive learning environments that may further support students in: (1) developing positive behaviours based on shared school-wide values, such as respect, safety, and responsibility; and (2) acquiring a set of self-management and self-regulation skills and attitudes. Moreover, we are keen to know how the end users (i.e., students and teachers) appreciate using the AR technical solution.

A pre-test/post-test between group design (Kazdin 2003) will be used to assess the effectiveness of PBIS enhanced with AR over and above the effectiveness of traditional PBIS. A sample of fifth- and sixth-grade primary school students (i.e., age range 10 to 12 years) will be recruited in the Netherlands and Italy. The sample will be equally divided over the experimental conditions (i.e., traditional PBIS and PBIS enhanced with AR). Data will be collected to assess students' behavioural, emotional, and cognitive characteristics, including their self-management and self-regulatory skills. Moreover, data will be collected to gauge students' behavioural problems within the classroom setting. These data will be collected pre- and post-intervention from participating students, their parents, and their teachers. The pre- and post-intervention data will be compared between experimental conditions to investigate the additional pedagogical value of the developed PBIS enhanced with AR solution.

Specifically, participating students will complete a set of questionnaires evaluating their behavioral, social, cognitive, and emotional characteristics, such as their ability to self-regulate their behaviour and emotions, their prosocial skills, and their perceived self-worth. Other questionnaires will be administered to evaluate how students perceive their school and classroom in terms of perceived school safety and their teachers' role in maintaining a positive and safe school and classroom climate. Students in the PBIS enhanced with AR classrooms will also be asked to rate their user experiences with the AR application. Students' parents and their teachers will be asked to complete similar questionnaires. Finally, teachers will also answer questions and/or make observations regarding their teaching practice, perception of school climate, and the fidelity of the implementation of the PBIS intervention and PBIS in their school in general.

CONCLUSIONS AND FUTURE STEPS

Current research within the educational pervasive processes that utilise AR, focus on the improvements in academic achievement, knowledge retention, motivation and level of technological acceptance related to the teaching and learning processes. Some AR applications that have recently emerged indicate to have positive effects on social interaction (Savela et al. 2020). Within this research paper the integration of AR within the framework of SWPBIS is investigated for promoting students' behavioral and cognitive growth. The future steps, as indicated from the review of the PBIS process includes the requirements' definition for the AR Framework, the identification of the pedagogical methods and the pilot specific components that will adhere the ETSI ISF ARF standards (ETSI 2020). The pilots will start during the 2021/22 academic year and the performance will be analysed and reported based on quantitative and qualitative feedback on a pre- and post-assessment method analysis. The primary goal of this study is to explore the impact of adopting AR technology in the PBIS process.

Our findings will provide several directions for future research in the area of applied AR in teaching behavioural learning, as it could unfold areas from a different perspective. Within this pilot study the AR component is not just a medium of presenting learning objects, but a toolkit to enhance a behavioural teaching and learning practice.

ACKNOWLEDGEMENT

The following paper has been supported by European Union's Horizon 2020 research and innovation programme, ARETE project under grant agreement No 856533.

REFERENCES

Alalwan, N; L. Cheng; H. Al-Samarraie; R. Yousef; A.I. Alzahrani; and S.M. Sarsam. "Challenges and Prospects of VR and AR Utilization among Primary School Teachers: A Developing Country Perspective." *Studies In Educational Evaluation* 66 (sep).

Alrowaily, M.A. and M. Kavakli. 2017. "The use of augmented reality for encouraging pro-environmental behaviors: The case of Australia." In *Proceedings of the 9th International Conference on Computer and Automation Engineering* (Sydney, Australia, Feb. 18-21). Association for Computing Machinery, New York, N.Y., 21-25.

Arrigo, M., F. Cappello; F. Di Paola; M. Farella; G. Lo Bosco; D. Saguto; and F. Sannasardo. 2018. "HeARt Mobile Learning." In *Proceedings of the 10th International Conference on Education and New Learning Technologie*s (Palma de Mallorca, Spain, Jul 2-4). IATED Academy, Valencia, Spain, 10899-10905.

Benedict, E.A.; R.H. Horner; and J.K. Squires. 2007. "Assessment and Implementation of Positive Behavior Support in Preschools." *Topics in Early Childhood Special Education* 27, No.3 (Jul), 174-192.

Bradshaw, C.P.; C.W. Koth; K.B Bevans; N. Lalongo; and P.J. Leaf. 2008. "The Impact of School-Wide Positive Behavioral Interventions and Supports (PBIS) on the Organizational Health of Elementary Schools." *School Psychology Quarterly* 23, No.4, 462-473.

