

## **2 Project-Based Language Learning, Virtual Exchange and 3D Virtual Environments: A Critical Review of the Research**

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### **1 Introduction**

This literature review aims to provide a critical evaluation of existing studies on project-based learning (PBL), virtual exchange learning and learning in 3D Virtual environments. The following sections look first at language learning and teaching in the 21st century, providing background information on the changing role of teachers and students arising from the role of technology both in their academic and personal lives. In the following sections, different types of learning which recognize a student-centered approach while addressing 21st century competencies are outlined and analyzed, starting with PBL, moving then to virtual exchange learning and finally learning in 3D virtual environments. The final section focuses on the relationship between these types of learning approaches, presenting current trends and some of the initiatives that aim to combine them.

### **2 Background and Description of the Research**

The 21st century has been labelled in different ways by researchers operating in different fields, including the Creative Age (Florida, 2004), the Digital Age (Thomas & Brown, 2011) and the Conceptual Age (Pink, 2005). These terms reflect a shared acknowledgement that the third millennium has distinctive features that differentiate it from previous ages, being a time where the “*digital revolution* – embodied in personal, mobile, and networked technologies – has replaced manual and routine mental labour with ideas, innovation, and personalized services” (Pei-Lin Tan et al., 2017, p. 425). In work, personal and academic spheres, people are now required to acquire and foster specific skills and competencies that allow them to engage

proactively and productively with the digital environment they operate in - be they involved with political, social, economic and/or cultural activity. Creativity, critical thinking, collaboration, communication, ICT literacy, critical and agentic digital literacy, productivity, social and cultural skills, problem-solving skills, flexibility and adaptability are just some of the 21st century competencies required to participate actively in local, global and virtual societies (Murray, Giralt & Benini, 2020). In this context lie the roots of different types of learning practices that we are now going to introduce: project-based learning, virtual exchange learning and 3D virtual learning.

Project-based learning is a model of practice that organizes learning activities around projects. According to Jones, Rasmussen and Moffitt (1997), projects can be described as a series of tasks based on challenging questions that involve students in design, problem-solving, decision-making or investigative activities which give them the opportunity to work relatively autonomously over extended periods of time while producing - sometimes collaboratively - realistic products (see also, Thomas, 2000). As Markham points out (2003), project-based learning emerges from two important developments over the past 25 years. On the one hand, there has been a revolution in learning theory. Research in neuroscience and psychology (Goswami, 2004; Ochsner & Gross, 2008; Meltzer, 2018) has extended cognitive and behavioral models of learning to show that knowledge, thinking, doing, and the contexts for learning are inextricably linked together. Moreover, it has been shown that learning is partly a social activity that takes place within the context of culture, community and past experiences.

On the other hand, education urges us to respond to the needs of the 21st century. As Markham et al. (2003, pp. 3-4) indicate, modern workplaces now demand “high-performance employees who can plan, collaborate, and communicate” as well as young people who can “learn civic responsibility and master their new roles as global citizens”. In this scenario, technology occupies a crucial role, offering several possibilities among which is the chance to

learn from and with experts from all around the world and have easier access to different and valuable resources. As Kineshanko and Jugdev (2018) have pointed out, technology integration in educational practices has been widely discussed in social constructivist and connectivist theories where the discussion has focused on how pedagogy can be incorporated ‘mindfully’ and effectively into blended learning or digital education contexts (see also, Kop & Hill, 2008; Siemens, 2005). The need for education to adapt to a changing world is at the core of PBL in that it aims to create new instructional practices that reflect the environment in which students and educators now live, learn and teach.

Above all, PBL means learning through experience. In PBL learning, students work in groups to solve challenging problems that are authentic, curriculum-based and often interdisciplinary. Because students are engaged in hands-on, authentic experiences they are given opportunities to learn content in more in-depth ways, while taking responsibility for their learning, building confidence, working collaboratively, communicating ideas and being creative innovators (Buck Institute of Education, 2010). Thus, PBL provides an effective way to address key 21st century competencies.

When designing a solid PBL curriculum, research shows that eight essential criteria should be met: 1) the availability of significant content, 2) a need to know, 3) a driving question, 4) an emphasis on student voice and choice, 5) 21st century skills, 6) inquiry and innovation, 7) feedback and revision, and 8) opportunities to publicly present the product created (Ravitz, Mergendoller et al., 2012). Although not necessary for PBL, the role of digital technologies is becoming increasingly recognized. As will be discussed in more depth in sections 5, 5.1 and 5.2, Solomon (2003) suggests that students can use and integrate digital tools (such as Web 2.0 tools, spreadsheets, word processing and databases) into learning practices, while engaging with specific tasks, whereas teachers, on the other hand, may employ

technology to monitor, assess and evaluate students' work in a more creative and proactive fashion.

Virtual exchange or telecollaboration is the second type of pedagogical practice analyzed here. According to Helm (2015), it can be defined as a systematic process of communicating and working with people from different locations through online or virtual means for the development of language and/or intercultural competence.

O'Dowd (2007) also refers to virtual exchange as a form of Online Intercultural Exchange (OIE) and Internet-mediated Intercultural Foreign Language Education (ICFLE). For Helm (2015, p. 187), telecollaborative learning offers the opportunity to learners to engage in a productive dialogue with peers located in different parts of the world while also offering the opportunity for universities "to support their internationalization strategies by 'globalizing their curriculum' ". In the education context, virtual exchange can be considered, as Makaramani (2015) suggests, a form of problem-based learning framed within a real context where telecommunication tools such as emails, chat, wikis, forums or other types of web communication are used. Technology is the mediational tool in the virtual exchange; it is therefore central to telecollaborative pedagogy and has an impact on interaction, as Kern (2014) argues, as participants engage with the technical as well as the social layer of interaction. In terms of terminology, it is important to specify that while the term *telecollaboration* is sometimes questioned, the term *virtual exchange* appears to be used increasingly in a wide range of contexts including the governmental and intergovernmental bodies such as the Bureau of Educational and the European Commission (O'Dowd, 2018).

