VIRAL SKILLS COMPENDIUM

*Fostering **Vi**rtual **R**eality applications*
*within **A**dult **L**earning*
to improve low skills and qualifications

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Introduction

The trend of digitalisation has entered all levels of public and private life and is also revolutionising adult education and training. According to the Forbes Magazine especially technologies like Virtual Reality (VR) will transform teaching and learning processes to a large extent in the near future. This is connected with recent technical advancements which make this medium not only cheaper but also more efficient and viable for practical use. Nevertheless, until today no comprehensive practical guidelines or pedagogic compendium for the application of Virtual Reality in adult education was developed.

With the **Viral Skills Compendium** the international team from Austria, Cyprus, Germany, Ireland, Italy, and Spain of the Erasmus+ project VIRAL SKILLS aims to support managers and teachers within adult education to tackle the challenges of implementing VR within adult learning. Based on an initial research approach (see "Viral Skills Survey Report of VR Applications") where existing and emerging hard- and software technologies in Virtual Reality have been analysed, important technical as well as pedagogical information has been gathered in order to provide a comprehensive guide on how to apply VR in the best possible way within adult education in general and in particular within training for low-skilled and low-qualified adults.

In this context the ***first chapter*** of the Viral Skills Compendium will provide a technical introduction of VR summarizing the main outcomes of the Viral Skills Survey about the state of the art in Virtual Reality.

The ***second chapter*** will constitute a comprehensive pedagogical part. This main chapter will not only present relevant information about the state of the art of academic discussions concerning Virtual Reality in education and adult education in particular. Further, it will also offer key questions, guidelines as well as recommendations which should guide adult educators and especially those working with low-skilled/-qualified learners when setting up a VR training course in their educational contexts.

In order to gain insight into developments, trends and standards concerning Virtual Reality in education inside and outside of Europe a Country Comparison is provided in ***chapter three***.

In connection with the compendium development also a qualitative survey within adult education providers was implemented. The survey aimed to gain an impression of educators' frameworks, needs, demands as well as of their fears, doubts and reservations concerning the use of IT applications in general and when thinking specifically of VR in their classes. The results of this survey will be presented in the ***fourth chapter***.

Besides the compendium another core element of the Viral Skills project is the "Viral Skills E-Thek". This E-Thek is a compilation of more than 25 selected free VR software applications and VR learning programmes which are recommended by the partnership for adult learning settings in general and specifically for activities with low-skilled and low-qualified learners. All selected VR applications have been intensively tested and analysed and are described in so called "VR application profiles". The comprehensive Viral Skills E-Thek and its Software Introduction can be found in the annex of the compendium.

1 Technical Introduction to VR

Virtual reality (VR) soft- and hardware solutions are gaining importance in many different sectors of society. Various technologies have already been implemented into regular processes within several industries pathing the way for future work within the educational environments. Nepal and Tang (2017) suggest, that "today the Virtual Reality technology is applied to advance fields of medicine, engineering, education, design, training, and entertainment. VR is a computer interfaces which tries to mimic real world beyond the flat monitor to give an immersive 3D (Three Dimension) visual experiences. Often it is hard to reconstruct the scales and distances between objects in static 2D images. Thus, the third dimension helps bringing depth to objects."

Academic literature provides many different definitions for the phenomenon of VR. Reasons for a different understanding of the term lie in different user environments and settings, various areas of application and foci on different aspects of ergonomics. Luckey (2012), founder of Oculus VR and developer of the Oculus Rift system, indicates that VR is best understood as a stereoscopic perspective with increased visual range, which creates a feeling of diving into a different world. The feeling is often described as *immersion* which Sherman and Craig (2002) pinpoint as one of four key elements in the formation of a true virtual experience. Yet, for a true immersive impact, further elements are important; the virtual world itself, the sensory feedback and interactions between the elements of the virtual world and the user. These elements are key in forming a true virtual reality. Contrary to a true perception of reality, VR allows the user to choose and change between different positions (within the virtual world) and points of view on elements of the virtual world. By doing so, events or occurrences of the story within the virtual world be actively be influenced and co-created (Zobel et al., 2018 and Sherman and Craig, 2002).

The main difference between Virtual Reality and other environments, such as Augmented Reality devices, are the completely shut cases and the lenses, which are adjusted in front of the various screens – two criteria, which are considered as important in fully immersing into the virtual world without being interrupted by light effects of the real world (Zobel et al., 2018).

Woodford (2019) further outlines, that a Virtual Reality experience is distinguished from a usual computer experience by the system of in- and output. While, for computer-based experiences, input follows on the submission of signals via a keyboard, a mouse or, more advanced, speech recognition, VR technologies use

sensors for detecting body movements. The output is displayed on one single screen in a computer-based environment. Instead, Virtual Reality uses two screens – one for each eye, and further incorporates sounds (e.g., via head-mounted systems) and haptic feedback via controllers of the head-mounted system for a more realistic and immersive experience.

