Guinevere
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Games Used in Engaging Virtual Environments for Real-time Language Education

IO2: Game Design of Global Simulations

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IO Number: 2
IO Name: Game Design of Global Simulations

Description: This IO will explore how an application created by 3DLES can enable users to connect previously separated immersive environments via a collaborative game. Target groups from the different partner countries will thus be able to work together in one virtual world (i.e. Minecraft) in order to communicate in a target language and participate in authentic simulations and collaborative projects involving the identification of solutions to problems. Based on this telecollaborative approach, this IO will clearly identify examples of best practice alongside the challenges and opportunities for the field of language learning as a result of technology-mediated project-based learning approaches in immersive environments.

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List of Abbreviations

BECTA	British educational communications and technology agency
BYOD	Bring your own device
CALL	Computer-assisted language learning
CLIL	Content and Language Integrated Learning
CMC	Computer-mediated communication
DES	Department of Education and Science
DS	Digital Schools
EFL	English as a foreign language
ESL	English as a second language
EU	European Union
FL	Foreign language
GUINEVERE	Games Used IN Engaging Virtual Environments for Real-time language Education
ICALL	Intelligent computer-assisted language learning
ICT	Information and communication technologies
L1	First language
L2	Second language
MALL	Mobile-assisted Language Learning
MMOG	Massively multiplayer online games
MOOC	Massive Open Online Courses
MOODLE	Modular object-orientated dynamic learning environment
OECD	Organization for Economic Co-Operation and Development
OFSTED	Office for standards in education, children's services and skills
PC	Personal computer
PISA	Programme for International Students Assessment
SLA	Second language acquisition
TELL	Technology-enhanced Language Learning
TL	Target language
TPACK	Technological pedagogical content knowledge
UNDP	United Nations development programme
VLE	Virtual learning environment
WELL	Web-enhanced language learning

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1. Introduction

This review of the literature aims to provide a critical evaluation of the existing studies on the topics tackled by this intellectual output, namely: project-based learning (PBL), telecollaborative learning and learning in 3D Virtual environments. The following sections will look first at language learning and teaching in the 21st century, providing background information on the connectivist theory and the changing role of teachers and students due, above all, to the crucial role of technology both in their academic and personal lives. In the following sections, different types of learning which recognise a student-centred approach while addressing the 21st century competencies, are outlined and analysed, starting with PBL, moving then to telecollaborative learning and finally learning in 3D Virtual environments. While discussing all these different types of learning approaches for second language acquisition (SLA), possible challenges and advantages of each method are explored and reviewed in detail. The final section focuses on the relationship between these types of learning approaches, presenting current trends and some of the initiatives that combine them.

1.1 Background and description of the research

The 21st century has been named 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 3rd 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, Choo et al., 2017, p. 425). In the working, 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 environment they operate in - may that be political, social, economic and/or cultural. Creativity, critical thinking, collaboration, communication, ICT 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. In this context lie the roots of different types of learning practices that we are now going to introduce: project-based learning (PBL), telecollaborative learning and 3D virtual learning.

Project-based learning is a model of practice that organizes the learning around projects. Projects can be described as tasks based on challenging questions that involve students in design, problem-solving, decision-making or investigative activities while giving them the opportunity to work relatively autonomously over extended periods of time and while producing - sometimes collaboratively- realistic products (Jones, Rasmussen, & Moffitt, 1997; Thomas, 2000).

As Markham points out (2003), project-based learning emerges from two important developments over the past 25 years. On 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 behavioural models of learning - where traditional models of instructions were employed - 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, such as "workforce demands for high-performance employees who can plan, collaborate, and communicate" or the need for young people to "learn civic responsibility and master their new roles as global citizens" (Markham, Mergendoller et al. 2006, pp. 3,4). In this scenario, technology holds a central and crucial role offering wide 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. Technology integration into educational practices has been widely discussed in the social constructivist and connectivist theories where the

discussion focused on how pedagogy can be incorporated ‘mindfully’ and effectively into blended learning or digital education (Kineshanko & Jugdev, 2018; Kop & Hill, 2008; Siemens, 2005). The need for education to adapt to a changing world is at the core of PBL that aims to create new instructional practices that reflect the environment in which students and educators now live, learn and teach.

PBL means learning through experience. In PBL learning, students work often in groups to solve challenging problems that are authentic, curriculum based and often interdisciplinary. Because students are engaged in hands on, authentic experiences they learn the content more in-depth while taking the responsibility of 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 8 essential criteria should be met, specifically: 1) significant content, 2) a need to know, 3) a driving question, 4) student voice and choice, 5) 21st century skills, 6) inquiry and innovation, 7) feedback and revision and 8) publicly presented product (Ravitz, Mergendoller et al., 2012). Technology is central in PBL as it is the catalyst of the process itself. As will be discussed in more depth in sections 3.3 and 3.4, students use and integrate digital tools (such as 2.0 web tools, spreadsheets, word processor, database) into learning practices engaging with and performing specific tasks whereas teachers, on the other hand, may employ technology to monitor, assess and evaluate students’ work in a more creative, proactive (Solomon, 2003).