The third type of pedagogical practice uses 3D virtual learning environments. Three-dimensional virtual worlds are platforms that were first developed for the purposes of entertainment and gaming, but are now also being used for educational purposes (Duncan et al. 2012; Schmidt & Wang et al.2012). Such educational environments are called 3D virtual

learning environments (3DVLE) (Zuiker, 2012). Numerous 3D learning environments have been developed using platforms such as Active Worlds, Second Life, Open-Sim, Minecraft, Traveler, Adobe Atmosphere, and There (Hew & Cheung, 2010). In 3DVLEs, students have the possibility of being fully engaged with the learning context; they can be anybody through avatar creation and they can experience different times and places and experience the learning environment in which they are immersed (Seo, 2012). Users can communicate via audio- or text-based tools (Dalgarno & Lee, 2010; Dickey, 2005). 3DVLEs offer the possibility for users to design interactive environments with their preferred content (Omale et al., 2009). They also provide the possibility to view a given problem from different perspectives, presenting activities that may be difficult to practice safely in real life. Users are able to access virtual content simultaneously, share information (Prasolova-Førland, 2008), receive feedback (Cheng & Wang, 2011), and complete activities by engaging with objects and individuals from different locations (De Lucia et al., 2009). Technology is of course central in 3D virtual learning as it is the tool that allows such communicative and pedagogical experience. As for the other pedagogical approaches described above, when users are immersed in and engaged with these digital and virtual learning contexts, they have the possibility to develop and foster 21st century digital competencies.

### **3 Methodology**

This study employed a review method in which concepts were built from data that had been previously analyzed and coded (Glaser & Strauss 2017). Following Norris and Ortega (2000, p. 430), the process started by retrieving a body of relevant studies through a “principled, replicable, and exhaustive search of literature”. The focus was on gathering relevant studies that were published as either peer-reviewed journal articles or book chapters, hence unpublished papers and dissertations were excluded. This is because the primary goal of the

review was 1) to provide the reader with a sense on the current status of the research and projects that define the three areas under consideration, 2) to examine advances made in our knowledge and note areas to be improved, and 3) to stimulate future research and understanding of the areas. Given the broad coverage of issues over the last two decades, the researchers do not try to provide an exhaustive review of the areas of interest, instead they aim to present a selective and qualitative review of published research since roughly 2010.

In order to access the initial corpus of literature relevant to the subject area, appropriate books, chapters and articles were selected via a keyword search in multiple databases such as Google Scholar, ERIC (Cambridge Scientific Abstracts), JSTOR Education, SAGE Full-Text Collection, SCOPUS, Web Science, Linguistics and Language Behaviour Abstracts and the MLA International Bibliography. Various topic keywords and subject headings and combinations of both were used to conduct the research including terms such as: *project-based language learning, virtual exchanges, telecollaboration, 3D virtual environments and 3D virtual learning*.

Bibliographies of all the retrieved studies were then analyzed for relevant research. After excluding duplicate study reports, the titles and abstracts of the retrieved studies were read and categorized accordingly. Following Morris' (2008) approach, categories were developed via inductive analysis of the data and the relationships between categories were investigated based on a process involving adjustment, integration or deletion according to the results of the analysis. The categories proposed were: 1) studies that were most relevant to the topics, and 2) studies that were clearly irrelevant (i.e., studies on biology, business etc.). This paper is organized around the overarching themes of reliability, validity and construct breadth, within a social framework.

## **4 Teachers' and Students' Roles in the PBL, Virtual Exchange and 3D Virtual Learning Contexts**

The impact of new technologies in education fosters the vision of an open, global and flexible form of learning leading to radical shifts from 'traditional' modes of instruction to a new current mode that is infused by new pedagogical ideas. Teachers are now required to develop suitable skills related to the new learning contexts and paradigms; their role has expanded to various challenging settings, allowing them to become a guide for the autonomous learning process, a researcher and a designer of suitable learning scenarios, an adapter and producer of new didactic materials in technology-based settings, a collaborator and contributor with other teachers and students from all over the world, an evaluator and finally a life-long learner in technology among all the other professional fields (Stickler & Hampel, 2015).

PBL, virtual exchange and 3D virtual learning environments, offer teachers the opportunity to act as facilitators by being the programme director or administrative e-moderator, the technical director or technical e-moderator, the instructor or academic e-moderator, and the social director or social e-moderator (Thomas, 2000; Bronack, 2008; Clavel-Arroitia & Pennock-Speck, 2015; Ensor, 2017). O'Dowd (2015), focusing on telecollaborative learning, describes in detail teachers' role and competencies; however, we feel that this suggested framework can be applied to both PBL and 3D virtual learning. He proposes that teachers' competencies can be divided into three categories: organizational, pedagogical and digital. The first category refers to the organizer, facilitator and course or task designer as well as reflective practitioner including also the outcomes gathered from previous experiences. The second category focuses specifically on the role of a facilitator where teachers need to be able to provide adequate scaffolding and support for completing specific learning tasks and also the role of the organizer, explaining the objectives and outcomes of the different

learning approaches. The third category of competences addresses the digital skills which teachers need to be equipped with. This requires teachers to be knowledgeable in digital communication and responsible for specific technical aspects. Because of the often integrated use of digital and Web 2.0 tools in these three learning approaches, there is an opportunity for teachers to encourage the development of critical reflection skills in students. This refers to the skill to critically engage with, filter, collect and evaluate online information (Cottrell, 2017; Dooly, 2010; Hockly & Dudeney, 2014).

Technology is influencing and supporting what is being learned in institutions but also the way students are learning. Learners are moving from a passive stance and teacher-centered form of delivery to a more active and student-centered one; instead of taking in information from a unique source (the teacher), students have the chance to learn more independently and collaboratively, interacting, comparing interpretations and working with teachers, fellow students and peers in other parts of the world to achieve mutual understanding.

The role of the modern student is strictly related to learner-centered pedagogy which is also at the core of learning practices proposed here (PBL, Telecollaboration and 3D virtual learning). This new pedagogy needs to offer learners not only the technologies they are likely to use in the knowledge economy but also the apprenticeship for different kinds of critical knowledge practice, new processes of inquiry, dialogue and connectivity (Beetham & Sharpe, 2013; Murray, Hourigan et al., 2005). Practices underpinning effective, innovative pedagogy will differ according to the subject areas but they are likely to include the following central elements (McLoughlin & Lee, 2008):

- Digital competencies that focus on creativity and performance;
- Strategies for meta-learning, including learner-designed learning;
- Inductive and creative modes of reasoning and problem solving;
- Learner-driven content creation and collaborative knowledge-building;



- Horizontal (peer to peer) learning and contribution to communities of learning.