Woodford (2019) summarizes, that, essentially, "Virtual Reality needs to be:

1. **Believable:** The user really needs to feel like being in a virtual world to keep believing that, or the *illusion* of Virtual Reality will disappear.
2. **Interactive:** While moving around, the VR world needs to move simultaneously".
3. **Explorable:** A VR world needs to be big and detailed enough for the user to explore. Although, as Woodford (2019) further pinpoints, a painting can be realistic as well, it only illustrates one scene, from one perspective. A book can also transport the reader into a "virtual world," but the user is essentially only able to explore this world in a linear way. Additionally, Woodford (2019) suggest, that VR needs to be:
4. **Immersive:** To be both believable and interactive, VR needs to engage both, the user's body and the user's mind. Paintings by artists can give the observer a glimpse of a scene or historic event, but the viewers can never fully convey the sight, sound, smell, taste, and feel of that scene or event.
5. **Computer-generated:** Only powerful machines, with realistic 3D computer graphics, are fast enough to create believable, interactive, alternative worlds that change in real-time as the user moves around them".

1.1 Virtual Reality in the educational sector

Digitalisation trends have reached the field of education and are revolutionising teaching and learning processes on all educational levels. One of the core aims of the Viral Skills project is to integrate innovative technological approaches into the areas of adult education and to facilitate and increase the widespread utilisation of VR technology in this field, especially as a potentially motivating medium for low-skilled and low-qualified adults.

By conducting an international survey about the available and emerging VR technologies and leading interviews with VR experts in all partner countries, relevant findings and assessment about the applicability of VR technologies in educational area were gained.

In total, 13 hardware systems (Oculus Rift, HTC Vive, HTC Vive Pro, Samsung Odyssey, Lenovo Explorer, Dell Visor, Acer AH 101,Samsung Gear, Google Daydream, Oculus Go, Lenovo Mirage with Daydream, Oculus Quest) were evaluated with respect to their suitability to the aims of the project, with respect to their presence on the market, their various supporting media, the average purchase costs, hard- and software required, technical specifications, functionality, simplicity & handling and accessibility. Following overview subdivided into 3 main areas allows to get a deeper insight into the topic:

1. PC-Based VR Devices

According to the various technical elaborations of PC-based VR devices general commonalities, differences, advantages and disadvantages do exist. In comparison to the other devices, the HTC Vive and the HTC Vive Pro are the most expensive solutions. However, in terms of quality, performance, functionality and simplicity both devices offer outstanding capabilities. The average purchase costs for the Oculus Rift are reasonably low; however, in terms of performance, hardware requirements and functionality the device does not offer evenly high standards like the HTC solutions. Yet, it is proposed that the Oculus Rift offers a better price – performance – ratio. Both, the HTC systems as well as the Oculus Rift can be used on various VR software environments such as Windows, MacOs and Linux. Instead, Dell, with their Visor solution, the Lenovo Explorer, the Samsung Odyssey and the Acer AH 101 are based on Windows Mixed Reality, which Milgram and Kishino (1994) define as a "reality spectrum" ranging between pure "reality" (without computer intervention) and pure "Virtual Reality" (a computer-generated environment). MR is any environment that incorporates aspects of both ends of this spectrum, such as overlaying virtual objects on top of a user's field of view of a real space. Devices using Windows Mixed Reality software are, according to industry experts, easier to set. Yet, in terms of overall performance Windows based solutions are suggested to be in an inferior position to all other manufacturers.

2. Smartphone-Based VR DEVICES

Smartphone-based VR solutions offer a stereoscopic vision by use of a smartphone, which is used as VR display, for example, by clipping the smartphone into a headset or a cardboard solution. With reference to the technical elaborations of the project partners the Samsung gear currently offers the best performance amongst smartphone-based VR devices. Although Google's cardboard solutions offer a wide range of possible applications, it is, in technical terms, not an actual VR device, but more an enhancing gimmick that enables phones to give a VR-like experience. The Google Daydream View database is rather small in comparison to the Cardboard database. Yet, it offers a steady performance. In comparison to pc-based VR devices, smartphone solutions' major advantage is the ability to use and experience VR services anywhere at any time. Additionally, assuming a smartphone is already available, smartphone solutions are comparatively cheap by contrast with pc-based and stand-alone solutions.

3. Stand-alone VR DEVICES

Stand-alone VR solutions such as the Oculus Quest, the Oculus Go or the Lenovo Mirage have an integrated display which is interlinked to the headset. In general, Stand-alone solutions are regarded as superior to smartphone-based devices as they usually have a higher performance and a better resolution. Yet, the focus of these systems is currently on gaming and entertainment, rather than applications in the educational sector. Yet, although stand-alone solutions presently have a relatively low presence on the market for VR devices, they are suggested to be well priced in comparison to pc-based solutions, especially, because further expensive hardware costs (e.g. for a pc) do not occur.

1.2 Core statements of VR experts

Conducted interviews with 18 VR experts, within the Viral Skills project, confirm the growing significance of new technologies as VR and AR in the educational sector. Based on interview data collected in the six European partner countries profound and useful information about the status quo of VR in general and its application in the adult education area were gained and evaluated.

Regarding the implementation of virtual technologies into the educational field, general agreement among the 18 European experts exists that some solutions are already applicable for educational purposes, although, it isn`t completely technically matured.