Telecollaboration is the second type of pedagogical practice analysed here. 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 (Helm, 2015). Telecollaboration has also been called Online Intercultural Exchange (OIE) (O'Dowd, 2007) and Internet-mediated Intercultural Foreign Language Education (ICFLE). 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’ ” (Helm, 2015, p. 197). In the education context, telecollaboration can be considered problem-based learning framed within a real context where telecommunication tools such as emails, chat, wikis, forum or other types of web communication are used (Makaramani, 2015). Technology is the mediational tool in telecollaboration; it is therefore central in the telecollaborative pedagogy and has an impact on interaction as participants engage with the technical as well as the social layer of interaction (Kern 2014).

The third type of pedagogical practice uses 3D Virtual learning environments. Three-dimensional virtual words are platforms that have been first developed for the purposes of entertainment and gaming, 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 to be 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 the users to design interactive environments with the preferred content (Omale et al., 2009). They also give 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 contents 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, being 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 .

1.2 Aims and Rationale

1.2.1 Key questions

The aims of this research have been distilled into the research questions presented below:

1. Affordances and Challenges of PBL, Telecollaboration and 3DVLEs: what does the research say?
2. What is the relationship between PBL, telecollaboration and 3DVLEs?
3. Investigating the effectiveness of Problem-Based Learning in 3D Virtual Worlds: what does the research say?
4. What are the trends in PBL, Telecollaboration and 3DVLEs research?

2. Methodology

This study employed a meta-analysis review method where concepts have been built from data previously analysed and coded (Glaser & Strauss 2017). The process started by retrieving a body of relevant studies through a "principled, replicable, and exhaustive search of literature" (Norris & Ortega, 2000, p. 430). 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 this review was to investigate the current projects and research defining the topics presented here, namely PBL, Telecollaboration and 3DVLEs. In order to access the initial body of the literature, keywords related to the topics were brainstormed and subsequently subject-word searches were conducted within Google Scholar, Linguistics and Language Behaviour Abstracts and the MLA International Bibliography**.** Reference sections of all the retrieved studies were then analysed for relevant research. After excluding duplicate study reports, titles and abstracts of the retrieved studies were read and categorized accordingly. Indeed, during a meta-analysis review, categories are developed via inductive analysis of the data. Possible relations between categories have been investigated and also, some categories may be adjusted and some others may be integrated or deleted according to the results of the analysis (Morris, 2008). Specifically the categories proposed were: (1) studies that are most likely relevant to the topics, and (2) studies that are clearly irrelevant (i.e., studies on biology, business etc.).

3. Foreign languages in the 21st century: The connectivism model

Learning and teaching in the 21st century are heavily affected by the predominant role of technology both in the academic and personal sphere. We can go even further saying that technology appears to affect the very nature of teaching and learning, changing the roles and paradigms of the traditional pedagogical system. The integration of technology into educational practice has had a rapid development in the past 20 or so years obliging the schools to "re-think" and renovate their pedagogical approaches and to avail and exploit new technological resources. There are high expectations of technology as, from a policy perspective, it holds the potential to sustain and promote competitiveness in the global market and, from an institutional one, it may lead to a profound transformation in education (Ottesen 2006; McGarr 2009; Hourigan, Murray et al. 2011). According to policy makers, the use of technology in schools should lead to significant educational and pedagogical outcomes, beneficial for both teachers and students (OFSTED 2002; European-Commission 2004). A large amount of research has shown that the use of technology in education can increase students' motivation and deepen understanding, promote active, collaborative and lifelong learning, offer shared working resources and better access to information, and help students to think and communicate creatively (Jonassen 2000; Webb 2005). The use of interactive multimedia software seems to motivate students and leads to improved performance; in fact, research shows that more students finished high school and many

more consider attending college where they routinely learned and studied with technology (BECTA 2004a). Many studies on the use of technology in education consistently found that students in technology rich environments experienced positive effects on performance in all subject areas and that technology inclusion would promote deep learning and allow schools to respond better to the varying needs (Barak 2006; Lau and Sim 2008). In addition, it has been claimed that due to the widespread use of technology the educational status of todays' students has changed and they are addressed as "Millennials" (Strauss and Howe 2000), the "Net Generation" (Tapscott 1999; Oblinger, Oblinger et al. 2005), "Generation Y" (Jorgensen 2003; Weiler 2005; McCrindle 2006) or "Digital Natives" in contrast with their teachers who are considered "Digital Immigrants" (Prensky 2001a).

Despite all the apparent benefits of the use of technology in educational environments, many studies have shown that the learning potential of technological tools is not fully exploited. Many schools, for example, tend to assimilate, rather than accommodate, new approaches to the use of technology (Higgins & Moseley 2001; Korte & Hüsing 2006; Lau & Sim 2008). It has been argued also that despite the changes in society as a result of technology, it is not widely integrated into the educational system and, where it is present and available, there is no evidence that it has affected teaching approaches (Levin and Wadmany 2005; Ertmer and Ottenbreit-Leftwich 2010). Research indicates also that although home access to technology has been growing rapidly both for teachers and students and the technological infrastructure in the schools has improved considerably in the past few years, teachers do not appear to make great and effective use of technological tools in their instruction (BECTA 2004a).