## **5 Project-Based Learning (PBL)**

Emerging from this context, project-based Learning (PBL) has been defined by Markham et al (2003, p. 4), as “a systematic teaching method that engages students in learning knowledge and skills through an extended inquiry process structured around complex, authentic questions and carefully designed projects and tasks”. PBL focuses on activities in which students are actively involved in the planning, designing and implementing of projects in real-life situations while collaborating with their peers and teachers who also provide scaffolding for their learning. PBL is therefore an inquiry-based instructional approach built around a learner-centered environment that focuses on students’ use of subject-related concepts, tools, experiences and technologies to answer questions and solve real-world problems (Krajcik & Blumenfeld, 2006; Markham, Larmer & Ravitz, 2003). PBL has been adopted extensively by K-12 schools, however research shows that higher education institutions have been slow to integrate PBL into their practices (Lee & Blackwell, et al., 2014). Because of the different approaches undertaken in educational settings, there is often a natural link to problem-based Learning (PrBL) when referring to PBL. As a matter of fact, both PrBL and PBL are similar yet quite different in how they are conceptualized (Savin-Baden, 2000). PrBL and PBL are inquiry-focused learning approaches that encourage an action-oriented model to engage students in complex forms of critical thinking. Their similarity derives from the fact that the learning activities are organized around achieving a shared goal or project (Savery, 2015). It is important to say that in this context, PBL is presented as a specific method of PrBL, whereas PrBL represents a wider and more comprehensive context.

A dominant model for PBL learning is the one supported by the non-profit Buck Institute for Education (BIE). According to this model, originally developed in the K-12 setting, students go through an extended process of inquiry in response to complex questions or

challenges proposed. Within this process, projects are designed, managed and assessed carefully in order to help students learn academic content while fostering key skills such as collaboration, communication, critical thinking and creating authentic and valuable products (BIE, 2013). The BIE model proposes specific criteria to implement PBL based on the so-called *Six A's* that allow projects to be structured and relevant. Specifically, the project has to be:

- 1) *Authentic*: presenting a real-world challenge;
- 2) *Academically Rigorous*: structured, reliable and critically developed;
- 3) learners *apply learning* by using cognitive, communicative and digital skills;
- 4) learners engage in *active exploration* by gathering and filtering information from various resources;
- 5) learners *interact* making adult connections; and
- 6) various forms of both formal and informal *assessment practices* are integrated within the PBL approach.

These six features of the PBL approach show that, when integrated into the curriculum, students have the possibility to learn in a real, authentic context where they can foster their creativity and their critical, problem-solving and collaborative competencies.

PBL learning is an inquiry-based instructional approach that aims to stimulate reform-based constructivist practices (Savery & Duffy, 1995). This approach challenges traditional pedagogical practices where teachers' role shifts from providers of knowledge to facilitators of learning. Research has shown that transitioning from a traditional instructional model to a PBL model can be challenging for both teachers and students. Specifically, Bradley-Levine et al. (2010) and Grant (2011) indicate that, despite the fact that teachers and students understood their new role in the PBL classroom, they struggle to find an appropriate and precise position. In Bradley-Levine et al.'s study (2010) it has been recognized that,

PBL teaching takes *more* time to plan, *more* curriculum and technology resources, *more* day-to-day problem solving about how to scaffold student growth and success in their project work, *more* effort to authentically assess student learning, *more* communication with persons in the community, *more* support from the administration in terms of suitable scheduling and curriculum alignment, and *more* opportunities to collaborate with their teaching colleagues. (pp. 19–20)

This aptly summarizes the benefits and challenges that teachers, students and institutions may face in the PBL classroom.

There is an important link between PBL and language learning and research has addressed this extensively. Following the PBL socio-constructivist approach proposed by BIE, various researchers have in fact promoted PBL for Languages, referring specifically to Project-Based Language Learning (PBL) (Beckett, 2006; Fried-Booth, 2002; Stoller, 2006). As indicated by Dooly (2013), PBL fits easily within an approach consistent with Communicative Language Teaching. In her study Dooly (2016) employed a blended approach using both CMC (Computer-Mediated Communication) and PBL. Referring to PBL in particular, she indicated that students participating in her study successfully gained new information about the topic proposed, and this information was then used to communicate face-to-face (with classmates) and online (with telecollaborative partners) in the target language in order to tackle and solve problems related to the topic.

## **5.1 Motivation and Benefits of PBL**

Several authors have described the characteristics and features required for a successful PBL approach to instruction. Duch, Groh, and Allen (2001), for example, described the methods used in PBL and the specific skills developed, including the ability to think critically, analyze and solve complex, real-world problems, to find, evaluate, and use appropriate learning

resources; to work cooperatively, to demonstrate effective communication skills, and to use content knowledge and intellectual skills to become continual learners. Torp and Sage (2002) described PBL as focused, experiential learning organized around the investigation and resolution of real-world problems. Hmelo-Silver (2004) described PBL as an instructional method in which students learn through facilitated problem-solving that centers on a complex problem that does not have a single correct answer. Stripling, Lovett and Macko (2009) presented PBL as an instructional strategy that empowers learners to pursue content knowledge autonomously while demonstrating their new understandings through a variety of presentation modes. In the same year Grant said that PBL is a “learner-centered strategy that affords learners the opportunity for in-depth investigations of worthy topics and the learners are more autonomous” (2009, p. 1). As a matter of fact, the student participants in Grant’s study saw PBL as engaging, giving them increased freedom and autonomy. Specifically, the study indicated that students understood the role of weighted grades in a PBL project, with grades assigned for work ethic, collaboration and aesthetics. They understood also that PBL may take more time. Hence, according to the proposed literature, when employing PBL in the classroom, students have the possibility to plan, implement, and evaluate projects that have real-world applications beyond the classroom. Students also have the possibility to work collaboratively with other co-learners while sharing and constructing knowledge on their own. This is the ideal context where the 21st century skills such as communication and presentation skills, critical thinking, creativity, collaboration, research and technical skills, and time management skills etc. can be fostered and enhanced in order to engage effectively and successfully with today’s globalized society.

## **5.2 Possible Problems and Difficulties in PBL**

Various researches have addressed the challenges that teachers and students face when integrating PBL into their practices. It has been highlighted that possible problems in PBL

implementation may refer to the teacher role and management of the classroom, to the control of student behavior, to the use of technology, and to the assessment and support of student learning. On a practitioner level, Thomas and Mergendoller (2000) in their qualitative study of K-12 teachers, highlighted that one challenge characterizing PBL implementation is finding and incorporating community partners. Teachers, in fact, need to allocate time to select appropriate partners and assesses the feasibility of the projects rigorously. Referring to the limitation of previous studies, the researchers stated also that “very little is known about the challenges by teachers in developing and enacting PBL on their own. Existing research on implementation is useful for identifying the kinds of training and support teachers need when using packaged or published materials ... but these findings may not generalize to or fully capture the challenges of teacher-initiated PBL” (Thomas & Mergendoller, 2000, p. 38). In addition, teachers integrating PBL approaches move from the role of knowledge providers to the facilitators of learning and specific teaching skills should be developed to support such scaffolding (Ertmer & Simons, 2006).

