

Version of the chapter approved for publication. The original text is available at <https://doi.org/10.4018/978-1-6684-3398-0.ch002>

Please cite text such as:

APA

Cárdenas, M. M., Alvarez, I. M., Manero, B., & Romero-Hernández, A. (2022). Virtual Reality for Teacher Training: An Experiential Approach to Classroom Conflict Management. In A. Correia, & V. Viegas (Ed.), *Methodologies and Use Cases on Extended Reality for Training and Education* (pp. 21-47). IGI Global. <https://doi.org/10.4018/978-1-6684-3398-0.ch002>

MLA

Cárdenas, Miriela M., et al. "Virtual Reality for Teacher Training: An Experiential Approach to Classroom Conflict Management." *Methodologies and Use Cases on Extended Reality for Training and Education*, edited by Anacleto Correia and Vitor Viegas, IGI Global, 2022, pp. 21-47. <https://doi.org/10.4018/978-1-6684-3398-0.ch002>

Chicago

Cárdenas, Miriela M. and Ibis M. Alvarez, Borja Manero, and Alejandro Romero-Hernández. "Virtual Reality for Teacher Training: An Experiential Approach to Classroom Conflict Management." In *Methodologies and Use Cases on Extended Reality for Training and Education*. edited by Correia, Anacleto, and Vitor Viegas, 21-47. Hershey, PA: IGI Global, 2022. <https://doi.org/10.4018/978-1-6684-3398-0.ch002>

Virtual Reality for Teacher Training: An Experiential Approach to Classroom Conflict Management

Miriela M. Cárdenas¹, Ibis M. Alvarez¹, Borja Manero² & Alejandro Romero-Hernández²

¹Universitat Autònoma de Barcelona, Spain

²University Complutense of Madrid, Spain

ABSTRACT

This chapter discusses the use of virtual reality (VR) in the training of preservice secondary education teachers in Spain as an integral part of their learning process. The authors propose some premises from which to design a training program to improve preservice teachers' communicative competence and their ability to manage conflict impacting the classroom climate. First, it explains the experiential and experimental potential of a virtual learning environment (VLE), its ability to create personalized virtual worlds, as well as the possibility to generate insightful instant feedback and feedforward. Finally, an example of a prototype scenario designed on this conceptual basis is provided. Furthermore, the chapter presents an overview of an educational proposal to implement this experiential immersive opportunity for preservice teachers to interact and manage disruptive situations in a safe and reliable environment conducive to the development of key communicative competences and strategies to turn conflict into a learning opportunity.

BACKGROUND

The Classroom Management

Classroom management can be defined as any of the actions that teachers conduct to use instructional time effectively and maintain students' attention and, through this, create an environment that facilitates both academic and socioemotional development (Doyle, 2006). Thus, classroom climate determines the quality of the learning process, conflicts undermine interpersonal relationships and can lead to disruptive events that could dramatically affect teaching and learning conditions.

Teachers often tend to have difficulty keeping track of everything that is going on in the classroom and, especially, noticing and responding when students cause disruptions. The complexity of the classroom environment is one factor that may contribute to this. Following Doyle (2006), classroom climate management is a complex issue for at least three reasons. First, because it depends on the quality of collaboration between teachers and students. Second, because it involves a wide range of circumstances and events that occur simultaneously, immediately and very often, unpredictably. Finally, classroom management involves the regulation of emotional and attitudinal aspects to face disruptive and/or conflictive events that hinder the development of the teaching activity.

We believe that exploring the affective attitudinal aspects underlying classroom conflict presents opportunities for teachers to learn how to manage it productively, but this is not enough. Successful classroom management also involves cognitive dimensions such as comprehension and interpretation, skills needed to recognize when and how to act in the presence of conflict events in the classroom. In this regard, teachers require training to recognize the affective cues triggering various reactive and ineffective automatic response patterns, and to become initiative-taking in implementing strategies to reduce the impact of said triggers, thereby increasing their sense of efficacy (Alvarez et al., 2022).

Tackling Conflict as a Learning Opportunity

A widely held conception describes conflict as “an expressed struggle between at least two interdependent parties who perceive incompatible goals, scarce resources, and interference by others in the achievement of goals (Hocker & Wilmot, 2014, p.13)”. Giving greater weight to affective-motivational variables, conflict has also been described as a subjective experience: “To recognize that we are in conflict is to acknowledge that we have been triggered emotionally (Jones, 2000, p. 91).”

Conflict, at its core, is about how people perceive each other and the situation. That is, conflict occurs because individuals have different ideas about how things “should be,” reflecting their own values, beliefs, and attitudes (Janke & Dumlao, 2019). Because conflict emerges due to natural and inherent differences among individuals, conflict itself is very normal. Many educational guidance specialists and advisers, to promote change, argue conflict is needed to transform individuals or circumstances for something new to develop. If one approaches conflict as a problem to be solved or an opportunity to persuade, more constructive choices are likely than if one views conflict as something to be feared (Dumlao, 2018).

Considering that conflict is unrelated to the communicative context in which they arise, several studies claim that adopting an emotional perspective, based on empathy, allows teachers to

react more appropriately to disruptive behaviors (Keller & Becker, 2020; Mcgrath & Van Bergen, 2019). In contrast, coping strategies based on domination (repeated verbal reprimands or imposition of sanctions) or avoidance (delaying discussion or intentionally ignoring confrontation) appear less effective for classroom climate management (Chang & Taxer, 2020; Martinez et al., 2020).

Typically, during class interactions, conflict situations occur that require teachers' communicative competence to manage them effectively. The use of expressive, spontaneous, safe, and influential language is preferred over other courses of action (Terroni, 2009). The range of interventions a teacher prepares includes such mild responses as moving closer to the student, making eye contact, or giving a knowing glance, using a corrective consequence, or even ignoring the behavior if it self-corrects (Everston & Poole, 2008).

According to Doyle (2006), the key to a teacher's success in management appears to be his or her (a) understanding of the configuration of events in a classroom, and (b) skill in monitoring and guiding activities considering this information (p.116). Thus, the effectiveness of classroom conflict management cannot be defined solely by stereotypical behavior patterns as traditional teacher education often suggests. Successful classroom management also involves aspects of the affective-attitudinal dimension that allow us to recognize when and how to act to face conflictive events in immediate circumstances.

The process of emotion elicitation and regulation that emerges during the assessment of the conflict situation shapes the quality of teacher-student relationships (Frenzel et al., 2021) and becomes a decisive factor in classroom conflict management. According to Lauermaun and Butler (2021), teachers' emotions convey important social messages with possible implications for students' beliefs, which can impact classroom climate management, in the short and long term.

As Ekman (1985) and Damásio (1999) have reliably demonstrated, the behavioral element of emotion is projected in the forms of expression of subjective emotional experience (facial expressions, vocal characteristics, gestures, and body postures) that we communicate intentionally or involuntarily. Considering this primary condition, during interactions with students, when conflicting events occur, some physiological changes and verbal and nonverbal emotional expressions will occur that will be consciously perceived by teachers and observed by their students. For both, these signals trigger certain modes of action (Keller & Becker, 2020; Sutton, 2004).