Second language acquisition (SLA) is a complex process that refers to and reflects on how people learn a new language. Various hypotheses and theories on how such acquisition occurs have been offered by researchers working in different fields such as linguistics, sociolinguistics, psychology, neuroscience and education (Chambers, Conacher et al. 2004; Blin 2005; Levy & Stockwell 2013; VanPatten & Williams 2014). Each of these theories, specifically behaviourism, cognitivism, constructivism and connectivism, captures a different aspect of the language learning process, however, not one in particular has been widely accepted as being predominant amongst researchers.

It is important to highlight that most of the SLA theories mentioned above were developed in a time when learning was not strongly impacted by technology with the exception of connectivism, which focuses on Internet technologies and the new opportunities created to learn and share information across the World Wide Web. Table 1 illustrates how connectivism compares to other learning theories and how it differs from established paradigms.

	Behaviourism	**Cognitivism**	**Constructivism**	**Connectivism**
How does learning occur?	Black box-observable behaviour main focus	Structural, computational	Social, meaning created by each learner (personal)	Distributed within a network, social, technologically enhanced, recognizing and interpreting patterns

What factors influence learning?	Nature of reward, punishment, stimuli	Existing schema, previous experiences	Engagement, participation, social, cultural	Diversity of network
What is the role of memory?	Memory is hardwiring of repeated experiences- where reward and punishment are most influential	Encoding, storage, retrieval	Prior knowledge remixed to current context	Adaptive patterns, representative of current state, existing in networks
How does transfer occur?	Stimulus, response	Duplicating knowledge constructs of "knower"	Socialization	Connecting to (adding nodes)
What types of learning are best explained by this theory?	Task-based learning	Reasoning, clear objectives, problem solving	Social, vague ("ill-defined")	Complex learning, rapid changing core, diverse knowledge sources

Table 1 Situating Connectivism (Ireland, 2007, p.7).

Connectivism, promoted by Downes and Siemens, seeks to explain complex learning in a rapidly changing digital society. According to the connectivist model, knowledge, which can be stored in a variety of digital formats, is distributed across networks and learning, defined as "actionable knowledge", and consists of the ability to construct and work within those networks (Downes 2012; Siemens 2014). Both cognitive and affective domains contribute to the learning process in a significant way. As illustrated by Siemens (2005, p. 4), the main principles of connectivism are the following:

- Learning and knowledge are based on a diversity of opinions;
- Learning is the process of connecting specialized nodes or information sources;
- Learning may reside in non-human appliances;
- The capacity to know more is more critical than what is currently known;
- Nurturing and maintaining connections is needed to facilitate learning;
- The ability to identify connections between concepts is important;
- Maintaining current and accurate knowledge is the purpose in connectivist activities;
- Decision-making is a learning process as information can change and what is viewed as correct one day may be incorrect the next.

Connectivism focuses specifically on two important skills that contribute to learning which are the ability to seek out current information and the ability to filter secondary and unimportant information. The ability to make decisions and be critical on the basis of information having been acquired is considered an essential part of the learning process. In connectivist learning the role of the teacher is to guide students among the load of information available (mainly on the Web) answering key questions as needed and encouraging them in sharing and discussing the information gained. Connectivist theory expresses the importance of open learning for a new learning society where:

> The ethic of learning is collaborative, global and universal. It is collaborative in that learners need to work with each other. It is global in the sense that every society has a contribution to make and a responsibility to each other. And it is universal because every part of a society must invest in learning and participate. (Cisco report 2010, p. 1)

In 2008, Siemens and Downes delivered an online course called “Connectivism and Connective knowledge” which was free and open to anyone who wished to participate initiating in this way the phenomenon of massive open online courses (MOOCs). The main features of a connectivist MOOC are that it is open to anyone who wants to enrol, it uses open software and systems across the Web to facilitate learning and sharing and it takes place primarily online for a designated period of time. There are facilitators that guide the MOOC and the participants are responsible for what and how they learn and share (Bárcena, Read et al. 2014). MOOCs can play an important and valuable role in secondary school education as a means to increase participation, enhancing students’ learning and improving outcomes on existing courses. Connectivist theory assumes a particular importance in this research as by focusing on teaching and learning dynamics in digital worlds, it represents a significant theoretical framework in which to analyse tools, perceptions, use and practices of today’s students and teachers.

3.1 Teacher's role

The impact of new technologies and the Internet 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, as summarized in Table 2 below.