On a student level, some studies found that they may struggle to discern their roles in a PBL classroom, especially when it comes to accepting responsibility for their own learning (Ertmer & Simons, 2006; Grant & Hill, 2006). Learners who are new to PBL require significant instructional scaffolding to support the development of problem-solving skills, self-directed learning skills, teamwork and collaborative skills in order to achieve a level of autonomy where the scaffolds can be later removed. Finally, it is important to highlight as Savery (2015) argues, that teaching institutions that have integrated a PBL approach into their curriculum have in parallel provided extensive tutor-training programs recognizing the critical importance of this element in facilitating and enhancing the PBL learning experience.

## 6 Telecollaborative Learning

Virtual exchange is an area of CALL (Computer-Assisted Language Learning) and CMC (Computer-Mediated Communication) which has been developed greatly over the last two decades. Telecollaboration has been defined by Belz (2003, p. 2), as: “institutionalized, electronically mediated intercultural communication under the guidance of a linguacultural expert (i.e., a teacher) for the purposes of foreign language learning and the development of intercultural competence”. Similarly, Guth and Helm (2012) proposed a definition of telecollaboration as “internet-based intercultural exchange between groups of learners of different cultural / national backgrounds set up in an institutional blended-learning context with the aim of developing both language skills and intercultural communicative competence” (p. 42). Hence, telecollaborative learning involves connecting teachers and learners from institutions located in different countries using Internet-based communicative tools to enhance language, intercultural, communicative and digital competences while fostering learners’ autonomy. Within this context, virtual exchange also offers also the opportunity as Helm (2015) further suggests, for institutions to develop their internationalization strategies by globalizing their curriculum. Virtual exchange is characterized by the use of both asynchronous CMC (ACMC) tools (i.e., email, bulletin board/online forums, blogs, etc.) and synchronous CMC (SCMC) tools (i.e., video conferencing tools, text chat tools, virtual learning platforms such as Second Life, OpenSim etc.) and research studies, as will be outlined below, have integrated and combined these tools according to the most current technological developments.

Virtual exchange has been the subject of extensive research based mostly on individual projects and studies focusing on pedagogical design, technological tools being used, analysis of the interaction, linguistic and/or intercultural learning outcomes and possible difficulties encountered (Dooly & O'Dowd, 2012; Helm 2015). As indicated by Helm, a limitation in virtual exchange research concerns the fact that very “few studies offer a bigger picture of

telecollaboration in terms of its implementation in higher education, other than a preliminary study carried out by O'Dowd (2011) which revealed that it is very much a peripheral or add-on activity that is not being fully integrated into foreign language programmes" (p. 198). However, because of the existence of extensive literature on virtual exchange, the following section will briefly review the research related to the following domains: virtual exchange and educational environments; the languages in use in virtual exchange projects; the role of technology as a mediation tool and tasks in virtual exchange projects.

Research on virtual exchange shows that very few studies have focused on the use of online collaborative learning with young (beginning) language learners (although see Gruson & Barnes, 2012; Kennedy & Miceli, 2013; Tolosa, Ordóñez & Alfonso, 2015; Verdugo & Belmonte, 2007). Among the reasons why such telecollaborative methods are used mainly in secondary education or university levels include the limitations of interests and comprehensive topics, the fact that little or no written input can be provided (depending on the age and proficiency level) and the difficulties presented by oral interaction when telecollaborative tasks with other speakers are in place (Sadler & Dooly, 2016). Another issue may be the teacher's digital competence and understanding of the relevance of CMC platforms and CALL games for primary education. Virtual learning environments and serious games have been used in primary education for years, however, they seem to usually involve a more individual and linear form of computer interaction where learners advance from simpler to more complex tasks without consistent and effective interaction with their peers performing in the same virtual environments. In addition, according to Sadler and Dooly (2016), the tasks set in virtual worlds seem to be focused more on acquiring lexical, syntactic and morphological knowledge and less on a meaningful and authentic communication.

Literature on virtual exchange offers a significant number of studies that employ the most commonly taught languages in their exchange programmes, with English being the most

popular, followed by French, German, Spanish and Italian (Helm, 2015). In 2003, Belz addressed the lack of research on virtual exchange involving the so-called less commonly taught languages (LCTL), however, more recently, several studies have been conducted employing such languages (Wang, Zou, Wang & Xing, 2013; Klimanova & Dembovskaia, 2013). Various virtual exchange projects (i.e., Cultura project, eTandem project) have been based on the bicultural/bilingual model where the “native speaker” is considered the “ideal interlocutor” who can “act as a cultural informant and/or language expert, providing error correction, feedback, and cultural information” (Helm, 2015 p. 199) However, more recently, research has focused on the use of a *lingua franca*, namely, the foreign language common to all the participants in the exchange programmes. According to Lewis et al. (2011), this may be due to projects that involve multiple partners and also, as Helm suggests, to an acknowledgement reached mainly by English language teachers, that their students are more likely to communicate with non-native speakers (2015). In addition, when interacting with non-native speakers, learners seem to be more relaxed and more inclined to support each other in the interaction and completion of different tasks (Helm, 2015).

Virtual exchange experiences are always mediated by technology. Both synchronous and asynchronous tools may be employed during the telecollaborative interactions and, in this regard, it is important to underline that the majority of studies on telecollaborative exchange projects carried out in the 1990s investigated asynchronous CMC applications more regularly, whereas an increasing number of studies on virtual exchange have more recently utilized synchronous tools solely or in conjunction with asynchronous CMC tools to maximize technological affordances (Cunningham, 2018). Synchronous communication is argued to help participants to be more motivated and engaged with the task at hand while fostering effective collaboration among peers (Lee, 2006; Canto, Jauregi, Melchor-Couto & Vilar Beltrán, 2013; Helm 2015; Çiftçi & Savaş, 2017).