On the other hand, given that emotions are considered inseparable from the educational context in which they emerge, paying attention to explanations of significant emotional experiences after they have occurred can help teachers identify and characterize emotionally relevant "courses of action" developed in the classroom for classroom climate management. Therefore, the proposed VR system includes features to recognize and capture attitudinal and emotional aspects of the teacher-student interaction during disruptive situations. This is the most innovative aspect of our proposal, as little research is found to identify underlying emotions during the communicative situation in the classroom. Literature mostly refers to the result of conflict and its poor management in the classroom.

Conflict Management Strategies from the Emotional Perspective

Some studies show that engaging in emotional perspective-taking allows teachers to react appropriately to disruptive behaviours (Barr, 2011; Evertson & Weinstein, 2006). Likewise, teachers who expressed close relationships with disruptive students also described emotional

perspective-taking, empathy, and emotion regulation (Mcgrath & van Bergen, 2019). These characteristics are likely to be particularly helpful when forming relationships with disruptive students by guiding effective classroom management and supporting a positive classroom climate (Jennings & Greenberg, 2009).

The complexity of a Secondary classroom is difficult to simulate in a practice scenario in which the future teacher could experiment, without undergoing the challenges and tensions that may happen. In this sense, it seems interesting to explore whether an immersive VR training could be a useful tool, offering a Virtual Learning Environments (VLE) that simulate everyday classroom situations that, together with the opportunity for experimentation, provide information on which factors intervene (positively or negatively) in classroom conflict management, within a safe environment.

Managing conflicts constructively can help teachers and students build successful short-term and long-term relationships. Considering the above-identified opportunities, a VRLE could be an ideal resource for teachers to learn how to manage classroom conflicts that affect the classroom climate.

In summary, identifying the role emotions play seems necessary to better understand the nature of conflict as well as the need for a more immersive approach to classroom management training. The complexity of emotional processing, including the components of emotional expression through verbal behaviours, the transparency of emotional states that are projected in nonverbal language (facial expressions, vocal qualities, and body posture), and the appraisal of emotional experiences driven by emotional arousal, presages the decisions teachers make to manage classroom conflict.

We understand that providing preservice teachers with access to a VRLE could be a starting point to identify said factors and better prepare them to face a Secondary classroom.

VR Salient Features for Teacher Training

A virtual reality learning environment is presented to users in such a way that they accept it as a real environment, within which they can navigate and interact with objects or other avatars in the same way they would experience real life (Ke et al., 2020).

An important feature of VR is that it allows users to immerse themselves in the event or situation and examine it from different perspectives. From a technological point of view, the term immersion means the “degree to which computer screens are capable of providing an illusion of inclusive, extensive, immersive, and vivid reality (Slater & Wilbur, 1997, p. 3) “. More specifically, this includes the degree of exclusion of physical reality, the range of sensory modalities, the breadth of the surrounding environment, as well as the resolution and accuracy of technological attributes (Mütterlein, 2018, cited by Radianti et al., 2020).

Immersion is considered from a psychological perspective as a psychological state in which the user perceives isolation of the senses from the real world (Witmer and Singer, 1998). Paradoxically, however, immersive VR has been often evaluated in terms of presence, which can be defined as the sense of being there or naturalness (Bianchi-Berthouze, et al. 2007). The core focus of immersive technologies is indeed on capturing the user’s senses in the most complete way (Freina & Ott, 2015), generating a feeling of presence where the mediation of technology disappears. This effect would help immersive VR in allowing users to experience situations and learning outcomes that are challenging to access in real life (Lau & Lee, 2015; Mulders et al., 2020). In this way, immersion and a sense of reality can promote interest and encourage participation and promote experiential, dynamic, self-organized, and self-directed learning that is informally structured, diverse, and vibrant, facilitating specific and

contextualized experiential learning while increasing student motivation and engagement (Sheridan, 2000).

As shown by recent experimental studies (e.g., Chi-Yuan, 2022; Ke et al., 2020), providing an immersive environment can promote student engagement and motivation, make them active learners, and increase creativity, to a greater extent than when using other technologies such as videos.

Video-based intervention are commonly used in teacher training programmes providing an opportunity of post-action reflection (e.g., Fadda & Sullivan, 2013; Kleinknecht & Gröschner, 2016). Although a video-based teaching method is simpler to implement, as no additional equipment or preparation time is needed, and it could offer more content; a VLE-based teaching method offers the same video case studies advantages but within an immersive learning experience allowing participants the capability of agency when facing simultaneous, immediate, and unpredictable events in the classroom, providing immediate feedback on learner's concerns, and making it more attractive to them. Furthermore, it not only increases the comprehensiveness of the immersive simulation, and true engagement but also provides positive effects on learning (Seufert et al. 2022). Effective user feedback allows errors and false assumptions to be corrected as doubts or challenges arise (Chi-Yuan, 2022). For example, one could simulate a situation in which, having driven the teacher to anger, the teacher is taught to practice strategies other than dominance or avoidance. This is especially important for pre-service teachers who are rarely exposed to real or simulated situations before starting to teach a real class (except for in mandatory internships). The study, explained in this chapter, aims to empirically contribute to advocating the use of VR in preservice teacher training.

In addition, the creation of a VLE allows us to incorporate increasingly complex and challenging situations for the teacher that will somehow jeopardize their safety and physical integrity within the program, but not in real life (Dalgarno & Lee, 2010). The functional interactivity or similarity of a simulation is framed by: (1) the extent to which the simulated environment recognizes the existence of the user and reacts to it in an analogous way to the operating environment of the real world does, and (2) the interaction and social presence of multiple users in the simulated environment.

Another aspect to highlight of VLE is its configurability, i.e., which allows the recreation of a multitude of high presence and realistic teaching scenarios and the inclusion of different tools and artifacts within them. This opens a wide range of possibilities, for example, the recreation of educational environments for the training of future teachers (e.g., Chi-Yuan, 2022). Researchers can define and control the characteristics of the environment, such as classroom size, layout, student characteristics, or the number and types of disruptive behaviours. The potential “danger” of the conflicting communicative situation in the classroom, represented in VR, can be brought to its fullest expression, prompting the teacher-in-training to use his or her intuition, put survival skills into practice, and draw on his or her conceptual knowledge, while rehearsing different alternative responses.

Nonetheless, the biggest contribution of VR is that it allows users to embody learning experiences in such a way that it produces intense and real emotional sensations (Stavroulia, et al., 2019). This feature helps teachers feel they are learning within a real environment, from an ecological learning perspective ('knowing how to learn') (Barnett & Jackson, 2019) that enhances and fosters the transfer of knowledge, professional skills, and learner empowerment in self-determining their own lifelong learning pathways (Sangrà et al. 2019).

Since VR allows for the opportunity to be immersed in a VLE that recreates real-life events and situations, we have considered it appropriate as a tool to digitalize and transform the current learning environment of our preservice teachers, allowing us to do things differently and closing

the gap between analog and digital learning to provide a comprehensive educational experience bringing coherence and authenticity to their professional development, in tune with today's digitalized society dimension. The use of virtual simulations is increasingly seen as an opportunity to provide pre-service teachers with unique opportunities to experience examples of classroom life in a controlled and structured manner (McGarr, 2021).