The main **arguments for an integration of VR** solutions are

- that the new technology allows educators to teach in a more exciting manner;
- that VR allows to visualize content and information that are not available in classrooms; and
- that VR is particularly strong in training for situations that are too expensive, too dangerous or too disruptive to train for in person;

The reported main **positive experiences** from VR implementation are:

- The possibility to combine VR with embodied technologies to combine two attributes – immersion and embodiment;
- The possibility to build an immersive art workshop using mixed reality devices and immersive classrooms with the aid of an interactive monitor to allow to create a mix between a traditional and an extremely innovative teaching method;
- better trainee engagement and better visualization /engagement with real-life scenarios;
- students enjoyed the VR experience;
- VR technologies in business or educational scenarios foster engagement, motivation, excitement, creativity and positive attitudes towards the various topics;
- In an experimental manner, VR solutions are perceived as being more realistic and efficient in delivering immersive experiences that entertain, motivate and foster positive attitudes of low-skilled and low-qualified learners towards the learning material;

Experts underline **relevant aspects**, to which special attention should be paid when introducing VR into the educational process:

- The pedagogical strategy behind a first idea must be stringent, logical and well planned.

- It is important, that learners are making their own experience with VR and immersive environments to minimise (possible) deficits in understanding;
- Criteria such as costs, accessibility, performance, usability, easy set up or reliability, the system itself and its purpose are to be considered when implementing VR systems for education.
- All tested VR devices can be considered as suitable for educational purposes, as most can be integrated easily into the educational environments.
- 6DoF (Six degrees of freedom), describing the freedom of movement of a rigid body in three-dimensional space, is regarded as essential for delivering a superior immersive experience;

Summing up the statements of the experts, it can generally be mentioned, that VR technology has a high potential to revolutionise teaching methods and training efforts and will have a big and positive impact on the education of adult learners.

2 VR and Learning – A Pedagogic Point of View

"Augmented, Mixed and Virtual Reality"- these are according to a trend analysis on behalf of the German Institute for Adult Education the most discussed key terms 2018 in the field of further education (Lutz, 2019). It is due to the recent technical advancements that technologies like Virtual Reality become more and more viable and desirable in many domains, including education and training (Elmqaddem, 2019). Although the first virtual reality headset was already created in the 1970s in the USA and the actual term "Virtual Reality" was proposed in the 1980s by the Jaron Lanier, back then several constraints prevented that these technologies were actually adopted by the general public. Today, VR technologies are finally mature enough and Virtual Reality is discussed from various disciplines including education science and related fields.

The following chapter will give an insight in these academic discussions specifically considering Virtual Reality from a pedagogic point of view. It will clarify advantages as well as challenges regarding VR in education and will further raise didactical and methodical questions which should be taken into account before any educational use of VR. By particularly considering the needs of low-skilled/-qualified learners adult educators will be provided with recommendations and guidelines concerning the practical implementation of Virtual Reality in the educational field.

2.1 State of the Art of Academic Discussions

Recent discussions among experts in the academic field clearly show: the interest of applying Virtual Reality in education is increasing. With the proliferation of new affordable hard- and software VR promises not only new teaching and learning models but also to be a medium that better meets the needs of the 21st century learner (Elmqaddem, 2019). When it comes to learning in virtual environments and its potentials academic discussions go back to the 1990s. In this time William Winn and Randy Jackson were one of the first researchers which tried not only to provide a conceptual basis for educational applications of Virtual Reality (Winn, 1993), but also stated fourteen propositions about educational uses of VR (Winn & Jackson, 1999). Most of these propositions are still highly topical. According to Winn and Jackson (1999) virtual learning environments support constructivist concepts of learning, allow simulation of concepts that are normally not assessable to the senses and enable

learning and training situations that may be too risky in the real world. Several researchers agree that VR-based training and learning can have significant advantages over traditional methods (Oh, Han, Lim, Jang, & and Kwon, 2018), although also drawbacks and issues can be found (Christou, 2010).

As to adult education only little literature can be found that explicitly focusses on Virtual Reality and learning of adults. Nevertheless, recent discussions show increasing interest also in this field. The following chapter will take a look not only at present but also at past approaches about VR and adult learning and therefore provide a comprehensive insight where academic discussions to this topic currently stand.

2.1.1 Current Discussions about VR in Adult Education

As already stated above a recent trend analysis revealed: "Virtual Reality" is one of the most discussed key terms 2018 in the field of further education. In social media adult education experts stress not only the potentials of VR as medium that enables learning through experience, connects learning with fun and can be highly motivating. Also, drawbacks, like motion sickness, and needs in practice are discussed. Although interest to use VR in the field of education is given, according to experts the medium is still at an experimental stage. For now, it is the technology itself and the fascination about it which is in focus. However, in order to become a learning medium that will survive long-term, emphasis has to be laid on didactical concepts and practical guidelines. According to experts this will be the challenge of the near future (Lutz, 2019).

Similar considerations can be found in Canada where Oh, Han et al. (2018) recently discussed the potentials of Augmented and Virtual Reality in the field of adult education. By referring to successful applications of VR for military and medical purposes the article tries to provide new insights and future direction of VR/AR uses in adult learning and education for scholars as well as adult learners. Although they consider Augmented- and Virtual Reality as potential learning tools to facilitate effective learning in various adult education fields, they stress the need to pay more attention to these new immersive technologies. "Despite the recognized significance of using VR and AR", they say, "there has been no conceptual or empirical studies examining the implication and influence of VR and AR in the field of adult education" (Oh, Han, Lim et al., 2018, p. 2). According to them researchers still have to investigate

which type of VR/AR and what kind of VR/AR apps are most effective to deliver adult learning programmes. Furthermore, they must not only focus on adult learners' characteristics and learning styles and but also identify benefits as well as limitations of Virtual and Augmented Reality used in adult education contexts. Only then valuable guidelines and reference tools for existing practices of VR- and AR-based learning could be provided.