In the last two decades, traditional pedagogical methods have been heavily criticised for putting too much emphasis on the content being taught and too little emphasis on what learners bring to the classroom concerning this content. It also happens that some of this content might be outdated due to the fast changes in knowledge at many levels. While traditional school learning has been increasingly disconnected from the kinds of learning situations that characterise activities and problems that learners encounter outside of school (Nagel 1996; Makrakis 2008), new pedagogy focuses more on providing experiences in authentic versus decontextualized environments and promoting learning processes versus learning outcomes (Choi & Hannafin 1995). In this context the teacher’s role and competencies have changed. As Makrakis argued (2008), teachers have to see themselves more as facilitators and mentors, as resource and technology coordinators and as curriculum developers. Teachers as “facilitators and mentors” will guide students’ critical and creative thinking in collaborative learning environments; teachers as “resource and technology coordinators” will have to develop searching skills to their students and make use of multiple resources and finally, teachers as “curriculum developers” refers to teachers who critically assess school knowledge and reorder and enrich it according to the principles of new pedagogy supported by technology.

Traditional Pedagogy	New Pedagogy supported by technology
Linear Presentation	Hypermedia presentation
Receptive Learning	Self-paced learning
High Teacher Control	High Learner Control
Limited Resources	Unlimited and updated resources
Focus on what to learn	Focus on how to learn
School learner	Life-long learner
End-task assessment	Authentic assessment
Expository teaching/learning	Scaffolding teaching/learning
Uni-perspective learning	Multi-perspective learning
Monologic/Uncritical	Dialogic/Critical
Absolute truth/answers	Relative truth/answers
Focus on observable behaviour	Focus on personal/social meaning
Directed goals/content	Negotiated goals/content
Learning by observing	Learning by doing/discovering

Table 2 Traditional pedagogy versus new pedagogy supported by technology (Makrakis 2008, p.2).

Overall, teachers are now required to develop suitable skills related to the new learning contexts and paradigms; their role expands to various and challenging settings, allowing them to become a guide of the autonomous learning process, a researcher and a designer of suitable learning scenario, 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 (Taalas, Tarnanen et al. 2008; Stickler and Hampel 2015).

As indicated above, the teachers' role in technology-based learning settings is not an easy one; it is in fact crucial that they acquire instruction regarding the design and implementation of online courses, the orchestration of Web-based instructional processes and the development of management skills (Garrett 2009; Levy 2009; Levy and Stockwell 2013; Stickler and Hampel 2015). On-going teacher training together with the creation of suitable instructional spaces becomes fundamental to enabling teachers to successfully integrate technology into their practice. It is important to consider the fact that when ICT is introduced in a learning environment, this does not necessarily mean that the pedagogical practice in place will change. Rather, as Hallissy, Butler et al. (2013) suggested: "ICT use in education is inextricably linked with understandings of the nature of knowledge and the nature of knowing" (p.7). Various studies have shown that teachers' attitudes and pedagogical orientation towards technology have a significant influence on how technology is actually employed in the classroom (Becker 2001; Plomp 2003; Law, Pelgrum et al. 2008). In addition, it has been shown that constructivist approaches to teaching strongly facilitate technology integration compared to more traditional ones (Higgins and Moseley 2001; Shear, Means et al. 2009). According to Hallissy, Butler et al. (2013): "when teachers' pedagogical orientations are driven by understanding of 21st century learning, they take on a more facilitative role, provide-student centred guidance and feedback and engage more frequently in exploratory and team-building activities with students" (p.8).

PBL, telecollaboration and 3D virtual learning environments, offer teachers the opportunity to act as facilitators 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; Pennock-Speck, Clavel-Arroitia, 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: organisational, pedagogical and digital. The first category refers to the organiser, facilitator and course or task designer as well as reflective practitioner including this skill 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 organiser, explaining students the objectives and outcomes of the different learning approaches. The third category of competences addresses the digital skills of which teachers need to be equipped with. This requires teachers to be knowledgeable in digital communication and responsible for specific technical aspects. Because 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, filtering, collecting and evaluating online information (Dooly, 2010; Hockly & Dudeney, 2014; Cottrell, 2017).

3.2 Students' role

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-centred forms of delivery to a more active and student-centred 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 toward mutual understanding (Kern 1996). Traditional approaches to teaching and learning are usually based on pre-packaged learning materials, fixed deadlines and assessment tasks designed by teachers. The reality, however, shows that today's students perceive little value in the absorption of factual information, given the accessibility and ease of use of search engines and web-based reference sites such as Google and Wikipedia (Berg, Berquam et al. 2007). Moreover, students are now very much in control of online content and, as members of the open and interactive culture of the Web, are capable of being both producers and consumers of knowledge using a variety of accessible tools that empower them to develop and share ideas (Klamma, Cao et al. 2007). Prensky (2001a) and others (Tapscott 1999; Oblinger, Oblinger et al. 2005) go even further arguing that because today's generation of young people have been immersed in a world infused with technology they behave and learn differently from their predecessors. It is claimed that they think differently, they exhibit different social characteristics and they have different expectations about life and learning. The new generation of students, according to them, are said to prefer receiving information quickly, relying on communication technologies for accessing information and interacting with others, favouring active rather than passive learning, being often proficient in multitasking and having low tolerance for lectures.