On the other hand, asynchronous communication offers participants time to reflect upon their task while finding the best strategy to employ in order to complete the task, may that be through blogs, forums or wikis (Lee, 2006; Dooly, 2008; Guth & Thomas, 2010). The mediational role of technology has also been analyzed by researchers from a social level of interaction focusing specifically on the role of social media networks (Lomicka & Lord, 2012; Chen, 2013; Guth, & Thomas, 2010) and the opportunities these platforms may offer for what has been described as intercultural communication in the wild (Thorne, 2010). Social media offer opportunities situated in scenarios where in fact the social activity is “less controllable than classroom or organized online intercultural exchanges might be, but which present interesting, and perhaps even compelling, opportunities for intercultural exchange, agentive action and meaning making” (Thorne, 2010, p. 144). In this regard, it has been highlighted by various reports that this telecollaborative approach allows learners to negotiate new roles, identities and meanings, overcoming possible limitations due to low level proficiency, a process which shifts them from second language learners to active second language users (Lee, 2018; Thorne, Black & Sykes, 2009; Thorne, Cornillie & Piet, 2012).

Virtual exchange projects generally employ a task-based approach and, in this regard, an extensive range of research studies have explored the different types of tasks designed to foster meaning making while integrating them into the development of communicative, intercultural and digital competencies (Blake, 2000; Helm & Guth, 2010; Thomas & Reinders, 2010).

Information about the types of tasks used in telecollaborative exchanges can be gathered from project descriptions and few studies have examined in detail the outcomes of specific tasks and their impact on participants. Harris (2002), for example, suggested that telecollaboration can be divided into three genres of online activity:

1. *Interpersonal Exchanges* activities are those that involve individuals talk electronically with other individuals, individuals talk with groups or groups talk with other groups.

2. *Information Collection and Analysis* activities are those that involve students collecting, compiling, and comparing different types of selected information.
3. *Problems-solving* activities are those that involve the promotion of critical thinking, collaboration, and problem-based learning.

A few years later, O'Dowd and Waire (2009) documented 12 different, frequently recurring tasks used by intercultural virtual exchange projects and synthesized them into three types:

1. Information Exchange tasks focus on students providing information to each other.
2. Comparison and Analysis tasks are usually classroom-embedded and focus generally on discussing similarities and differences on cultural products such as movies, books, articles. The model for this task type is the Cultura project (Furstenberg, Levet, English & Maillet, 2001).
3. Collaboration and Product Creation tasks focus on the creation of a product through active collaboration. This may include but is not limited to a production of a presentation, joint translation or essay. These types of tasks are considered the most challenging and demanding, especially for teachers with poor technology competency (O'Dowd & Waire, 2009; Helm & Guth, 2010).

Among the three types of tasks outlined above by O'Dowd and Ware, the most commonly used are the first two, as the third one requires teamwork, reciprocity among learners, a balanced workload and mutual respect for deadlines (Guth & Helm, 2010) which make the task particularly complex for both teachers and students.

## **6.1 Affordances of Virtual Exchange**

Over the years, different studies have shown enough evidence of how telecollaboration contributes to linguistic development (Belz, 2003; Guth & Helm, 2010; Chun, 2015), sociolinguistic and pragmatic competence (Guth & Helm, 2010; Chun, 2015), motivation (Jauregi, 2015), intercultural competence of the learner and practitioner (O'Dowd, 2011) as

well as digital competence (Hauck, 2019; Guth & Helm, 2010). In addition, several studies suggest that student autonomy and collaborative interaction may both increase when students take part in telecollaborative practices (Belz, 2005; Dooly, 2008). As Kinkinger (2016) states, virtual exchange has the potential to contribute to different aspects of a learner's development:

In telecollaborative pedagogies, students can create social connections with their peers, see themselves through the eyes of others, be exposed to specific attitudes and discourses about foreigner identities, experience and analyze spoken or informal forms, and expand their discourse options beyond the strictly pedagogical. (p. 20)

When taking part in a virtual exchange, students from different cultures and in different locations can establish a virtual relationship; indeed, participants embrace a different kind of learning experience that provides them with opportunities to engage in international online communication in ways that are not typically enacted in a conventional language setting. As outlined above, in the virtual exchange scenario, participants can foster linguistic, cultural and digital skills, however, it is important to highlight also that the curriculum can be positively affected. As a matter of fact, research conducted both at secondary (Ware & Kessler, 2016) and university level (Helm, 2015) shows that virtual exchange has the potential to globalize the curriculum while meeting and strengthening its established learning goals. This is perfectly in line with the increased demands for 21st century paradigms and skills and, moreover, global communication.

## **6.2 Possible Challenges in Virtual Exchange**

As for other models of instruction, the virtual exchange model presents challenges that can make communication between participants difficult or even, sometimes, unsuccessful. The literature has widely addressed those challenges and in particular, O'Dowd and Ritter's (2006) research proposed four levels at which the telecollaborative approach may result in a negative

experience: the individual level, the classroom level, the socio-institutional and interaction level. The individual level refers to the learners' attitude, motivation, knowledge, and expectations as well as the stereotypes that they may have and bring into the classroom and virtual exchange contexts. The classroom level addresses several factors that may be crucial for an effective interaction such as the task design, the relationship between the teachers involved in the telecollaborative exchange, the balance between the students paired for the project and the overall group dynamic. The social-institutional level refers to the technologies mediating the process, the general organization of the module that students are undertaking (e.g., including workload and assessment), the recognition of attendance to the telecollaborative experience as well as more practical factors such as differences in timetable and contact hours. According to O'Dowd and Ritter, the latter is the level that has been examined most by the research literature (2006). Finally, the interaction level addresses the differences in communication and behavior referring, for example, to the use of humor, non-verbal communication, being more or less open and/or direct during the virtual exchange. However, many studies agree on the fact that the greatest challenge on the interactional level is having participants engaged in a deeper level where they move beyond an assumption of similarity and manage to reach a critical intercultural perspective (Belz 2003; Kramsch & Thorne, 2002; Ware, 2005; O'Dowd, 2006; Helm, 2013). It is important to specify that, although the factors that may lead to failure of the virtual exchange communication have been identified and examined by several researchers, a combination of these factors is more likely to create a challenging environment for the virtual exchange experience.

When it comes to challenges that may be encountered during a virtual exchange project, the role and skills required for the teachers involved have often been discussed. According to Helm and Guth (2016) many issues can be avoided if teachers communicate prior to an exchange and discuss planning, task design and specific course needs while trying to

understand their respective contexts. In addition, Ware's (2005) research indicates that teachers may be prepared to support and facilitate discussions about generic cultural differences but they may not be as prepared to facilitate students at a deeper level of interaction, tackling issues that may also be of a sensitive nature (Ware 2005). Students tend to "avoid deep engagement through probing questions on sensitive issues" (Helm, & Guth, 2016, p. 249) and this avoidance strategy "can lead to missed communication or missed opportunities for approximating the kind of rich, meaningful intercultural learning that instructors often intend with telecollaborative projects" (Ware, 2005, p. 66). As indicated by O'Dowd (2013), it is therefore essential to include strategies to engage with and tackle such sensitive topics in the professional development of in-service teachers in order to overcome possible misunderstandings or tensions in communications and, more specifically, the failure of the virtual exchange experience.