According to the authors Virtual Reality is expected to provide adult learners with great access to learning resources, enhanced motivation for learning through lifelike experiences and can help reduce overall costs and time for learning. Considering these positive effects of VR, Oh, Han et al. (2018) recommend fostering further investigations about the use of VR in adult education. More comprehensive discussions in this context can be found in the USA and France, which should be summarized in the section below.

2.1.2 Past Approaches to Virtual Reality and Adult Learning

In 2009 professor Kenny Ott at the Valdosta State University (USA) laid a focus on VR in Adult Education and discussed Virtual Reality as wonderful element that could enhance any traditional business classroom. In his report about "Virtual Reality and Simulation in Adult and Career Education" he gave brief examples how VR and simulations could be integrated into education. For Ott VR as learning medium was definitely more engaging than simply reading a text or sitting in class. To better understand the potentials of VR for educational contexts he referred to Winn and Jackson (1999) and their fourteen propositions, which were already mentioned above. Although in 2009 Virtual Reality was no longer an expensive technology tool, according to Ott the application of VR in adult and career education was still in its infancy (Ott, 2009).

A more comprehensive analyses of adult learning and VR was provided in France by Mellet-d'Huart who published his article "Virtual Reality for Training and Lifelong Learning" (Mellet-d'Huart, 2009). In this context Mellet-d'Huart gave not only an overview of existing VR applications in this field. He also provided a design approach as well as recommendations for developing virtual environments that should especially suit the requirements of adult learning. Within the whole article the uniqueness of VR and its characteristics is in focus. Especially for training and work-

based learning Mellet-d'Huart referred to a number of unique advantages VR has over traditional training methods: Since VR could create safe environments for training and learning, it allows rehearsal of emergency situations, skill acquisition for hazardous tasks, learning to operate, maintain or repair unavailable machines and equipment as well as training of situations, where conventional on-the-job learning is impossible due to both the risks from accidents and damaging tools.

All in all, Virtual Reality enables training which would be in real life either too dangerous, too expensive or simply unachievable. However, according to Mellet-d'Huart VR could be used to enhance training situations even when feasible in the real world. In order to have easier and more effective learning VR learning environments could provide different feedbacks and replay functions, multiple scenarios, close adaption to learners' activities and a lot more. Although the author referred to the fact that VR trainings are proven effective, he also pointed out that when it comes to using VR for learning in general not all experimental results had been so straightforward in the past (see Winn, 2003; Winn, 2005). Possible reasons for this include according to Mellet-d'Huart insufficient consideration of learning concepts and/or of VR's uniqueness when designing applications and/or a lack of adequate design methods. Exactly these shortcomings had to be addressed. In 2009 for Mellet-d'Huart it were especially the learning sciences that should not only develop new concepts, but also analyse learning processes and think of methods for designing learning resources, so that VR-supported learning could be as effective as possible.

Looking at current discussions so seem Mellet-d'Huart's made considerations anything but obsolete. It's not only his call for a more pedagogical point of view but also his laid emphasis on VR's uniqueness for adult training. VR and training seems to be a frequently reported topic. According to a literature review on immersive Virtual Reality in Education (2015) most papers can be divided in those that refer to high school and university education and those aimed at adult training in special fields. Consistently, papers about VR applications in medical, military and industrial training can be found (Freina & Ott, 2015). But also in transportation VR flight and driving simulators seem to be successful (Christou, 2010). As a quite recent contribution to VR in the field of adult training the article of Zobel, Werning, Metzger and Thomas (2018) can be mentioned. The authors name not only applications of VR in education and training of the German-speaking world. Focus is also on chances as well as limitations which can be found in these fields.

2.1.3 Virtual Reality in Adult Training

It is due to recent technological progresses added to the proliferation of affordable hard- and software that interest for Augmented and Virtual Reality is also aroused in fields of education and training. Not only for schools but also for companies, universities and military training centers using VR seems to become successively promising. Nevertheless, also problems, challenges and constraints are discussed. Zobel, Werning et al. (2018) try to pick up on the state of the art in these fields, providing different to many others a more comprehensive point of view of VR.

As to education and training in the industrial/production sector Zobel, Werning et al. can state similar benefits than Mellet-d'Huart's. Using VR means saving costs and resources and reduction of risks for those who learn. Although VR training and education is an upward trend, results of surveys are not that straightforward. When it comes to the implementation of Virtual Reality in companies, at least in the German-speaking Europe not all representatives seem convinced. Critique is expressed on the costs, which seem still too high, as well as on the medium itself and its missing social components. Despite all that, advantages could still outweigh the drawbacks on one condition. Referring to Katzky (2012) Zobel, Werning et al. think VR should complement rather than replace any training of adults with real machines (Zobel, Werning et al., 2018). Recent developments indicate that even the expressed critique might be already obsolete. Nowadays not only qualitative hardware is more affordable (Elmqaddem, 2019), but also so called "social virtual realities" exist, allowing multiple users to interact in the same virtual world (Klampfer, 2017).