It can be said that technology, by its very nature, is a tool that incites and supports independent learning therefore, students working with new technologies are encouraged to take responsibility for their own learning, becoming more aware of the process itself and of the knowledge they acquire. According to Dubreil (2006), learners today have specific characteristics and roles, they are in fact described as "active participants", "researchers", "ethnographers" and "authors". Active participation is one of the main features of modern students. As mentioned before, they do not gain knowledge only from their teachers but also from the collaboration and interaction with others, and the teachers act as facilitators of this learning process. Learners behave nowadays as researchers, they express in fact their curiosity by looking for and collecting information and consequently they develop hypotheses for future meanings. Learners act also as "ethnographers" by studying "the qualitative description of human and social phenomena" (Ibid., p. 254). Finally, students may assume the role of authors producing their own work that can be easily shared.

Overall, the role of modern students reflects the constructivist paradigm where the teaching is based on the belief that learning occurs as learners are actively involved in a process of meaning and knowledge construction as opposed to passively receiving information. Constructivist teaching fosters critical thinking, and creates motivated and independent learners. In practice, teachers relinquish control of the class and learners are the makers of meaning and knowledge under their guidance (Dubreil, Ducate et al. 2006; McLoughlin & Lee 2008). This being said, it is important to underline that the role of the modern student is strictly related to the modern learner–centred pedagogy which is also at the core of learning practices here proposed (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 knowledge practice, new processes of inquiry, dialogue and connectivity (Murray, Hourigan et al. 2005; Beetham and Sharpe 2013). Practices underpinning effective, innovative pedagogy will differ according to the subject areas but they are likely to include the following central elements (McLoughlin and 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

4. Project-based learning (PBL)

Project- Based Learning (PBL) has been defined 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” (Markham et al., 2003, p. 4). PBL focuses on students’ activities where students are actively involved in the planning, designing and implementing of projects in real life situations while collaborating with their peers and teachers who provide also scaffolding for their learning. PBL is therefore an inquiry-based instructional approach build around a learner-centred 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 slower in the integration of PBL into their practices (Lee, Blackwell,et al., 2014). Because the different approaches undertaken in educational settings, when referring to PBL there is a natural link to Problem-based Learning (PrBL). As a matter of fact both PrBL and PBL are similar yet quite different in conceptualization (Savin-Baden, 2000). PrBL and PBL are inquiry learning approaches that encourage an action-oriented model to engage students in complex and critical thinking. Their similarity derives from the fact that the learning activities are organized around achieving a shared goal (project) (Savery, 2015). It is important to say that in this context, PBL is presented as a specific method of PrBL where 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 a specific criteria to implement PBL learning 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; 6) various forms of both formal and informal *assessment practices* are integrated within the PBL approach. These 6 features of the PBL approach shows 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, as an inquiry based instructional approach, stimulates 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 finding 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 (PBLL) (Fried-Booth, 2002; Beckett, 2006; Stoller 2006). As indicated by Dooly (2013), PBLL 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 PBLL. Referring to PBLL 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.
In the next two paragraphs, the benefits and challenges of PBL will be examined and addressed in detail.

4.1 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) 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 centres 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, student participants in Grant's study (2009) 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.

On the website for the PBL Initiative (http://www.pbli.org/pbl/generic_pbl.htm) Barrows listed in details the set of Generic PBL Essentials, specifically:

- Students must have the responsibility for their own learning.
- The problem simulations used in problem-based learning must be ill-structured and allow for free inquiry.
- Learning should be integrated from a wide range of disciplines or subjects.
- Collaboration is essential.
- What students learn during their self-directed learning must be applied back to the problem with reanalysis and resolution.
- A closing analysis of what has been learned from work with the problem and a discussion of what concepts and principles have been learned are essential.
- Self and peer assessment should be carried out at the completion of each problem and at the end of every curricular unit.
- The activities carried out in problem-based learning must be those valued in the real world.
- Student examinations must measure student progress towards the goals of problem-based learning.
- Problem-based learning must be the pedagogical base in the curriculum and not part of a didactic curriculum.

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, time management skills etc. can be fostered and enhanced in order to engage effectively and successfully with today's globalized society.

4.2 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 behaviour, to the use of technology, and to the assessment and support of student learning. On a practitioners 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 go through the feasibility of the projects. 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 one of 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 students may struggle to discern their roles in a PBL classroom, especially when it comes to accepting responsibility for their own learning (Bickford, Tharp, McFarling, & Beglau, 2002; 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 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 (Savery, 2015).

5. Telecollaborative learning

Telecollaboration, known also as Online Intercultural Exchange (OIE) (O'Dowd, 2007), Internet-mediated Intercultural Foreign Language Education (ICFLE) and, more recently, Virtual Exchange (O'Dowd, 2018), 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 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" (Belz, 2003, p. 2). Similarly Guth and Helm (2012) years later proposed their 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 communicative tools to enhance language, intercultural, communicative and digital competences while fostering learners autonomy. Within this context, telecollaboration offers also the opportunity for institutions to develop their internationalization strategies by 'globalizing their curriculum' (Helm, 2015). Telecollaboration 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 it will be outlined later, have integrated and combined those tools according to the different and most current technological developments.

Telecollaboration has been the subject of extensive research based mostly on individual projects and studies carried out at third level 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 telecollaboration 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 add-on activity that is not being fully integrated into foreign language programmes" (p. 198). However, because the extensive literature on telecollaboration, the following section will briefly review the research related to the following domains: telecollaboration and educational environments; the languages in use in telecollaborative projects; the role of technology as a mediation tool and tasks in telecollaborative projects.