It should be cautioned, however, that VR use is associated with several adverse effects, such as dizziness, headache, and nausea; this is not surprising, as in VR there is often an inconsistency between the information received by the body and the eyes (Roettl and Terlutter, 2018). For example, some VR scenes have inconsistent focal distances among all objects. As a result, continuous accommodation without changing eye vergence is needed; the disruption between eye vergence and accommodation may cause visual inconvenience. There are numerous potential causes of visual discomfort when viewing stereo displays. These include discomfort due to the eyewear needed to separate the two eyes' images, ghosting or crosstalk between the two images, misalignment of the images, inappropriate head orientation, vergence–accommodation conflict, visibility of flicker or motion artifacts, and visual-vestibular conflicts (Kooi & Toet, 2004, cited by Vienne et al., 2014)

Recent VR devices have been developed for full immersion, with more realistic settings to facilitate an enhanced user experience, in addition to the development of innovative modern technology. However, the more complex and realistic settings may cause adverse effects, including dizziness (Watanabe & Ujike, 2008). Therefore, although innovative technologies can counteract these effects (Radianti et al., 2020), it is necessary to evaluate these aspects in usability tests. It is also necessary to warn users of these effects and to be attentive to possible manifestations during experiments to avoid discomfort.

During our pilot experience, few participants presented motion sickness and dizziness. We saw it happened on participants wearing prescription glasses and going immediately back to their mobile devices despite our suggestions in this regard. They also reported they felt these symptoms for at least ten minutes after the experience during the pilot exit interview.

Didascalía Virtual-Classroom

This proposal is part of a larger project in which the system Didascalía Virtual-ClassRoom (hereinafter Didascalía VC), was designed and validated (Alonso et al. 2021; Bocos-Corredor et al. 2020). The project has been funded by the Spanish Ministry of Science, Innovation, and Universities [Didascalía, RTI2018-096401-A-].

As previously mentioned, it is our intention to facilitate an experiential opportunity and provide feedback to preservice conflict modelled in Didascalía VC to enable future teachers to learn to effectively manage disruptive situations in an engaging and safe environment, before facing the challenging reality in the Secondary classroom.

Methodological Design

Based on mixed-method research (Creswell, 2002), the study analyses both quantitative and qualitative data to explain how an immersive VR training could help improve preservice teachers' communicative competence.

The research is contextualized on the module Psycho-pedagogical and Social Training of the master's degree in Teaching in Secondary school at Spanish universities. Intentionally, to guarantee diversity in the research population, former master's students will also be included in our participants' pool, currently enrolled students belonging to different disciplines (Sciences, Languages, and Social Sciences).

As this research is part of a developing educational program, such as the master's degree in Secondary Teacher Education in Spain, the present study adopts the principles of the European framework for Responsible Research and Innovation (RRI), involving stakeholders in its development (Carrier and Gartzlaff, 2020). It is an approach that anticipates and evaluates the potential implications of educational innovations with the purpose of fostering more effective, inclusive, and sustainable designs, implementation, and impact.

As part of the research, a pilot test and iterative validations were teachers on the impact of emotions and communicative skills involved in coping with classroom conducted. 162 preservice teachers took part in the validation of the training proposal described below. Most of them women (109, 67.3%), average age 27.3. Thirty-four percent (55 participants) reported teaching experience between one and five years. In addition, four teachers, implicated in the design and development of the practice in their respective class groups, validated and assessed the tool (Borja et al. 2022). Research participation was voluntary, and an informed consent was signed before interacting with the VR tool.

Our intention was to involve an even number of males and females in the testing sample, special attention to preservice teachers' gender and disciplines was and will be considered in future iterations.

The System Features

Didascalía VC is a reactive immersive virtual reality environment (IVRE) that allows trainee teachers to experience, record, and reflect on affective and attitudinal issues critical for effective conflict management in the Secondary classroom. The system Didascalía VC transports future teachers into a Secondary classroom by providing a context in which a conflict has occurred that requires their intervention (e.g., two students have been fighting for the entire previous week).

During the experience, the system collects different information from the user: where he is looking, his position in the classroom, his tone of voice, and the words he says. Based on these parameters - an aggressive tone of voice with offensive words, in close proximity to a student - the system adjusts the behavior of the virtual students. Each scenario begins with a context screen with background information about the incident. During the experimental situation, trainee teachers ("players") can choose different strategies to manage the simulated conflict (compete, collaborate, accommodate, compromise, and avoid).