Also in medicine a significant percentage of papers reporting applications in the medical fields can be found. Here, VR has been widely used at very different levels. Starting from nurse education in a collaborative immersive system, medical training in a virtual hospital, simulation of surgical procedures and training with expensive instruments like endoscopes (Freina & Ott, 2015; Elmqaddem, 2019; Zobel, Werning et al., 2018). In this context Zobel, Werning et al. especially stress the potential of VR's replay function. It allows VR-training situations to be repeated as often as required and this even without risks to patients or damaging medical tools. However, challenge lies in realistic simulations. Klampfer (2017) states in this context that it is important that the knowledge and competences gained in the virtual environment can be transferred to new (real) situations. Although successful transfer of training in VR is already demonstrated in emergency medicine, Zobel, Werning et al. refer to Riener and

Harders (2012) which stated seven years ago that it still needs a lot more research to examine these effects also in other medical fields.

Finally Zobel, Werning et al. also report about advantages in the military sector where nascent pilots benefit from VR flight simulations and VR in general can be useful for role playing and training operations within a safer environment (Zobel, Werning et al., 2018).

Although it needed the latest technological advancements for VR to become efficient for the general public and fields like training, discussions about Virtual Reality Learning have a long tradition and are highly relevant today. Even in Morocco Elmqaddem states that the actual adoption of VR in education will be reality in near future (Elmqaddem, 2019). Until now several advantages and drawbacks of Virtual Reality in the educational field were discussed. The following chapters shall provide an overview of the state of the art.

2.1.4 Virtual Reality in Education – A general Approach

According to academic discussions Virtual Reality can improve and facilitate traditional learning in a variety of ways. In general VR allows not only to visualize contents in a three-dimensional space. It even enables interaction with objects and people in the virtual world. These worlds may be realistic or imaginary, macroscopic or microscopic and based on imaginary dynamics or on realistic physical laws. The multitude of scenarios that Virtual Reality can be used to depict make it broadly applicable to many education fields (Christou, 2010). In this context Klampfer (2017) provides various examples of VR's potentials which shall be presented below.

Firstly, Klampfer states *virtual teleportation* which seems to extend any boundaries of a traditional class. Especially in Geography, Biology or Art Education learners may be transported from classrooms to places which would be too far away, too dangerous or not even accessible without the virtual world. In VR learners could then either passively observe 360° videos and/or photos or even actively discover and explore the contents shown. In this context VR allows not only to reconstruct ancient cities and cultures as well as to bring historical events back to life. Applications reach from virtual tours in galleries and museums and flora and fauna in Australia to exotic expeditions to any place on earth.

Further, Klampfer refers to VR *simulations* whose unique potential for training of adults was already mentioned above. However, not merely in medical, military and industrial contexts but rather in all educational fields Virtual Reality allows for didactic learning scenarios, which would be impossible without. VR simulations can be carried out independent of time or place, be repeated as often as required and can also (re)construct situations from the future or the past. By using didactic reduction even complex processes and difficult contents can be easily understood. VR can make use of time-compression or –stretching, hide irrelevant details, show interdependent factors or boost learning by the manipulation of objects and their relative size.

Apart from simulation and teleportation Klampfer also stresses potentials for *communication and cooperation*. According to his article VR can be also used as ""social virtual" environments" (Klampfer, 2017, p. 18). In these VR will make it possible to meet other people (e.g. development teams), to exchange ideas, cooperate on projects and even interact with objects in the real world. Exactly these environments could also become important for blended learning. In this context VR would not only offer excellent opportunities for language learning by meeting students from other countries. Also children forced to be absent from school for a long period of time might benefit from VR.

Finally, Virtual Reality could reinvent *art*. According to Klampfer VR in art is not confining itself to virtual tours in galleries and museums. There already exist creative apps, which allow students to learn art in VR and actively draw and paint in real life size and 3D (Klampfer, 2017).

When looking at approaches to VR and learning also discussions about theoretical basics can be found. Though Klampfer sees cognitivist as well as constructivist learning theories as potential learning models, most articles state constructivism as the ideal learning theory. According to Christou (2010) it's especially the experiential nature of VR which supports a constructivist approach to learning. Students can construct knowledge by learning form their experiences they make in the virtual worlds. In this respect VR may prove to be a powerful resource that can help in teaching by providing an environment that allows the student to experience scenarios, engage in authentic problems as well as explore solutions and situations rather than imagining them (Hu-Au & Lee, 2017).

Research shows that especially low-performing students benefit from these experiences. In general also for low-skilled/-qualified learners advantages of VR-learning can be found.

2.1.5 Virtual Reality and Low-performing Students

In 1997 the potential of Virtual Reality especially for low-ability students was shown. In this year psychologists and educational experts Winn, Hoffman, Hollander, Osberg, Rose and Char conducted an empirical study having students built their own Virtual Environments (VEs) to learn various – mainly science related – contents. Within the study Winn, Hoffman et al. did not only examine the student's performance after learning by building and visiting VEs and after learning the same content in more traditional ways. In performance data they also looked for differences among low- and high-ability students. Results show that those learners who did not well with a more traditional, symbol orientated pedagogy improved academically, even more than their high-achieving counterparts, through learning with VEs. Whether these were caused by the possible interaction, the immersive "first hand" experience or rather the opportunity to learn contents without an abstruse and abstract symbol system remained to determine. The authors state that using VR seems to help students understand concepts and principles that have been incomprehensible and baffling before (Winn, Hoffman et al., 1997).