Research on telecollaboration 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; Ramírez Verdugo & Alonso Belmonte, 2007; Tolosa, East, & Villers, 2015). Among the reasons to 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 the oral interaction when telecollaborative tasks with other speakers are in place (Dooly & Sadler 2016). Another issue may be the teacher's digital competence and understanding of the relevance of CMC (Computer-Mediated Communication) platforms and CALL (Computer-Assisted Language learning) 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 computer interaction where learners advance from more simple to

more complex tasks without a consistent and effective interaction with the peers performing in the same virtual environments. In addition, 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 (Ibidem, 2016).

Literature on telecollaboration offers a great number of studies that employ the most commonly taught languages in their exchange programmes being English the most popular followed then by French, German, Spanish and Italian (Helm, 2015). In 2003, Belz addressed the lack of research on telecollaboration 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 & Dembovskaya, 2013). Various telecollaborative projects (i.e. Cultura project, eTandem project) are based on the bicultural/bilingual model where the "native speaker" is considered the ideal interlocutor and 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).

Telecollaborative 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 say 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 telecollaboration nowadays utilize synchronous tools solely or in conjunction with asynchronous CMC tools to maximize technological affordances (Cunningham, 2018). Synchronous communication is said to help participants to be more motivated and engaged with the task to be completed while fostering effective collaboration among peers (Lee, 2006; Tudini, 2003; Canto, Jauregi & van den Bergh, 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 mediation role of technology has been analysed by researchers also 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 and shifting then from second language learners to active second language users (Thorne, Black & Sykes, 2009; Thorne, Cornillie & Piet, 2012; Lee, 2018).

Telecollaborative projects employ generally a task-based approach and, in this regard, an extensive literature looked into 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 more specifically the outcomes of

specific tasks and their impact on participants. Harris (2002) 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. *Problem Solving* activities are those that involve the promotion of critical thinking, collaboration, and problem-based learning.

Few years later, O'Dowd and Ware (2009) documented 12 different, frequently recurring tasks used by intercultural telecollaborative 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 ones especially for those teachers with poor technology competency (O'Dowd and Ware, 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 as well as a mutual respect of deadlines (Guth & Helm 2010) which make the task particularly complex for both teachers and students.

After having analyzed the telecollaborative learning approach and what it entails, the following paragraph will focus on its affordances as examined by the current literature.

5.1 Affordances of telecollaboration

Over the years, different studies have shown enough evidence of how telecollaboration contributes in linguistic development (Belz, 2007; Guth & Helm, 2010 Chun, 2015), sociolinguistic and pragmatic competence (Guth & Helm, 2010; Chun, 2011), motivation (Jauregi, 2015), intercultural competence of the learner and practitioner (O'Dowd, 2011; Lee & Markey, 2014) as well as digital competence (Hauck, 2007; Guth & Helm, 2010). In addition, student autonomy increases when taking part in telecollaborative practices (O'Rourke, 2005) and collaborative learning is greatly fostered (Belz, 2005; Dooly, 2008). As Kinkinger (2016) states, telecollaboration has the potential to contribute to different aspects of the 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 telecollaborative exchange, students from different cultures and in different locations establish a virtual relationship during the time that the telecollaborative practice lasts. Indeed, participants embrace a different kind of learning experience that provides them opportunities to engage in international online communication in ways that do not typically get enacted in a conventional language setting. As outlined above, in the telecollaborative 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, 2014) and third level (Helm, 2015) shows that telecollaboration has the potential to globalize the curriculum while meeting and strengthening its established learning goals. This is in perfect line with the

increased demands for 21st century paradigms and skills and, moreover, global communication.

5.2 Possible challenges in telecollaboration

As for other models of instructions, the telecollaborative 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 (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, expectations as well as the stereotypes that they may have and bring into the classroom in general and into the virtual exchange in particular. 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 dynamics. The social-institutional level refers to the technologies mediating the process, the general organization of the module that students are undertaking (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 literature (2006). Finally, the interaction level addresses the differences in communication and behaviours referring, for example, to the use of humour, non-verbal communication, being more or less open and/or direct during the virtual exchange. However, many studies agree on the fact that the greater challenge on an interaction 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 telecollaborative communication have been singularly identified and examined by the researchers, a combination of these factors is more likely to create a challenging environment for the telecollaborative experience.

When it comes to challenges that may be encountered during a telecollaborative project, the role and the skills required for the teachers involved have often been discussed. It has been in fact indicated that many issues can be avoided if teachers communicate prior to an exchange discussing planning, task design and specific course needs while trying to understand their respective contexts (Helm & Guth, 2016). In addition, research indicates teachers may be prepared to support and facilitate discussions about generic cultural differences but they may be not as prepared to facilitate students at a deeper level of interaction tackling issues that may be also of a sensitive nature (Ware 2005; Helm, & Guth, 2016). 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 telecollaborative experience.