## **7 3DVLEs Learning**

Three dimensional (3D) technologies have become a central feature in the vast majority of computer games, including massively multiplayer online games (MMOGs) such as World of Warcraft and immersive virtual environments (VEs) such as Second Life (SL), OpenSim (OS) and Minecraft (MC). Nowadays, video games and virtual worlds are viewed as relevant educational tools not just for their potential for entertainment, but also for promoting learning (Prensky, 2007). VEs can be described as "environments that capitalizes upon natural aspects of human perception by extending visual information in three spatial dimensions" (Wann & Mon-Williams, 1996, p. 833) whereas an Educational Virtual Environment (EVE) or Virtual Learning Environment (VLE) can be defined as an "environment that is based on a certain pedagogical model, and incorporates or implies one or more didactic objectives, provides users with experiences they would otherwise not be able to experience in the physical world and redounds specific learning outcomes" (Mikropoulos & Natsis, 2011, p.769). In 3D VLEs,

avatars represent the users' real presence (Seo, 2012) and they can communicate and interact via audio and text-based tools (Dalgarno & Lee, 2010). In 2012, virtual learning environments attracted significant interest which was subsequently renewed by the rise of augmented reality applications such as Pokémon Go and SoundPacman in 2015 (Chatzidimitris et al., 2015). The potential of using 3D games and virtual environments for teaching and learning has been widely acknowledged among educators and educational institutions throughout the world (de Freitas, 2006; Dalgarno & Lee, 2010; Panichi & Deutschmann, 2012). Over the years, resources and financial support have been allocated to enhance the pedagogical potential of these technologies with "academia, industry and government working to develop new platforms, tools and resources to support these endeavors" (Dalgarno & Lee, 2010, p.11). Indeed, these platforms provide a new range of educational opportunities. They offer users not only the unique possibility to explore and navigate a pre-existing three-dimensional environment, but also to extend the environment by creating and manipulating virtual objects while interacting and collaborating with others. Each virtual world provides a set of tools for recreating real world objects and experiences that can be expanded as much as an individual's imagination and technology allow for. The game-like techniques employed in 3DVLEs as well as in the so-called serious games (games whose main purpose is to educate while entertaining their users) promote user engagement and motivation and, in the recent years, a growing awareness on the learning potential of games and virtual worlds has been widely recognized in the computer-assisted language learning field (Cornillie, Thorne & Desmet, 2012; Jauregi et al., 2011; Panichi & Deutschmann, 2012; Reinders, 2012; Sykes & Reinhardt, 2012).

## **7.1 Affordances of 3DVLEs Learning**

According to Panichi and Deutschmann (2012), 3DVLEs are very effective learning spaces where formal and informal learning can be created and effectively employed (see also Thomas & Schneider, 2018). These multi-user environments offer teachers and students the unique

opportunity to create and collaborate while experimenting with their creative competencies and fostering responsibility for their own learning (Ferguson, 2011). As widely confirmed by the research, 3DVLEs can also be more appealing and motivating for certain subjects and for certain types of learners than the use of traditional learning material; they may be in fact useful to simulate the effect of physical laws (Brown, Cobb & Hugh Reynolds, 1999), to simulate social environments and allow people to practice social skills (Liu, et al., 2010) or to learn about history (Ketelhut, Dede et al., 2017; Di Blas, Hazan, Bearman & Trant, 2003).

Dalgarno and Lee (2010) identified a set of contributions that can potentially arise from tasks conducted in 3DVLEs environments. Specifically, the authors describe five unique affordances characterizing these educational settings (See Figure 2.1):

- 1). 3D VLEs can be used to facilitate learning tasks that lead to the development of enhanced spatial knowledge representations of the explored domain. This is the ability to move freely around a 3D virtual setting; interacting and manipulating objects allow also the development of spatial knowledge as well as using photographic or video technologies (such as QuickTime VR).
- 2). 3DVLEs can be used to facilitate experiential learning tasks that would be impractical or impossible to undertake in the real world. This is the opportunity for users, as confirmed also by Ortega and Falconer (2015), to attempt or complete tasks that may have been impossible or difficult in a real-world setting. For example, Wiecha et al. in their study (2010) describe a range of 3D web-based tools designed to support training on various medical procedures.
- 3). 3DVLEs can be used to facilitate learning tasks that lead to increased intrinsic motivation and engagement. Simulations and virtual worlds have the potential to simulate intrinsic learning as a result of the high degree of personalization that arises from learners' choices and achievements (Rieber, 2005). As indicated by Csikszentmihalyi (1990), some tasks can be so engaging that the user feels fully immersed and focused in the activity undertaken. The term

‘flow’ proposed by Csikszentmihalyi describes the learners’ experience in these situations. The high degree of fidelity of 3DVLEs allows the users to become psychologically engaged with the virtual world and concentration or absorption, central concepts in flow theory, are strictly related to meaningful learning, deep cognitive processing and academic performance (Corno & Mandinach, 1983; Csikszentmihalyi, 1990; Fullagar, Knight & Sovern, 2013).

4). 3D VLEs can be used to facilitate learning tasks that lead to improved transfer of knowledge and skills to real situations through contextualization of learning. 3D technologies can offer realistic and interactive settings consistent with the real world, hence concepts learnt within a 3D VLE should be more readily recalled and applied to the corresponding real environment. This calls for a situated kind of learning as described by Ruzic (1999) who stated that, “The advantages of VR-based teleteaching are individualized, interactive and realistic learning that makes virtual reality a tool for apprenticeship training, providing a unique opportunity for situated learning” (p. 188) and later emphasized by several authors (Bronack, Riedl & Tashner, 2005; Chittaro & Ranon, 2007).

5). 3D VLEs can be used to facilitate tasks that lead to richer and/or more effective collaborative learning than is possible with 2-D alternatives. In collaborative environments, such as Second Life or Minecraft, users can meet each other and collaborate or socialize. These environments provide users with the possibility to engage with and carry out tasks together while also collaborating in the creation of joint products. Mennecke, Hassall and Triplett (2008) report on how students undertook a scavenger hunt activity in Second Life, in which they explored the virtual world as they embarked on a mission to discover interesting places and practice basic virtual world skills. To complete the tasks, students had to retrieve information, decipher hints and ‘teleport’ to the location of the item they were searching for. The activity required students to work in teams, while communicating and coordinating their activities throughout the process.