Winn, Hoffman et al. focused their study on students in grades 4 to 12. Malo, Neudorf and Wist (2009), however, also see potentials for adult learners, especially those who are lacking in basic literature skills and basic skills in numeracy.

2.1.6 Virtual Reality for Low-skilled and Low-qualified Adults

According to the article of Malo, Neudorf et al. game based Virtual Environments seem to be an effective method that allows visitors to acquire numeracy and literacy skills in an explorative, action-orientated way. Referring to Cromby, Standen, Brown (1996) and Standen, Brown and Cromby (2001), who state various advantages of VEs for learners with intellectual and learning disabilities, Malo, Neudorf et al. see in VEs also for low-skilled and -qualified learners a promising medium. Within their article they name multiple benefits. According to them interactive VEs would not only encourage active involvement in learning and give users the experience of control over the

learning process. Virtual Environments would also allow for target group orientated training and could provide low-skilled/qualified learners with adequate tasks. But who are these low-skilled/qualified learners?

In defining low-qualified and low-skilled persons we can consider the established definitions provided by the International Standard Classification of Education in that low-qualified are those with basic educational levels (ISCED 0-2)[1].

Working with low-skilled and low-qualified adult learners requires educators to adopt a flexible and open manner and a willingness to facilitate learning using a range of different strategies to ensure positive enrolment and engagement in the learning process. These learners often approach education with a range of additional needs and barriers which can hinder their continued engagement in education and training. As such, working with these 'non-traditional' learners means that educators first need to understand some of the unique characteristics associated with this target group.

Representatives of these target groups can be found in classrooms and learning settings across Europe and are often identified as:

- *Refugees* (a refugee is anyone who cannot return to their country for fear of persecution for one of the following five reasons: Race; Religion; Nationality; Membership of a particular Social group, Gender, Sexual Orientation; Political Opinion etc. Refugees are entitled to be protected against forcible return to their countries of origin);
- *Migrants* (an international migrant is someone who changes his or her country of usual residence, irrespective of the reason for migration or legal status. Generally, a distinction is made between short-term or temporary migration, covering movements with a duration between three and 12 months, and long-term or permanent migration, referring to a change of country of residence for a duration of one year or more);
- *School drop outs:* individuals leaving high school, college, university or another group for practical reasons, necessities, or disillusionment with the system from which the individual in question leaves;
- *Long-term unemployed*, etc.;

[1] 0 = pre-primary education; 1 = primary education or first stage primary education; 2 = lower secondary or secondary stage of basic education

The characteristics of these adult learners are clustered and presented below:

- Adult learning tends to be **selective**, in that adults will learn what is relevant and meaningful for them. As such, adults will not learn for the sake of it, and it is important that educators appreciate this, and try to contextualize the learning content so that it is relevant to the individual adult learner.
- Adult learning contains a degree of **responsibility** and is **self-directed**. This means that adults take responsibility for their learning, and are able to identify their training needs, set learning goals and organise their learning to achieve these goals. When working with low-skilled and low-qualified adults, it is important to educators to lead learners through the process of developing this self-awareness and responsibility if they are lacking this competence.
- Adult learners have **experiences** achieved outside of the classroom. Adult learners often have vast real-life experience, other commitments and responsibility and a set of attitudes and beliefs that have been cultivated through their experiences; as such they expect that educators will treat them as adults.
- Adults tend to learn best through a **problem-centred approach**. Adult learners tend to have most interest in content that has a direct application in their daily lives; especially where learning can help to solve a problem which exists in their life.
- Adult learners have typically been away from the classroom for an extended period of time; as such, they may need **additional support** to develop their self-confidence and self-esteem; especially considering that many of them may also have previously had a negative experience with education.

These characteristics help to build the rather typical profile of a 'non-traditional' adult learner group comprise low-skilled and low-qualified learners. In addition to appreciating the unique characteristics of these adult learners, it is important that adult educators adapt different strategies and approaches to work effectively with these learners.

In order to develop effective adult education programmes that instill the drive in learners to continue and attain their education goals, research conducted by Jim Bryson (2013) suggests that educators should adopt a 'principle-based approach' to curriculum design and delivery. The principles Bryson advocates include instilling in

adult learners a set of beliefs and attitudes, which motivate and support them to succeed.

The central message of this research is that rather than expecting 'uniformity', educators working with low-skilled and low-qualified adults (refugees, migrants, school drop outs, people who have been long-term unemployed) have to strive for '*multiformity*'; this means revising traditional models of adult education which adopted a 'one-size fits all' approach, and instead tailoring the learning experience to appeal to the needs and preferences of our increasingly diverse adult learner population. This might be easier said than done; but as a starting point for adopting this approach to engaging the low-skilled and low-qualified adult learners in education, Bryson advises educators to begin each training programme by familiarising themselves with the characteristics of their learning group and considering a range of supports that could be specific to learners in the group.

As already stated above one supporting medium might be Virtual Reality. According to Döbert and Hubertus (2000) another characteristic of low-skilled and qualified adult learners is often constant fear of social exclusion and exposure. In their article Malo, Neudorf et al. (2009) describe Virtual Environments especially in this context as a unique medium to learn. VEs provide adults with the opportunity to learn by mistakes and this without having to suffer any real, dangerous or humiliating consequences of errors they made. They could train situations of daily routine as well as work at their own pace and in addition to this, would, though, receive consistent feedback to their activities in the VE (Malo, Neudorf, & Wist, 2009).