Bradshaw, C.P.; C.W. Koth; L.A. Thornton, L. A.; P.J. Leaf. 2009. "Altering school climate through School-Wide Positive Behavioral Interventions and Supports: findings from a group-randomized effectiveness trial." *Prevention Science* 10, No.2 (Jun), 100-115.

Bradshaw, C.P.; T.E. Waasdorp; and P.J. Leaf. 2012. “Effects of School-Wide Positive Behavioral Interventions and Supports on Child Behavior Problems.” *Pediatrics* 130, No.5, e1136-e1145.
Brunsting, N. C.; M.A. Sreckovic; and K.L. Lane. 2014. “Special Education Teacher Burnout: A Synthesis of Research from 1979 to 2013.” *Education and Treatment of Children* 37, No.4 (Nov), 681-711.
Cehovin, F.; and B. Ruban. 2017. *The Impact of Augmented Reality Applications on Consumer Search and Evaluation Behavior* CBS Copenhagen business school, Denmark.
Chiazzese, G.; E. Mangina; A. Chifari; G. Merlo; R. Treacy; and C. Tosto. 2018. “The AHA Project: An Evidence-Based Augmented Reality Intervention for the Improvement of Reading and Spelling Skills in Children with ADHD.” In *Proceedings of the 7th International Conference on Games and Learning Alliance* (Palermo, Italy, Dec, 5-7). Springer, Cham, 436-439.
Chitiyo, M.; P. Makweche-Chitiyo; M. Park; L.K.Ametepee; and J. Chitiyo. 2011. “Examining the Effect of Positive Behaviour Support on Academic Achievement of Students with Disabilities.” *Journal of Research in Special Educational Needs* 11, No.3 (Nov), 171-177.
Dishion, T. J. and J.M. Tipsord. 2011. “Peer Contagion in Child and Adolescent Social and Emotional Development.” *Annual Review of Psychology* 62, (Jan), 189-214.
Emerson, E.; J. Blacher; S. Einfeld; C. Hatton; J. Robertson; and R.J. Stancliffe. 2014. “Environmental Risk Factors Associated with the Persistence of Conduct Difficulties in Children with Intellectual Disabilities and Autistic Spectrum Disorders.” *Research in Developmental Disabilities* 35, No.12 (Dec), 3508-3517.
ETSI. 2020. “ETSI GS ARF 003 V1.1.1”, Specification Group, Augmented Reality Framework (ARF) ETSI Industry Specification Group (ISG), available at: https://www.etsi.org/deliver/etsi_gs/ARF/001_099/003/01.01.01_60/gs_ARF003v010101p.pdf.
Freeman, J.; B. Simonsen; D.B. McCoach; G. Sugai; A. Lombardi; and R. Horner. 2016. “Relationship between School-Wide Positive Behavior Interventions and Supports and Academic, Attendance, and Behavior Outcomes in High Schools.” *Journal of Positive Behavior Interventions* 18, No.1 (Jan), 41-51
Goei, S.L. and R. DePry. (in press). *School-wide Positive Behaviour Support in Europe*. London: Routledge.
Goei, S.L.; M. Van Oudheusden; T. Bosma; R. Blok; and B. Klein. (in press). “Positive Behaviour Support Europe: PBS Europe.” In *School-wide Positive Behaviour Support in Europe*, S.L. Goei and R. DePry (Eds.). London: Routledge, xx-xx.
Greenwood, C.R.; T.R. Kratochwill; and M. Clements. 2008. *Schoolwide Prevention Models. Lessons Learned in Elementary Schools*. The Guilford Press, New York, N.Y.
Hodgson, G.M. 1997. “The ubiquity of habits and rules.” *Cambridge Journal of Economics* 21, No.6 (Nov), 663-684.
Horner, R.H.; G. Sugai; and C.M. Anderson. 2010. “Examining the Evidence Base for School-Wide Positive Behavior Support.” *Focus on Exceptional Children* 42, No.8 (Apr), 1-14.
Horner, R.H.; G. Sugai, G; K. Smolkowski; L. Eber; J. Nakasato; A.W. Todd; and J. Esperanza. 2009. “A Randomized, Wait-List Controlled Effectiveness Trial Assessing School-Wide Positive Behavior Support in Elementary Schools.” *Journal of Positive Behavior Interventions* 11, No.3 (Jul), 133–144.
Kazdin, A. 2003. *Research Design in Clinical Psychology*. Allyn & Bacon, Needham Heights, M.A.
Kelm, J.L. and K. McIntosh. 2012. “Effects of School-Wide Positive Behavior Support on Teacher Self-Efficacy.” *Psychology in the Schools* 49, No.2 (Feb), 137-147.