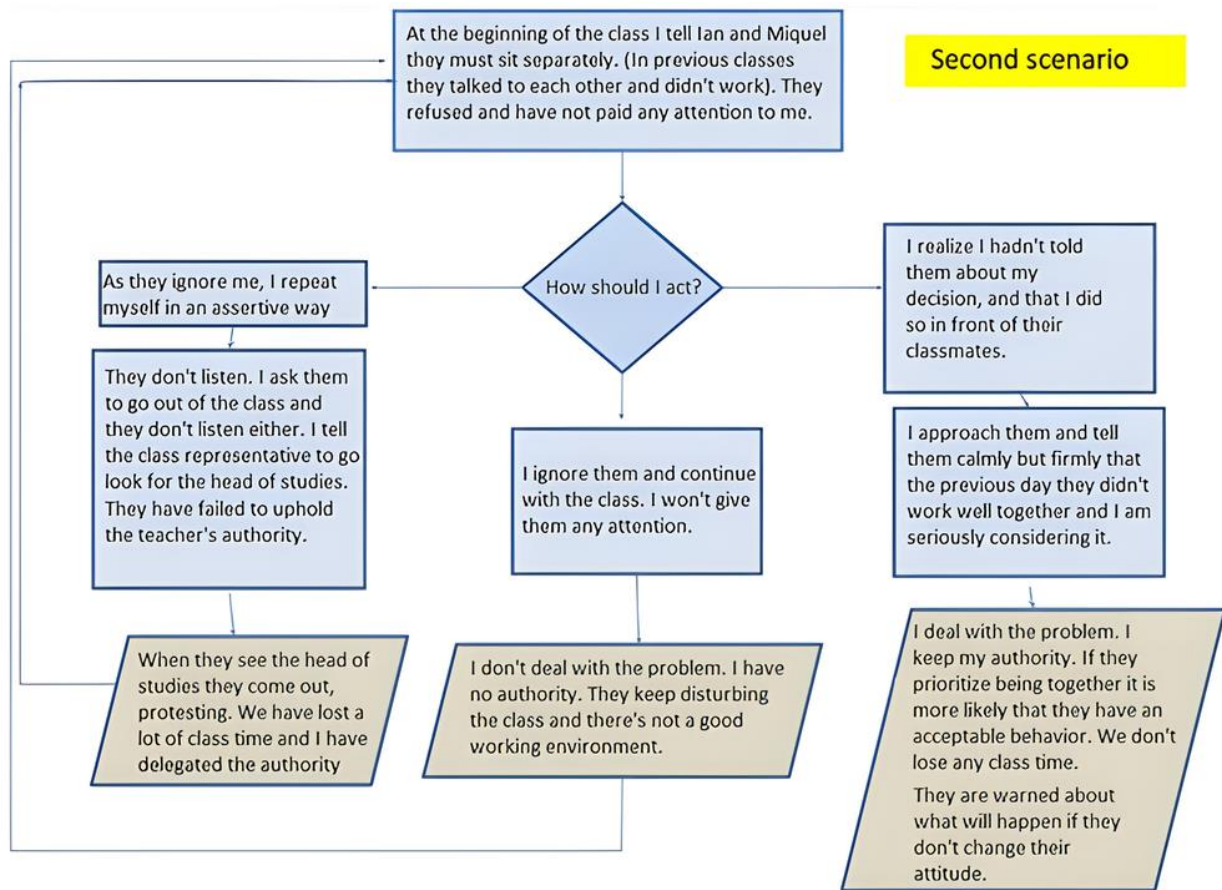
VLE Design

Didascalía VC is programmed to prioritize user immersion in virtual reality. During its creation, we focused on creating an environment that was as close to a high school classroom as possible.

Previously, 1583 critical incident reports were analyzed to design the content of the virtual classroom scenarios; 468 were taken from Secondary schools in Madrid and 1115 in Barcelona (Masó, 2022). These incident reports were extracted from the last two academic years. The results of this study allowed for the creation of three virtual scenarios that simulate disruptive classroom behaviours, potentially escalating into conflicts frequently encountered in Secondary schools. These are (1) Overt academic disinterest (e.g., getting up without permission, not working in class, falling asleep), (2) Disruptions among classmates (e.g., chatting, or distracting classmates, confrontations between classmates in a workgroup), and (3) Disruptions affecting the teacher-student relationship (e.g., talking to the teacher inappropriately, challenging authority, among others). In addition, different actions that teachers usually implement to manage these conflicts, with greater or lesser success were identified.

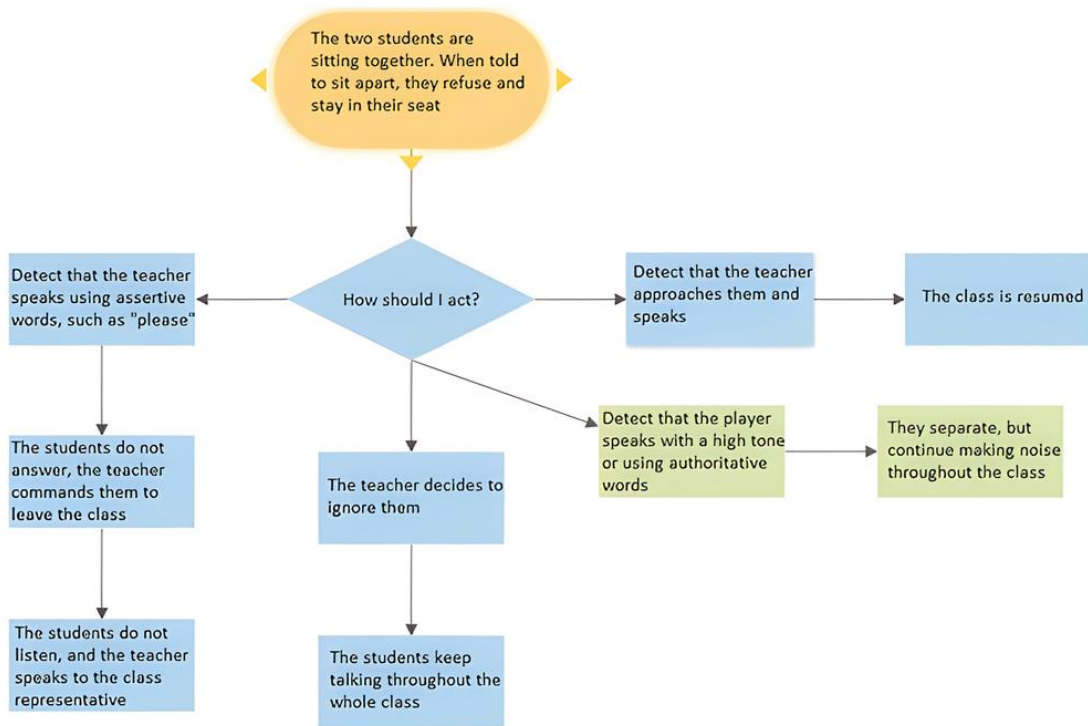
As a result, Didascalía VC recreates three real-life Secondary school classroom scenarios offering teachers context to solve the potentially conflicting situations. Each scenario begins with the description of an initial conflict, in which the teacher had to make a choice. As shown in the algorithm presented in Figure 1, conceived for the second scenario design, every situation is described in the form of a flowchart. Depending on the action taken by the “player” (preservice teacher), the user can follow different paths, each one with positive or negative consequences for the class. Afterward, feedback is provided to the players on their performance.

Figure 1. Scenario proposed by Bocos-Corredor et al. (2020).



To illustrate the procedure followed for the scenario design, we focus on the situation simulated in the second scenario: two students sit together, ignoring their teacher's prior prohibition. The Unity 3D software used to develop the Didascalía VC system includes functionalities that allow monitoring whether the player is within a specific range of the VLE students. Figure 2 showed the adapted pathway considering our software capabilities (the player features that it can detect). Thus, the scheme followed for the technological design of the second scenario was “Detect that the teacher approaches the students” and “uses appropriate words and tone of voice for assertive coping” (most appropriate path).

Figure 2. Scenario adapted by Bocos-Corredor et al. (2020).



It is important to highlight that when designing the setting, a standard Spanish Secondary school classroom was taken as a reference. Its main components are desks, chairs, a blackboard, and a platform for the teacher with a lectern. To achieve this, an asset pack from the Unity Asset Store named “Classroom,” which included all the necessary elements was used. Thirty seats were added to the VLE classroom, the maximum number of students allowed per classroom according to Spanish law as shown in Figure 3 (Ministry of Education, 2010). Another weighty decision for this scenario design was to place the teacher on a platform, higher than the students, a common feature in classrooms allowing the teacher to see and be seen by all the students. Initially, the teacher is facing the students, as the scenarios require him/her to be able to observe their behavior.

Figure 3. Simulated Secondary school classroom.



Figure 4. Students from the preservice teacher's view.



Next, models of students using *Adobe Fuse* were created. This program allowed the creation of 3D objects in a fast and straightforward manner, customizing their aspect and characteristics. Apart from that, each student was given a label with a name to help the player address them. Labels are important for the teachers-students communication; since students can benefit from perceiving instructors know their names (Cant et al., 2022).

Despite having thirty seats, only a total of eight students are present in the VLE classroom. We considered this number of students to be high enough to successfully achieve the learning purpose in each scenario, but low enough not to be overwhelming for the teacher. Four students are boys, and four are girls, since according to the Spanish Ministry of Education, 51% of all Secondary school students are male, and 49% are female (Ministry of Education, 2020). All of them were Caucasian, the most common ethnicity present in most European schools (see figure 4). After creating the students, Adobe Mixamo was used for animation. In this manner, we were able to represent common students' disruptive behaviors in the classroom accurately, such as their sitting, cheering, laughing, or getting distracted.