6. 3DVLEs learning

Three dimensional (3-D) 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 a "virtual 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 remarkable interest and that interest was subsequently renewed by the rise of augmented reality applications such as Pokémon Go and SoundPacman (Chatzidimitris et al. 2015; Serino et al. 2016).

The potential of using 3-D games and virtual environments for teaching and learning has been widely acknowledged among educators and educational institutions throughout the world (de Freitas, 2006; Bell, 2009; 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 the 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 provide a set of tools for recreating real world objects and experiences that can be expanded as much as imagination and technology allow. 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).

6.1 Affordances of 3DVLEs learning

3DVLEs are very effective learning spaces where formal and informal learning can be created and effectively employed (Panichi & Deutschmann, 2012; Thomas & Schneider, 2018). These multi-users 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 be also 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 in their work (2010) identified a set of contribution that can potentially arise from tasks conducted in 3DVLEs environments. Specifically, the authors describe 5 unique affordances characterizing these educational settings (See Figure 1):

1. 3-D VLEs can be used to facilitate learning tasks that lead to the development of enhanced spatial knowledge representation 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. 3-D VLEs 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. 3-D VLEs 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 in the flow theory, is strictly related to meaningful learning, deep cognitive processing and academic performance (Corno & Mandinach, 1983; Csikszentmihalyi, 1990; Fullagar, Knight, & Sovern, 2013).

4. 3-D VLEs can be used to facilitate learning tasks that lead to improved transfer of knowledge and skills to real situations through contextualisation of learning.

3-D technologies can offer realistic and interactive settings consistent with the real world hence, concepts learnt within a 3-D 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. 3-D 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 the possibility to engage with and carry out tasks together while maybe collaborating in the creation of a joint products. Mennecke, Hassall and Triplett (2008) report on how students undertake a scavenger hunt activity in SL, in which they explore the virtual world as they embark on a mission to discover interesting places and practise basic SL skills. To complete the tasks, students have to retrieve information, decipher hints and 'teleport' to the location of the item they are searching for. The activity requires students to work in teams, while communicating and coordinating throughout the process.

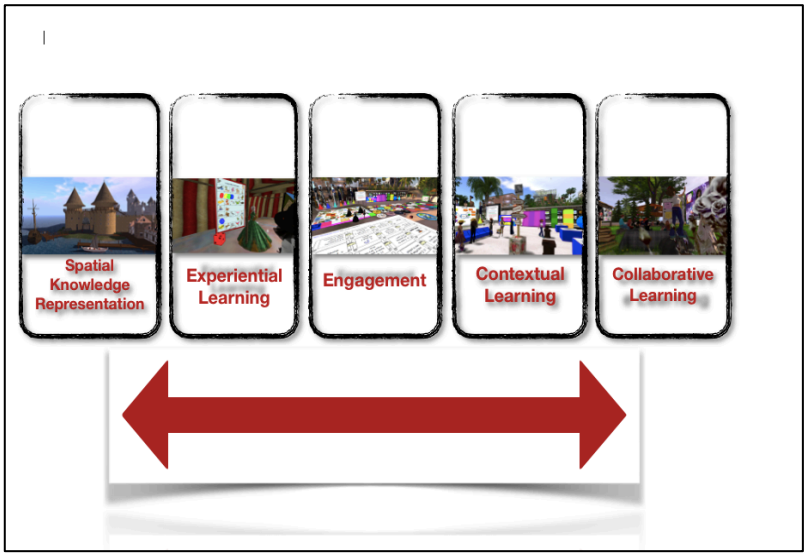

Figure 1 The 5 unique affordances of 3DVLEs (Dalgarno & Lee, 2010) for the GUINEVERE project.

In 3DVLEs a student-centred model of instruction can be fostered as constructivist and problem-based pedagogies can be easily implemented. 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" (Polka, 2001, p. 55). 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, 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" (Moore, Fowler & Watson, 2007, p. 46). 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 in instructional processes (Cheryan et al. 2011; Prasolova-Førland 2008).

6.2 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 strong internet connection and hardware as well as support in terms of cost. 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 a land which is necessary in order 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, they have been 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 behaviour by other players (Kluge & 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 3D VLEs (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 play video games, may spend their time in activities not very much 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 (Dede 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 to the use of 3D VLEs (Eschenbrenner, Nah & Siau, 2008).

7. PBL, Telecollaboration and 3DVLEs: current trends and initiatives

This section focuses on the description of various projects and initiatives where multimodal approaches have been employed to learn and practice language, digital and intercultural skills. Specifically, the projects here selected used a telecollaborative approach combined, along with other educational practices, with 3D virtual environments as a synchronous communication mode of instruction. By describing and comparing these projects, this study aims to answer the proposed research question - What are the trends in PBL, telecollaboration and 3DVLEs research? - while discussing possible gaps in the research and contributions that can be proposed. The value of combining different pedagogical practices has been critically pointed out by Hoffstaedter and Kohn (2015) which 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 background to collaborate and create content together. Specific projects where such methods of instruction have been employed, were selected and are described in the section below.