Finally, Virtual Environments are assumed to be highly engaging. Using VEs could not only support understanding and application, but also lead to more intrinsic motivation to learn (Malo, Neudorf et al., 2009). According to Elmqaddem (2019) learners would even feel more receptive. In fact, virtual reality-based learning is proven to increase learners' level of attention by 100 percent.

Although various educational experts agree that VR can be considered as a real new enhancement of teaching and learning in the 21st century, also weak points are addressed. The following chapter provides a short insight in some problems and criticism discussed.

2.1.7 Challenges and Prospects Relating to the Educational Use of VR

When looking at the current use and integration of VR in education and training there seem to be still a number of challenges and problems that prevent VR tools from showing their actual potentials. Limitations range from pedagogical, technical, economical to even management issues. Although some problems were discussed in the past and might be already obsolete today, all shall be briefly presented below.

- ***Simulator Sickness:*** One of the most discussed disadvantages related to VR seems to be "simulator sickness" which can occur when using VR (Christou, 2010; Mantovani, 2003; Klampfer, 2017). Symptoms range from dizziness and headaches, tiredness of the eyes or even sickness.

- ***Costs:*** As already mentioned in one section above, costs surely represents one important limit to VR penetration into educational and training contexts. Especially in the past VR was seen as relatively expensive alternative to conventional methods of teaching (Christou, 2010; Pantelidis, 2009; Mantovani, 2003).

- ***Usability:*** Mantovani (2003) and Pantelidis (2009) further mentioned usability to be critical. Due to complexity of Virtual Reality technology not only students but also teachers would be challenged to learn how to use VR hard- and software.

- ***Realism and Transfer:*** According to Christou (2010) lack of realism was mainly a problem of initial visualization used in VR. Fidelity and realism, though, are crucial for certain applications. In 2010 realistic environments combined with realistic dynamics and interaction, e.g. for surgical training, were still a challenge.

As already mentioned above, some of the criticism has been stated years ago in the past. Nowadays mass production brought prices down and affordable headsets exist. Prospectively, according to Lege and Bonner (2018) and Elmqaddem (2019) even cheaper hardware will be released. Today Virtual Reality is both more affordable and efficient. Elmqaddem (2019) even refers to Michael Abrash, head of the scientific team of the company Oculus VR, when he states: "[W]hat VR allows us to do today was technically almost impossible a few years ago" (p. 236). According to him VR has evolved and is now mature enough to be integrated in educational contexts.

As to simulation sickness also with latest VR tools side effects seem to occur. Nevertheless, Klampfer (2017) refers to individual as well as technical factors which may be linked to increased occurrence of the illness. These are presented in Table 1 and 2 below.

Table 1. ***Individual Factors***

Factor	Comment
Age	Greatest susceptibility between 2 and 12 years. Susceptibility decreases successively until the age of 50, then it disappears.
Experience with simulators	Experience with VR lowers susceptibility
Gender	Women more susceptible to simulator sickness
Ability for mental rotating	Enhanced ability to mental rotation decreases incidence

Source: (Mehlitz, 2004, p. 12)

Table 2. ***Technical Factors***

Factor	Comment
Binocular vision	Stereoscopy increases susceptibility
Field of View (FOV)	Greater FOV increases susceptibility
Use of tracking systems	Geometric distortion and other sources of error may lead to greater susceptibility
Display refresh rate, interaction interval	Every delay in the display, either due to slow refresh rate or long interaction intervals may lead to greater susceptibility
Speed	Higher speed during navigation rather causes simulator illness.

Source: Mehlitz 2004, p. 13

According to Klampfer exactly these factors as well as the type of VR application must be considered from a methodical/didactical point of view before any educational use of VR. Further guidelines and recommendations concerning the practical implementation of VR will be provided in the following chapter below.

2.2 Recommendations for Setting up a VR Training Course

As already stated above Virtual reality has the potential to transform the way we learn and teach, from providing in-depth knowledge and helping us understand complex subjects to facilitating language immersion and virtual trips. While potential benefits of

using VR in educational settings are still being established, the above mentioned aspects of VR experiences are also likely to enhance adult learning as part of well-designed learning activities. However, by providing a safe, accessible and affordable environment for learners to "learn through experience", VR may not only enhance future adult education in general (Beqiri, 2017). Virtual Reality can also be a very effective way of educating low-skilled and low-qualified adults, as they can get an interactive experience in which to learn, irrespective of literacy and numeracy skills. In this context, the VR-technology offers a new tool for educators in modern day education and provides a new way of reaching out and engaging learners (Bell & Fogler, 2004).

In order to take advantage of VR's potential in education, setting up a VR training course requires methodical and didactical planning and the consideration of various aspects in advance. For this reason, in the following sections some key questions concerning the preparation and implementation of Virtual Reality in education will be addressed. By considering the needs of low-skilled and – qualified learners the chapter should provide some support in this context and help all adult educators to integrate Virtual Reality successfully into their educational settings.