Pre-service teachers enter the virtual classroom equipped with virtual glasses (Oculus) and two controllers. The external trainer (the teacher or an advisor) controls the virtual students in the VR classroom through use of a desktop computer. Meanwhile, other students observe, on the computer screen, the actions taken by their partner to manage the virtual classroom (a practical example is shown in figure 5).

Figure 5. A group of student teachers during the VR experience (photo courtesy of participants). On the right, screenshot, the "player's" view.



A detailed explanation of the architecture and features of this system can be found in Bocos-Corredor et al. (2020), which was later adapted by Alonso et al. (2021).

In the adapted version, the device ClassroomVR-MotionCapture (CVR-MC) was introduced. Based on this application, several extensions with new functionalities were developed, as shown below:

- Tone of voice analysis: changes are detected during key moments of the simulation.
- Analysis of proxemia between interlocutors: distance between interlocutors (student and teacher) is analyzed and will determine the simulation response.
- Keyword detection in conflict management: keywords are classified to determine the response to the simulation and relate them to the user's emotions.
- Possibility of choosing the execution platform: CVR-MC allows you to choose your preferred execution platform: a virtual reality environment or a desktop environment (PC).
- Analysis of the user's body expression to establish the predominant emotion: the Perception Neuron and EmoPose system (García-Magariño et al., 2019) captured and analyzed the teacher's body expression to associate it with an emotion.
- Storage of the most relevant parameters of the simulation (e.g., voice tone, proxemia with students...).

A gameplay of the VLE prototype narrated in Spanish, with English captions, can be found <https://youtu.be/3NPiaMzRSvE>.

An Overview of an Educational Proposal to Implement Didascalia VC

The original idea of implementing this training proposal modality arises from a tangible need within the Official Master's Degree in Teacher Training for Secondary Education at the Autonomous University of Barcelona (UAB), for an experiential and experimental training component to develop key communicative competences in preservice teachers; not only to face the classroom for the first time but also to guarantee them a much-needed preparedness to manage classroom conflict and succeed in maintaining a suitable classroom climate.

Furthermore, the pilot training intended to demonstrate the value of technology in teaching communication' comprised of mutual feedback from both students and facilitators (teacher trainer). Early implementation, continued accessibility, enhancing realism, and technological improvements through the ClassroomVR-MotionCapture (CVR-MC) tool, were listed as key areas for program improvement, while increased situational sensitivity and conflict resolution training are recommended to further enhance students' communication skills (Alonso et al. 2021).

Near the training proposal implementation within the master's degree in Secondary Teacher Education an extensive study of the emotional states associated with different conflict management strategies in the classroom was conducted (Alvarez et al. 2022). New technical features were added to the design, such as the possibility of using a suit to capture the user's nonverbal communication while testing the product and learning its functionality (Alonso et al. 2021). This newly added feature will make capturing a set of emotional and attitudinal variables (expressions, gestures, and postures) possible. The inputs received will feed an analysis system in charge of delivering feedback to the players during the VR experience. Among these emotional and attitudinal factors, the following aspects were highlighted:

- Gaze direction (see which object you are looking at)

- Whether the person is speaking or not and the tone of voice used (if intense/overbearing, calm/persuasive).
- Words or phrases (please, thank you, shut up, punished, etc.).
- Body language (positions of hands, feet, head, arms, elbows, torso, etc.).
- Position in relation to objects (whether the preservice teacher is facing the students, or has turned their back to them, or is standing to the side).
- User's balance point (If you have all the weight resting on one of the feet or spread evenly between the two).

Considering that VR systems currently present serious usability problems, such as conceptual disorientation, inability to manipulate objects, and inadequacy of content or presentation, among others, mentioned in the introduction, finally, user testing was performed, following the Technology Acceptance Model (TAM) (Davis, 1989). As noted by Sanders (2010), usability testing should be mandatory before deploying any e-learning content, as it allows developers, trainers, and end-users (in this case, educators) to understand how players interact with the system and identify usability issues.

The main result we have obtained is that Didascalía-VC, as confirmed by users, could be especially useful in teacher training, as it would allow teachers to improve their competence in solving complex situations in the classroom. Participants highlighted the importance of the system's immersive and its realism. Moreover, all participants recognized that the tool is a perfect complement to be introduced in the training of pre-service teachers (Manero et al., in press).

The Training Proposal Step by Step

The training proposal for preservice teachers includes practical considerations in different areas to guarantee a successful pilot test implementation such as methodology, diagnosis of current praxis, curriculum, group size, evaluation strategies, student support, activities calendar, and practicum characteristics within the master's degree to allocate the workshop at a pivotal moment in the preservice teacher's instruction.

The classroom experience (workshop) will last two hours, divided into four stages:

- **Stage 1:** Introduction. In this stage, the structure, objective, and framework supporting the experience will be presented. Time will be given to clarify doubts and address suggestions before signing the informed consent form. Participants will then be asked to complete the self-efficacy classroom management Questionnaire.
- **Stage 2:** Analysis of classroom conflicts. After watching "classroom" videos, participants will be asked to discuss the conflict management process. Subsequently, the experience will be conducted in the VLE (one participant per group, 15 minutes, approximately). The rest of the team members will be able to witness the experience, through the computer screen, while the participant interacts with the VR device.
- **Stage 3:** Focus group discussion. After experiencing the VRLE, each team will comment and reflect on the practice gathered in a focus group format. The team members will receive a script with questions to reflect on key issues to guide the discussion.
- **Stage 4:** Evaluation and closure. In the following class, the results of the self-efficacy questionnaire will be commented on and different strategies for classroom management will be discussed, providing theoretical references.

This practical activity helps preservice teachers build their teaching identity as they acquire knowledge, and professional skills, and develop a self-image awareness in which personal and professional perspectives interact, creating an individual image of who they are as a teacher (Graus et al., 2022).

The opportunity of successive trials with various response options increased the safety benefit of the VLE by building confidence in the participants' ability to respond to the challenges the environment presents. During the experience, as teachers move up a level and resolve conflict situations, we expect to observe the communicative competence consolidation as a skill, to manage various conflict situations arising properly and effectively in the simulated Secondary school classroom.

In turn, since the VLE training provides immediate feedback through the adjustment of all its elements and algorithms, preservice teachers could reflect and review their performance individually or in peer groups. This tweaking tool capability enhances the skill tested promoting the development of new skills and offering more efficient results since teachers' errors and false assumptions can be corrected right when the doubt or challenge arises (Dann, 2019; Winstone et al., 2017).

In all, the implementation of this training provides substantial tangible benefits. First, via the possibility of an immersive experience close to a real-life classroom environment, eliminating the risk and anxiety associated with conflict and classroom management. Second, it fosters discussion, after-action reflection, and collaborative solutions teachers often point to as "challenging cases to manage in the classroom." Finally, it strengthens preservice teachers' ability to identify critical incidents and act from a mindful perspective bringing awareness to topics such as self-efficacy and conflict management styles.