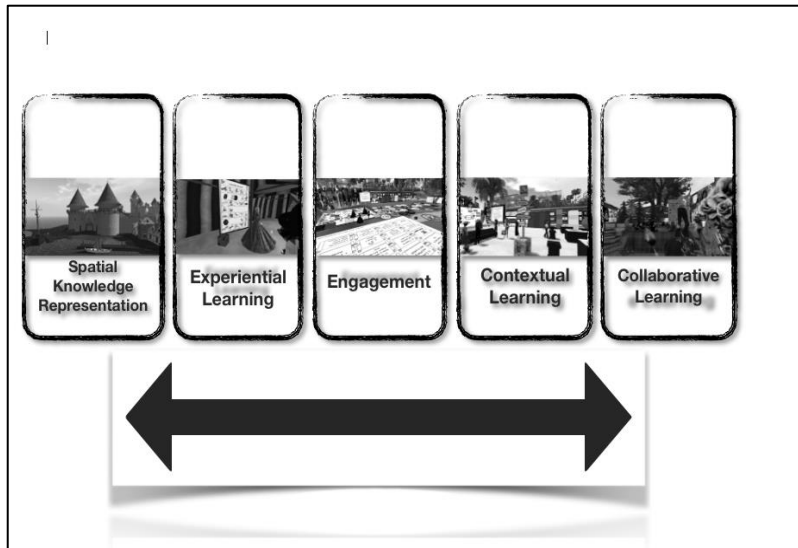


Figure 2.1 The 5 unique affordances of 3DVLEs (Dalgarno & Lee, 2010).

In 3DVLEs a student-centered model of instruction can be fostered as constructivist and problem-based pedagogies can be easily implemented. According to Polka (2001, p. 55), learners can in fact “use their experiences to actively construct understanding that make sense to them, rather than have understanding delivered to them in already organized form”. Students are actively and regularly involved in the process of constructing meaning from their own experiences while also “interacting in a way that conveys a sense of presence lacking in other media” (New Media Consortium, 2007, p. 18). It is important also to note that in 3DVLEs learners use avatar representations that might be extremely helpful to improve communicative, linguistic and social skills as it provides presence which is positively associated with better learning outcomes in such environments (Dickey 2005; Duncan et al. 2012; Moreno & Mayer 2004). 3DVLEs can be also adapted to integrate authentic learning material and strategies. As indicated by Lombardi (2007):

authentic learning typically focuses on real-world, complex problems and their solutions, using role-playing exercises, problem-based activities, case studies, and participating in virtual communities of practice. The learning environments are inherently multidisciplinary. They are not constructed in order to teach geometry or to teach

philosophy. A learning environment is similar to some ‘real world’ application or discipline: managing a city, building a house, flying an airplane, setting a budget, solving a crime, for example. (p. 2)

In this sense, 3DVLEs offer the unique opportunity to take part in simulations and activities that closely resemble real-world situations. In addition, Moore, Fowler and Watson (2007, p. 463), indicate that 3DVLEs offer an exceptional setting where educators can prepare their learners for “the increasingly complex and interconnected global society in which they live and work”. Indeed, across various virtual worlds such as Second Life or Minecraft, students can engage with people from different cultural and linguistic backgrounds, encounter and approach a given task from different perspectives, experience real life-like situations, create and share content (Prasolova- Førland, 2008), receive multifaceted feedback (Cheng & Wang, 2011), while being in charge of their own learning. Finally, 3DVLEs are important for those universities that aim to a close collaboration in virtual interactive classrooms among students located in different places (Phuong et al., 2015; Shah et al., 2012). As a consequence, several universities around the globe have implemented their own 3D virtual campus environments using the types of instructional approach described above (Cheryan et al. 2011; Prasolova-Førland 2008).

## **7.2 Possible Challenges in 3DVLEs Learning**

Although 3D VLEs offer many opportunities for learning, there are also challenges that need to be addressed from an institutional, educator and learner level. From an institutional perspective, virtual worlds require a fast and resilient internet connection and hardware infrastructure as well as support in terms of costs. Specifically, regarding the latter, Second Life offers, for example, different membership plans with the opportunity to create a basic account for free. However, an institution can create a presence on SL and have an area dedicated to pedagogical activities with a premium account. A premium account is required to

purchase land which is necessary to have a safe learning environment for students. Minecraft offers, on the other hand, an annual membership that can be purchased at an affordable price. Second Life and most virtual worlds were not created for educational purposes, however, and they have had to be repurposed by educators for teaching and learning.

Teaching in virtual worlds has its own challenges. Creating classes in virtual environments requires specific digital competencies on educators part as well as the ability to overcome possible technical problems. Indeed, educators interested in conducting their teaching in virtual environments need to gain confidence and skills regarding the possible interruption of pedagogical activities due to technical problems (Bower, Cram & Groom, 2010). It may take time to overcome issues regarding accessibility of objects or the design of the environments, thus teachers should be equipped with a number of skills that allow them to design effective virtual environments while coping with such possible scenarios (Warburton, 2009). It is important to highlight, as indicated by Riley (2008), that developing and managing courses in these settings takes time and effort that may go beyond what is ‘normally’ required in a traditional classroom based approach. Finally, liability issues may be in place in 3DVLEs. Students in public areas (not restricted to only authorized people as in privately owned land) may be subjected to disruptive behavior by other players (Riley, 2008). Teachers need to be aware of these risks and, in this respect, specific legal issues need to be discussed further and finally resolved (Bugeja, 2007; Riley, 2008). From the students’ perspective, a novice user may feel overwhelmed or get lost in the 3DVLEs (Bricken & Byrne, 1992), not knowing what to do first or next and how to deal with specific situations. In this case, more time is required to become acquainted with such environments and, as a consequence, their short-term satisfaction may be affected.

On the other hand, learners that are used to playing video games, may spend their time engaged in activities not related to learning, especially if their motivation is low. In this case,

there will be a negative impact on the effectiveness of 3D virtual pedagogy (Ketelhu et al., 2003; Virvou & Katsionis, 2008). Overall, it can be said that possible technological problems, the cost of the chosen virtual environments, liability and adaptation requirements for environments are reported to be among the biggest limitations influencing the more widespread the use of 3DVLEs (Eschenbrenner, Nah & Siau, 2008).