The first project presented is the TILA project (Telecollaboration for Intercultural Language Acquisition). This is a European educational project (http://www.tilaproject.eu) within the Lifelong Learning Programme that focuses on: innovate and enrich foreign language teaching programmes by encouraging the use of telecollaboration activities among European secondary schools; support teachers in their efforts to integrate digital and telecollaborative tools and activities into their teaching practices while developing their digital, intercultural and organizational competences; examine the added value of telecollaboration for language learning in relation to intercultural awareness, motivation and communication amongst young learners (Jauregi, Melchor-Couto & Vilar, 2013). The TILA project employs different telecollaborative tools for both synchronous and asynchronous modes of instruction. In the synchronous modes, digital activities and games in 3D virtual worlds have been employed together with chats and video communications. Whereas in the asynchronous mode, wiki and forum have been used. One of the main areas of research within the project is task based learning and the relationship between the task developed and the activities that learners carried out in the telecollaborative sessions. The project run from January 2013 to 2015.

The second project presented is the TeCoLa project (Pedagogical Differentiation through Telecollaboration and Gaming for Intercultural and Content Integrated Language Teaching). The project (https://sites.google.com/site/tecolaproject/background/project-summary) was funded by the European Commission within the Erasmus+ programme and its aim is to develop and validate innovative gamified telecollaborative approaches for secondary schools. At the core of the TeCoLa project there is the investigation and validation of authentic, task-based telecollaborative process among peers of different socio-cultural, educational, and language backgrounds. The project proposes also a multimodular 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 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.

A project that aims at both primary and secondary level is 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 it has then been integrated in Erasmus+ since 2014. The eTwinning project aims to promote and support collaboration between schools through technology, providing tools and services. Specifically, this 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 offers opportunities for free and continuing online professional development for educators (Papadakis, 2016).

More recently, the Erasmus+ Virtual Exchange (EVE) programme has been launched (https://europa.eu/youth/erasmusvirtual/about_en) which aims to expand the scope of the Erasmus+ programme via virtual exchanges. During 20018, the EVE programme aims to engage over 8000 participants from Europe and the South-Mediterranean area to create a safe online community where young people can increase their linguistic, intercultural, digital and communicative competences. This programme, currently implemented by a consortium of organisations led by Search for Common Ground and which includes UNICollaboration,

offers learners the opportunity to participate in various and engaging virtual exchange initiatives (O'Dowd, 2018).

The TILA, TeCoLa, eTwinning and EVE projects have the common purpose to internationalize education by integrating telecollaborative approach in schools and to diversify teaching and facilitating content integrated language learning by using digital tools (serious games and virtual worlds in the case of the TILA and TeCoLa projects). These projects offer conditions and settings where to foster intercultural communicative competences, experience real-life communication, develop collaborative and personalized learning and exploit the endless possibilities of web 2.0 applications. Furthermore, these projects aim to offer educational material to practitioners as well as empowering and supporting teachers on the use of telecollaboration and gamification for in their practices. In this regard, it is important to highlight that in the case of the TeCoLa project, teachers shown little experience with the digital tools proposed by the project (video communication, chats, digital games), especially with virtual worlds indicating also video communication, being the tool with whom they were more familiar with, as the most valuable for dealing with diversity, promoting intercultural awareness and communicative competence (Jauregi, & Melchor-Couto, 2017). The eTwinning project is the only one targeting both primary and secondary schools, however, it does not seem to make regular use of virtual environments and serious games as it is the case of the TILA and TeCoLa projects. Task-based learning as opposed to project-based learning is at the core of these project. It was recently stated by Colpaert during a TeCoLa project conference that: "There is not enough evidence to suggest that technology has a direct effect on learning not even virtual worlds, not even games. My hypothesis is that the added value of technology depends on the design of your learning environment on the one hand and the task design on the other".

8. Conclusion

This review of the literature provided a critical overview on the current research on teaching and learning in the 21st century and specifically on project-based learning (PBL), telecollaborative learning and learning in 3D Virtual environments as interactive, immersive and collaborative pedagogical settings. The review was guided by research questions which were addressed in depth in the topic-related paragraphs. The review started discussing the role and contribution of technology into the educational field addressing the features and the skills required for both teachers and students in order to engage and work effectively in the current *connectivist* environment. Consequently, 3 selected methods of learning, namely PBL, telecollaboration and 3DVLEs, have been discussed in relation to their affordances and potential challenges. According to the research examined, all the learning methods proposed allow learners to develop specific competencies including motivation, autonomy, collaboration among peers, digital competencies 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 into their teaching practices. Teachers need in fact to take part in ad-hoc teachers 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 the institutions is crucial for the success of the proposed learning processes. Finally, research shows that the current educational scenario where PBL, telecollaboration and 3DVLEs are implemented as models of instruction is extremely prolific as the TILA, TeCoLa, eTwinning and EVE projects, among others, demonstrate. After an analysis of these projects, it can be stated that at the core of them there is the common purpose to internationalize education by integrating these approaches in educational settings and to diversify teaching and facilitating content by using digital tools. This is perfectly in line with the requirements and the development of the 21st century paradigms and skills and, moreover, global communication.

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