FINAL REFLECTIONS AND PERSPECTIVES

After evaluating not only the benefits, but also other reference programs experiences which satisfactorily implement this technology in the initial and continuous professional teacher development courses, we recommend VR as an effective resource to include within the preservice Secondary education teachers' training curriculum.

The methodology proposed for its implementation requires further trials, in upcoming academic years and in other universities, to continue incorporating the voices of teachers, students, and managers of Spanish universities where the master's degree in Secondary Teacher Education is taught. Likewise, it would be advisable that this VR tool, with the improvements suggested by the participants in the pilot test, could be developed to iterate the training experience as part of a training module that would take into account some knowledge prior to the practice of preservice teachers in training and, subsequently, be linked to the teaching practices in different educational centers offering them a more holistic perspective and in accordance with the learning ecology approach (Sangrà et al., 2019).

In summary, Didascalia VC recreates challenging, formative virtual scenarios, but above all, it reminds users of experiences and situations lived. We see value in the experiential and experimental potential in which VR immerses the teacher and its ability to create challenging and personalized virtual worlds. This way preservice teachers face challenging, motivating, and suggestive situations supported by post-action reflections, immediate feedback, and prospective feedforward aiming to enhance their conflict management communicative competence.

This immersive initial experience merges both praxis and theory otherwise absent in today's Official master's degree. It is a 10-minute experience low in cost and high in value to develop

and self-fed through Preservice Teachers' practicum observations which will keep the VLE current and synchronized with the day-to-day situations.

Additionally, Didascalía VC's capability to capture nonverbal emotional expressions permits to further evaluate preservice teachers' outcomes after their training immersion for the purpose of analyzing how emotions could positively or negatively impact teachers' performance and classroom conflict management. It could also be implemented within the subject of pedagogy to train preservice teachers to successfully implement pedagogical strategies and improve cognitive outcomes in the classroom.

The experiential approach to learning is useful not only to manage conflicting situations in the classroom but also to train both preservice and seasoned teachers to successfully cope with special needs students in the classroom. Thus, this training modality could be a potent tool to prepare them to be more inclusive and employ appropriate strategies.

In view of the diversity of disruptive situations in the classroom, it is deemed necessary to include new situations to continue to present fresh and relevant scenarios to train teachers to achieve professional readiness not only for the first day at work as a preservice teacher but also to assist in-service teachers.

We recommend the use of preservice teachers' practicum observations to feed relevant cases to VLE scenarios and understand the nature of the communicative situation beyond what is reported by in-service teachers in disciplinary reports. We also propose to use Didascalía VC for the training and development of other necessary skills such as the management of students with specific educational needs and cultural diversity, for which there is currently no intentional and specific training that promotes the professional training of in-service teachers.

ACKNOWLEDGMENT

This project has been funded by the Ministry of Science, Innovation and Universities of Spain (Didascalía, RTI2018-096401-A-I00). The researchers would like to thank the teachers and teachers-in-training who voluntarily participated in this study.

REFERENCES

- Alonso, S., López, D., Puente, A., Romero, A., Álvarez, I. M., & Manero, B. (2021). Evaluation of a motion capture and virtual reality classroom for Secondary school teacher training. In *Proceedings of the 29th International Conference on Computers in Education*. Asia-Pacific Society for Computers in Education. <https://icce2021.apsce.net/proceedings/volume1/>
- Alvarez, I. M., González-Parera, M., & Manero, B. (2022). The role of emotions in classroom conflict management. Case studies geared towards improving teacher training. *Frontiers in Psychology*, *13*, 818431. Advance online publication. doi:10.3389/fpsyg.2022.818431 PMID:35369238
- Barnett, R., & Jackson, N. (Eds.). (2019). *Ecologies for learning and practice: Emerging ideas, sightings, and possibilities*. Routledge. doi:10.4324/9781351020268
- Barr, J. J. (2011). The relationship between teachers' empathy and perceptions of school culture. *Educational Studies*, *37*(3), 365–369. doi:10.1080/03055698.2010.506342
- Bianchi-Berthouze, N., Kim, W. W., & Patel, D. (2007). Does body movement engage you more in digital game play? and why? In A. C. R. Paiva, R. Prada, & R. W. Picard (Eds.), *International conference on affective computing and intelligent interaction* (pp. 102–113). Berlin: Springer.

- Bocos-Corredor, M., Diaz-Nieto, A., Lopez-Garcia, A., Romero-Hernandez, A., Alvarez, I. M., & Manero, B. (2020). A VR game to improve communication skills in Secondary -school teachers. In *Proceedings of EDULEARN20.12th International Conference on Education and New Learning Technologies* (pp. 8701–8710). IATED Academy.
- Cant, R., Cooper, S., & Ryan, C. (2022, March 8). Using virtual simulation to teach evidence-based practice in nursing curricula: A rapid review. *Worldviews on Evidence-Based Nursing*. Advance online publication. doi:10.1111/wvn.12572 PMID:35261156
- Carrier, M., & Gartzlaff, M. (2020). Responsible research and innovation: Hopes and fears in the scientific community in Europe. *Journal of Responsible Innovation*, 7(2), 149–169. doi:10.1080/23299460.2019.1692571
- Chang, M.-L., & Taxer, J. (2020). Teacher emotion regulation strategies in response to classroom misbehaviour. *Teachers and Teaching*, 27(5), 353–369. doi:10.1080/13540602.2020.1740198
- Chi-Yuan, Ch. (2022). Immersive virtual reality to train preservice teachers in managing students' challenging behaviours: A pilot study. *British Journal of Educational Technology*, 53(4), 998–1024. Advance online publication. doi:10.1111/bjet.13181
- Clarà, M., Mauri, T., Colombiana, R., & Onrubia, J. (2019). Supporting collaborative reflection in teacher education: A case study. *European Journal of Teacher Education*, 42(2), 175–191. doi:10.1080/02619768.2019.1576626
- Creswell, J. W. (2002). *Educational research: Planning conducting and evaluating quantitative and qualitative research*. Pearson.
- Dalgarno, B., & Lee, M. J. (2010). What are the learning affordances of 3-D virtual environments? *British Journal of Educational Technology*, 41(1), 10–32. doi:10.1111/j.1467-8535.2009.01038.x
- Damásio, A. (1999). *The feeling of what happens: body and emotion in the making of consciousness*. Harcourt Brace & Company.
- Dann, R. (2019). Feedback as a relational concept in the classroom. *Curriculum Journal*, 30(4), 352–374. doi:10.1080/09585176.2019.1636839
- Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *Management Information Systems Quarterly*, 13(3), 319–340. doi:10.2307/249008
- Doyle, W. (2006). Ecological approaches to classroom management. In C. M. Evertson & C. S. Weinstein (Eds.), *Handbook of classroom management: Research, practice, and contemporary issues* (pp. 97-125). Mahwah, NJ: Erlbaum.
- Dumlao, R. (2018). *A guide to collaborative communication for service-learning and community engagement partners*. Stylus Publishing, LLC.
- Ekman, R. (1985). *Telling Lies*. Berkley Books.
- Evertson, C., & Poole, I. (2008). Proactive classroom management. In T. Good (Ed.), *21st century education: A reference handbook* (pp. I-131-I-140). Thousand Oaks, CA: SAGE Publications, Inc. doi:10.4135/9781412964012.n14
- Evertson, M., & Weinstein, C. S. (Eds.). (2006). *Handbook of classroom management: Research, practice, and contemporary issues*. Erlbaum.