Martin N. 2008. *Habit: the 95% of Behavior Marketers Ignore*. Financial Times, Prentice Hall N.J.
McEvoy, A. and R. Welker. 2000. “Antisocial Behavior, Academic Failure, and School Climate: A Critical Review.” *Journal of Emotional and Behavioral Disorders* 8, No.3 (Jul), 130-140.
Närhi, V.; T. Kiiski; S. Peitso; and H. Savolainen. 2015. “Reducing Disruptive Behaviours and Improving Learning Climates with Class-wide Positive Behaviour Support in Middle Schools.” *European Journal of Special Needs Education* 30, No.2 (Apr), 274-285.
Nelen, M.J.; A. Blonk; R.H. Scholte; and E. Denessen. 2020. “School-Wide Positive Behavior Interventions and Supports: Fidelity of Tier 1 Implementation in 117 Dutch Schools.” *Journal of Positive Behavior Interventions* 22, No.3 (Jul), 156-166.
Ögülmüs, K. and S. Vuran. 2016. “Schoolwide Positive Behavioral Interventions and Support Practices: Review of Studies in the "Journal of Positive Behavior Interventions".” *Educational Sciences: Theory and Practice* 16, No.5 (Oct), 1693-1710.
Ozdemir, M.; C. Sahin; S. Arcagok; and M.K. Demir. 2018. “The Effect of Augmented Reality Applications in the Learning Process: A Meta-Analysis Study.” *Eurasian Journal of Educational Research* 18, No.74, 165-186.
Ronis D.L.; J.F. Yates; and J.P. Kirscht. 1989. “Attitudes, Decisions, and Habits as Determinants of Repeated Behavior.” In *Attitude Structure and Function*, A.R. Pratkanis; S.J. Breckler; and A.G. Greenwald (Eds.). Lawrence Erlbaum, N.J., 213-239.
Ross, S.W.; N. Romer; and R.H. Horner. 2012. “Teacher Well-being and the Implementation of School-wide Positive Behavior Interventions and Supports.” *Journal of Positive Behavior Interventions* 14, No.2 (Apr), 118-128.
Sailor, W.; G. Dunlap; G. Sugai; and R. Horner. (Eds.). 2008. *Handbook of positive behavior support*. Springer Science & Business Media, New York, N.Y.
Savela, N.; A. Oksanen; M. Kaakinen; M. Noreikis; and Y. Xiao. 2020. “Does Augmented Reality Affect Sociability, Entertainment, and Learning? A Field Experiment.” *Applied Sciences*, 10, No.4 (Jan), 1392.
Sugai, G. and R.H. Horner. 2009. “Defining and Describing School-wide Positive Behavior Support”. In *Handbook of Positive Behavior Support*, W. Sailor; G. Dunlap; G. Sugai; and R.H. Horner (Eds.). Springer, Boston, MA, 307-326.
Sugai, G.; J.R. Sprague; R.H. Horner; and H.M. Walker. 2000. “Preventing School Violence: The Use of Office Discipline Referrals to Assess and Monitor School-Wide Discipline Interventions.” *Journal of Emotional and Behavioral Disorders* 8, No.2 (Apr), 94-101.
Taylor, R. 1950. “Purposeful and Non-Purposeful Behavior: A Rejoinder.” *Philosophy of Science* 17, No.4 (Oct), 327-332.
Tosto, C.; T. Hasegawa; E. Mangina; A. Chifari; R. Treacy; G. Merlo; and G. Chiazzese. 2020. “Exploring the effect of an augmented reality literacy programme for reading and spelling difficulties for children diagnosed with ADHD.” *Virtual Reality*, 1-16.
Waasdorp, T.E.; C.P. Bradshaw; and P.J. Leaf. 2012. “The Impact of Schoolwide Positive Behavioral Interventions and Supports on Bullying and Peer Rejection: A Randomized Controlled Effectiveness Trial.” *Archives of Pediatrics & Adolescent Medicine* 166, No.2 (Feb), 149-156.
Walker, R.H.; R.H. Horner; G. Sugai; M. Bullis; J.R. Sprague; D. Bricker; and M.J. Kaufman. 1996. “Integrated Approaches to Preventing Antisocial Behavior Patterns among School-Age Children and Youth.” *Journal of Emotional and Behavioral Disorders* 4, No.4 (Oct), 193–256.
Wienen, A.W.; I. Reijnders; M.H. van Aggelen; E.H. Bos; L. Batstra; and P. de Jonge. 2019. “The Relative Impact of School-Wide Positive Behavior Support on Teachers’ Perceptions of Student behaviour Across Schools, Teachers, and Students.” *Psychology in the Schools* 56, No.2 (Feb), 232-241.