## **8 PBL, Telecollaboration and 3DVLEs: Current Trends and Initiatives**

This final section of this chapter focuses on various projects in which multimodal approaches have been employed to learn and practice languages, as well as digital and intercultural skills. The value of combining different pedagogical practices has been identified by Kohn and Hoffstaedter (2015) who stated that “a multi-modal telecollaboration approach offering tool options from virtual worlds and video communication to chat and forum is ideally suited for providing practice opportunities for all skills relevant in foreign language learning from reading and writing to listening and speaking” (p. 5). In addition to fostering language competencies, these specific multimodal approaches offer the opportunity to enhance digital and intercultural skills while allowing students and teachers from different locations and cultural backgrounds to collaborate and create content together. Specific projects where such methods of instruction have been employed, were selected and are described below.

The TILA project (Telecollaboration for Intercultural Language Acquisition) was funded by the European Commission Lifelong Learning Programme (<http://www.tilaproject.eu>). It explored how to innovate and enrich foreign language teaching programmes by encouraging the use of telecollaboration activities among European secondary schools. It also investigated how to support teachers to integrate digital and telecollaborative tools and activities into their teaching practices while developing their digital, intercultural and organizational competences, and examined the added value of telecollaboration for language learning in relation to

intercultural awareness, motivation and communication amongst young learners (Jauregi, Melchor-Couto & Vilar, 2013). TILA employed different telecollaborative tools for both synchronous and asynchronous modes of instruction. In the synchronous modes, digital activities and games in 3D virtual worlds were employed together with chat and video communications. In the asynchronous mode, wikis and discussion fora were used. One of the main areas of research was task-based learning and the relationship between tasks developed by teachers and the activities that learners carried out in the telecollaborative sessions.

The second project is TeCoLa (Pedagogical Differentiation through Telecollaboration and Gaming for Intercultural and Content Integrated Language Teaching) (<https://sites.google.com/site/tecolaproject/background/project-summary>) which was funded by the European Erasmus+ programme and its aim was to develop and validate innovative gamified telecollaborative approaches for secondary schools. At the core of the TeCoLa project was the investigation and validation of authentic, task-based telecollaborative process among peers of different socio-cultural, educational, and language backgrounds. The project proposed a multi-modular approach for teachers' development around task-based gamified telecollaboration while offering open educational resources and support (Jauregi & Melchor-Couto, 2017). The project started in 2019 and lasts for three years. In the first year the basis for teacher training programmes were created together with a model of meaningful gamified telecollaborative tasks to be applied in different educational contexts. During the following years, the proposed model will be employed and validated.

The GUINEVERE (Games Used IN Engaging Virtual Environments for Real-time language Education) was a two-year European Commission project (<https://guinevereproject.eu>) that investigated the potential of digital game-based learning in 3D immersive environments focusing on foreign language learning. The project started in 2017 and lasted two years. The GUINEVERE examined digital play in specific 3D virtual learning

platforms namely Second Life, OpenSim and Minecraft across primary and secondary level schools environments. At the core of the project was the promotion of language learning through the use of digital technologies to develop play, creativity and dialogical thinking while understanding new cultures (Thomas et al, 2018)

Another project that targeted both primary and secondary levels was the eTwinning project (<https://www.etwinning.net>). The project was launched in 2005 as the main action of the European Commission's eLearning Programme and was then integrated into Erasmus+ in 2014. The eTwinning project aimed to promote and support collaboration between schools through technology, providing tools and services. Specifically, the project developed a portal to help schools find partners and to facilitate communication and collaboration between staff and pupils of partner schools while engaging in joint educational projects. In addition, it offered opportunities for free and continuing online professional development for educators (Papadakis, 2016).

More recently, the Erasmus+ Virtual Exchange (EVE) programme was launched ([https://europa.eu/youth/erasmusvirtual/about\\_en](https://europa.eu/youth/erasmusvirtual/about_en)) which aimed to expand the scope of the Erasmus+ programme via virtual exchanges. During 2018, the EVE programme aimed to engage over 8,000 participants from Europe and the South-Mediterranean area to create a safe online community where young people could increase their linguistic, intercultural, digital and communicative competences. This programme, currently implemented by a consortium of organisations led by the Search for Common Ground includes UNICollaboration, and offers learners the opportunity to participate in various engaging virtual exchange initiatives (O'Dowd, 2018).

The TILA, TeCoLa, GUINEVERE, eTwinning and EVE projects share the common purpose of internationalizing education by integrating telecollaborative approaches in schools, diversifying teaching and facilitating content integrated language learning (CLIL) by using

digital tools (serious games and virtual worlds in the case of the TILA, TeCoLa and GUINEVERE projects). These projects aim to create the conditions to foster intercultural communicative competences, experience real-life communication, develop collaborative and personalized learning and exploit the possibilities of Web 2.0 applications. Furthermore, these projects aimed to offer educational resources to practitioners, as well as to empower and support teachers on the use of telecollaboration and gamification in their practices. In this regard, it is important to highlight that in the case of the TeCoLa project, teachers showed little experience with the digital tools proposed by the project (video communication, chats, digital games), especially with virtual worlds, which indicated that video communication was the tool with which they were more familiar, as it was the most valuable for dealing with diversity, promoting intercultural awareness and communicative competence (Jauregi & Melchor-Couto, 2017). The GUINEVERE and eTwinning projects were the only ones targeting both primary and secondary schools, however, only the GUINEVERE, TILA and TeCoLa projects made regular use of virtual environments and serious games.

## **9 Conclusion**

This literature review has provided a critical overview of recent and current research on teaching and learning in the 21st century, and had a specific focus on project-based learning (PBL), telecollaborative learning and learning in 3D Virtual environments, in order to explore the potential of interactive, immersive and collaborative pedagogical settings. The review started by discussing the role and contribution of technology to the educational field, and addressed the features and skills required by both teachers and students to engage and work effectively in current digital environment. According to the research, all the learning methods proposed allow learners to develop specific competencies including motivation, autonomy, collaboration with peers, digital skills and sociolinguistic and pragmatic competences. However, some challenges were addressed by different studies, above all, the role and skills

required for teachers to implement effectively those methods of instruction in their teaching practices. Teachers need in fact to take part in structured teacher training programmes that allow them to develop specific teaching skills essential to support and guide their students in such educational models of instruction. It goes without saying that the support of educational institutions is crucial for the success of the proposed learning processes.

Finally, research shows that the current educational scenario in which PBL, telecollaboration and 3DVLEs are integrated as models of instruction (e.g., the TILA, TeCoLa, eTwinning and EVE projects), demonstrates some promise for future research. These projects have a common purpose: to internationalize education by integrating these approaches in educational settings, diversifying teaching and facilitating the use of digital tools. Such a direction of travel is in line with the requirements and the development of 21st century learning paradigms and the skills needed for global communication.

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