- Fadda, P., & Sullivan, P. (2013). Using interactive video to develop preservice teachers' classroom awareness. *Contemporary Issues in Technology & Teacher Education*, 13(2), 156–174.
- Freina, L., & Ott, M. (2015, April). A literature review on immersive virtual reality in education: state of the art and perspectives. In The international scientific conference eLearning and software for education (Vol. 1, No. 133, pp. 10-1007). Academic Press.
- Frenzel, A. C., Daniels, L., & Burić, I. (2021). Teacher emotions in the classroom and their implications for students. *Educationnels Psychologist*, 56(4), 250–264. doi:10.1080/00461520.2021.1985501
- García-Magariño, I., Cerezo, E., Plaza, I., & Chittaro, L. (2019). A mobile application to report and detect 3D body emotional poses. *Expert Systems with Applications*, 122, 207–216. doi:10.1016/j.eswa.2019.01.021
- Graus, M., van de Broek, A., Hennissen, P., & Schils, T. (2022). Disentangling aspects of teacher identity learning from reflective blogs: The development of a category system. *Teaching and Teacher Education*, 111, 103624. Advance online publication. doi:10.1016/j.tate.2021.103624
- Hamit, O., & Yildirim, R. (2020). Teacher perspectives on classroom management. *International Journal of Contemporary Educational Research*, 7(1), 99–113. doi:10.33200/ijcer.645818
- Hocker, J., & Wilmot, W. W. (2014). *Interpersonal conflict* (9th ed.). McGraw-Hill.
- Janke, E., & Dumlaio, R. J. (2019). Developing Communication Repertoires to Address Conflict in Community Engagement Work. *Journal of Higher Education Outreach & Engagement*, 23, 35–56. <https://eric.ed.gov/?id=EJ1212501>
- Jennings, P. A., & Greenberg, M. T. (2009). The prosocial classroom: Teacher social and emotional competence in relation to student and classroom outcomes. *Review of Educational Research*, 79(1), 491–525. doi:10.3102/0034654308325693
- Jones, T. S. (2000). Emotional communication in conflict: Essence and impact. In W. Eadie & P. Nelson (Eds.), *The language of conflict and resolution* (pp. 81–104). Sage. doi:10.4135/9781452205496.n6
- Ke, F., Pachman, M., & Dai, Z. (2020). Investigating educational affordances of virtual reality for simulation-based teaching training with graduate teaching assistants. *Journal of Computing in Higher Education*, 32(3), 607–627. doi:10.1007/12528-020-09249-9
- Keller, M. M., & Becker, E. S. (2020). Teachers' emotions and emotional authenticity: Do they matter to students' emotional responses in the classroom? *Teachers and Teaching*, 27(5), 404–422. doi:10.1080/13540602.2020.1834380
- Kleinknecht, M., & Gröschner, A. (2016). Fostering preservice teachers' noticing with structured video feedback: Results of an online- and video-based intervention study. *Teaching and Teacher Education*, 59, 45–46. doi:10.1016/j.tate.2016.05.020
- Lau, K. W., & Lee, P. Y. (2015). The use of virtual reality for creating unusual environmental stimulation to motivate students to explore creative ideas. *Interactive Learning Environments*, 23(1), 3–18. doi:10.1080/10494820.2012.745426
- Lauermaun, F., & Butler, R. (2021). The elusive links between teachers' teaching-related emotions, motivations, and self-regulation and students' educational outcomes. *Educational Psychologist*, 56(4), 243–249. doi:10.1080/00461520.2021.1991800

- Lee, E. A. L., & Wong, K. W. (2014). Learning with desktop virtual reality: Low spatial ability learners are more positively affected. *Computers & Education*, 79, 49–58. doi:10.1016/j.compedu.2014.07.010
- Manero, B., Alvarez, I. M., Romero, A., & Cárdenas, M. (2022). Adopting an immersive virtual reality system to enhance Pre-service teachers' communicative competence. *Proceedings. IEEE 22nd International Conference on Advanced Learning Technologies ICALT2022*.
- Martínez, M. B., Chacón, J. C., Díaz-Aguado, M. J., Martín, J., & Martínez, R. (2020). Disruptive behavior in compulsory Secondary education classrooms: A multi-informant analysis of the perception of teachers and students. *Pulso.Review of Education*, 43, 15–34. <https://revistas.cardenalcisneros.es/index.php/PULSO/article/view/380>
- Masó, I. (2022). Los conflictos en el aula de secundaria y las competencias comunicativas del profesorado [Conflict in the Secondary school classroom and teachers' communication skills]. In J.A. Marín, J.C. de la Cruz, S. Pozo, & G. Gómez (Eds.), *Investigación e innovación educativa frente a los retos para el desarrollo sostenible* (pp. 1383-1398). Andalucía: Dylinson. sl.
- McGarr, O. (2021). The use of virtual simulations in teacher education to develop pre-service teachers' behaviour and classroom management skills: Implications for reflective practice. *Journal of Education for Teaching*, 47(2), 274–286. doi:10.1080/02607476.2020.1733398
- McGrath, K. F., & Van Bergen, P. (2019). Attributions and emotional competence: Why some teachers experience close relationships with disruptive students (and others don't). *Teachers and Teaching*, 25(3), 334–357. doi:10.1080/13540602.2019.1569511
- Ministry of Education. (2010). *Royal Decree 132/2010, of February 12, 2010, which establishes the minimum requirements for the centers that teach the second cycle of early childhood education, Primary education and Secondary education*. Available at <https://www.boe.es/buscar/pdf/2010/BOE-A-2010-4132-consolidado.pdf>
- Ministry of Education and Vocational Training. (2020). *Facts and figures - School year 19/20*. <https://sede.educacion.gob.es/publiventa/datos-y-cifras-curso-escolar-20192020/ensenanza-estadisticas/23109>
- Mulders, M., Buchner, J., & Kerres, M. (2020). A Framework for the Use of Immersive Virtual Reality in Learning Environments. *International Journal of Emerging Technologies in Learning*, 15(24), 208–224. doi:10.3991/ijet.v15i24.16615
- Radianti, J., Majchrzak, T. A., Fromm, J., & Wohlgenannt, I. (2020). A systematic review of immersive virtual reality applications for higher education: Design elements, lessons learned, and research agenda. *Computers & Education*, 147, 103778. Advance online publication. doi:10.1016/j.compedu.2019.103778
- Roettl, J., & Truter, R. (2018). The same video game in 2D, 3D or virtual reality – How does technology impact game evaluation and brand placements? *PLoS One*, 13(7), e0200724. Advance online publication. doi:10.1371/journal.pone.0200724 PMID:30028839
- Sandars, J. (2010). The importance of usability testing to allow e-learning to reach its potential for medical education. *Education for Primary Care*, 21(1), 6–8. doi:10.1080/14739879.2010.11493869 PMID:20202315
- Sangrá, A., Raffaghelli, J. E., & Guitert-Catasús, M. (2019). Learning ecologies through a lens: Ontological, methodological and applicative issues. A systematic review of the literature. *British Journal of Educational Technology*, 50(4), 1619–1638. doi:10.1111/bjet.12795

- Sarcedo-Gorgoso, M. C., Santos-González, M. C., & Rego-Agraso, L. (2020). Las competencias docentes en la formación del profesorado de educación secundaria. *Profesorado.Revista de Currículum y Formación de Profesorado*, 24(3), 401–421. doi:10.30827/profesorado.v24i3.8260
- Schleicher, A. (2020). *Teaching and Learning International Survey. TALIS 2018. Insights and Interpretations*. OCDE. <https://www.oecd.org/education/talis/>
- Seufert, C., Oberdörfer, S., Roth, A., Grafe, S., Lugin, J. L., & Latoschik, M. E. (2022). Classroom management competency enhancement for student teachers using a fully immersive virtual classroom. *Computers & Education*, 179, 104410. doi:10.1016/j.compedu.2021.104410
- Sheridan, T. B. (2000). Interaction, imagination and immersion some research needs. *Proceedings of the ACM symposium on Virtual reality software and technology*, 1–7. 10.1145/502390.502392
- Slater, M., & Wilbur, S. (1997). A framework for immersive virtual environments (FIVE): Speculations on the role of presence in virtual environments. *Presence (Cambridge, Mass.)*, 6(6), 603–616. doi:10.1162/pres.1997.6.6.603
- Sorensen, P. (2014). Collaboration, dialogue and expansive learning: The use of paired and multiple placements in the school practicum. *Teaching and Teacher Education*, 44, 128–137. doi:10.1016/j.tate.2014.08.010
- Stavroulia, K., Christofi, M., Baka, E., Michael-Grigoriou, D., Magnenat-Thalmann, N., & Lanitis, A. (2019). Assessing the emotional impact of virtual reality-based teacher training. *The International Journal of Information and Learning Technology*, 36(3), 192–217. doi:10.1108/IJILT-11-2018-0127
- Sutton, R. E. (2004). Emotional regulation goals and strategies of teachers. *Social Psychology of Education*, 7(4), 379–398. doi:10.1007/11218-004-4229-y
- Terroni, N. N. (2009). La comunicación y la asertividad del discurso durante las interacciones grupales presenciales y por computadora [Communication and discourse assertiveness during face-to-face and computer-based group interactions]. *Psico-USF*, 14(1), 35–46. doi:10.1590/S1413-82712009000100005
- Vienne, C., Sorin, L., Blondé, L., Huynh-Thu, Q., & Mamassian, P. (2014). Effect of the accommodation-vergence conflict on vergence eye movements. *Vision Research*, 100, 124–133. doi:10.1016/j.visres.2014.04.017 PMID:24835799
- Watanabe, H., & Ujike, H. (2008). The activity of ISO/study group on “image safety” and three biological effect. *Proceedings of the 2nd International Symposium on Universal Communication, ISUC 2008*, 210–214. 10.1109/ISUC.2008.11
- Winstone, N. E., Nash, R. A., Parker, M. P., & Rowntree, J. (2017). Supporting learners’ agentic engagement with feedback: A systematic review and a taxonomy of recipience processes. *Educational Psychologist*, 52(1), 17–37. doi:10.1080/00461520.2016.1207538

ADDITIONAL READING

- Chen, C.-Y. (2022, July). Immersive virtual reality to train preservice teachers in managing students’ challenging behaviours: A pilot study. *British Journal of Educational Technology*, 53(4), 998–1024. Advance online publication. doi:10.1111/bjet.13181

- Coskun, A., & Cagiltay, K. (2021). Investigation of classroom management skills by using eye-tracking technology. *Education and Information Technologies*, 26(3), 2501–2522. doi:10.1007/10639-020-10368-0
- Gandolfi, E., Kosko, K. W., & Ferdig, R. E. (2021). Situating presence within extended reality for teacher training: Validation of the extended Reality Presence Scale (XRPS) in preservice teacher use of immersive 360 video. *British Journal of Educational Technology*, 52(2), 824–841. doi:10.1111/bjet.13058
- Lee, M., & van Vlack, S. (2018). Teachers' emotional labour, discrete emotions, and classroom management self-efficacy. *Educational Psychology*, 38(5), 669–686. doi:10.1080/01443410.2017.1399199
- Loulou, M. S., Garner, P. W., & Hamada, H. (2021). Teachers' emotional expressiveness and classroom management practices: Associations with young students' social-emotional and behavioral competence. *Psychology in the Schools*. Advance online publication. doi:10.1002/pits.22631
- Luo, Z. (2021). Using eye-tracking technology to identify learning styles: Behaviour patterns and identification accuracy. *Education and Information Technologies*, 26(4), 4457–4485. doi:10.1007/10639-021-10468-5
- Noroozi, P.-D., Pijeira-Díaz, H. J., Sobocinski, M., Dindar, M., Järvelä, S., & Kirschner, P. A. (2020). Multimodal data indicators for capturing cognitive, motivational, and emotional learning processes: A systematic literature review. *Education and Information Technologies*, 25(6), 5499–5547. doi:10.1007/10639-020-10229-w
- Özen, H., & Yıldırım, R. (2020). Teacher perspectives on classroom management. *International Journal of Contemporary Educational Research*, 7(1), 99–113. doi:10.33200/ijcer.645818
- Pekrun. (2021). Teachers need more than knowledge: Why motivation, emotion, and self-regulation are indispensable. *Educational Psychologist*, 56(4), 312–322. doi:10.1080/00461520.2021.1991356
- Ye, X., Liu, P., Lee, X., Zhang, Y., & Chiu, C. (2021). Classroom misbehaviour management: An SVVR-based training system for preservice teachers. *Interactive Learning Environments*, 29(1), 112–129. doi:10.1080/10494820.2019.1579235

KEY TERMS AND DEFINITIONS

Academic Emotions: A set of emotions that are experienced by students and teachers in learning or teaching situations.

Attitude: A mental and neural state of readiness, organized through experience, exerting a directive or dynamic influence upon the individual's response to all objects and situations with which it is related.

Classroom Management: Actions teachers take to use instructional time effectively to maintain students' attention and, through this, create an environment that facilitates both academic and social-emotional development.

Conflict: A particular type of communication as an expressed contradiction that blocks communicative processes.

Emotional Activation: Tendency towards action experienced when facing conflicts could be caused by an incongruence with expectations or by the occurrence of an unforeseen event.

Learning Ecology: The learner self-directs her activity, cultivating relationships and using, producing, and sharing resources, interacting in an organised way with their context - their social, physical, and virtual environment to achieve a specific learning goal.

Virtual Learning Environment (VLE): An environment rich in meanings where subjects and technological objects interact, enhancing knowledge construction. VLE includes a variety of tools, documents, and artifacts that enable learning.