2.2.1 Training Low-skilled/-qualified Adults & VR – General Aspects to keep in Mind

Adult educators thinking of setting up a VR training course for low-skilled and low-qualified adults must take many different factors into account. Firstly, they must consider that adult learners differ in many ways from younger students and children; have different motivational drivers; have pre-existing experiences with learning processes that can be both positive and negative; and often have been absent from education or training for prolonged periods of time, and as a result the motivation of this target group is often more difficult to ignite. Therefore, like any educational activities, using VR in adult education requires careful planning and adaptation ensuring that the technical and contextual aspects of the learning meet the current expectations and needs of these adult learners.

Secondly, educators working with low-skilled and low-qualified adults (refugees, migrants, school drop outs, people who have been long-term unemployed) have to strive for "multi-formity" as already mentioned above. There is a life story behind each

adult learner, as well as a world of educational experience. Therefore, for educators working with low-skilled and low-qualified adults, it is crucial to know and understand their audience. Knowledge of the different adult learning theories will help educators plan their VR-infused lessons from conception, development and execution in a way that facilitates an effective learning process (Popescu, 2019).

Thirdly, if using VR applications in education with low-skilled and low-qualified adults it is necessary to consider carefully the level of their existing knowledge, their motivation and learning styles and how they will be able to make an effective use of the knowledge gained in practice.

In order to ensure the motivation and involvement of low-skilled and low-qualified adult learners in the learning process, it is crucial to use VR content at a level that is compatible with the computer literacy and initial ICT skills and associated confidence of the learners.

Before adopting and implementing a new technology like Virtual Reality into a learning environment, the *AR & VR Whitepaper: Implementing VR in the Classroom* (ClassVR, 2017) has highlighted a number of key questions which should be taken into account. Some of them shall be presented in the following sections.

2.2.2 Setting up a VR Training Course – Key Questions to consider

In order to ensure that learners, and low-skilled/-qualified learners in particular, ultimately benefit from Virtual Reality and its implementation careful planning and understanding of the innovative technology are required. To support this process the *AR & VR Whitepaper* (ClassVR, 2017) suggests the following key questions which we will consider in our sections below.

- How do we find the right equipment?
- How will we install and manage it?
- How do we integrate it into our lessons and curriculum?
- How can we measure the success and outcomes from using it?
- What training is required for our teachers to use it effectively?
- What ongoing support and training is available?

2.2.2.1 Consideration of VR Hardware & Installation

Prior to developing a VR activity for the classroom decisions about the right equipment and considerations about its installation have to be made. As with any technology purchase, understanding what options are available on the market, what each system can do, their advantages, limitations and their costs, are the key aspects to helping guide you towards the most effective solution to implement (ClassVR, 2017). In this context the Viral Skills project published the VR Digest which includes not only the main, commercially available VR systems today but also a SWOT analyses in terms of their educational use. A summary of it can be also found as part of this compendium in the technical introduction of chapter one.

There are currently three common categories for VR/360 hardware devices: Dedicated PC headsets, Smartphone-based and Stand-alone VR. Understanding how these will connect to your existing network, what ICT requirements they have, how much internet connectivity they need or how much bandwidth they use, are also important factors to consider.

Further, in terms of setting up and managing the VR system in the classroom, consideration needs to be given to the fact that most VR systems have been designed for individual use, rather than in a shared or group environment. Obviously, this poses several challenges for educators not only in terms of Health and Safety but also in terms of class management. Consideration also needs to be given to the capital investment required for classroom-based systems, insofar as the requirement to purchase individual headsets and possibly PCs for each learner. Moreover, questions should be raised in terms of trainer-based controls with the ability to pause devices, view and monitor learners content as well as regarding possibilities to capture data and feedback in terms of measuring learning outcomes and conducting assessments. Understanding what classroom controls a system has, and how they are used in practice needs to considered so that a lesson can be successfully delivered (ClassVR, 2017).

2.2.2.2 Didactical & Methodical Questions and Steps

Once the right VR hardware is found and installed, didactical and methodical questions in terms of using VR in one's educational setting have to be raised. In this context several aspects must be taken into taken account beginning from the

identification or design of the right VR content over its integration in the course schedule to forms and strategies in order to support and measure the learning process. The sections below shall provide some support and guidance in this regard. In order to set up a VR training course in adult education and in particular for low-skilled/-qualified learners the following steps should be considered:

- Firstly, **design or identify the VR activity** that aligns with the course objectives. Identify VR applications that relate to course content in a meaningful, authentic way for your adult learners.

Aware of the possibilities that VR offers, the first thing to do is to focus on the educational objective and information that you think may be interesting and relevant to investigate in this context. This exercise can be carried out by the trainer or through a collective and participatory activity conducted in class with learners (Gabbari, Gagliardi, Gaetano, & Sacchi, 2017). Particularly in terms of low-skilled/-qualified learners, it's Important to select resources and VR content that contribute to reaching a tangible, real-world learning outcome for the adult learner.

Ideally, learning resources with VR components should be mapped to the curriculum of one's course, ensuring that the material is at a suitable level for the learner, and that mastery of concept is at least obtainable. Especially in terms of VR for low-skilled/-qualified adult learners this is a very important aspect to take into account. It is very demotivating to be confronted with materials that are too difficult and which contain vocabulary beyond a learner's current level, causing them to lose interest, fracturing their connection with the material. Likewise, it is also demoralising to be presented with redundant, previously-learned information which renders the whole exercise meaningless. It is a complex balance, but one that needs to be attended to, securing a proper relationship between learner and study materials (Veative Labs, 2019).

In this context, one option might be to design the learning material on one's own. What is presented in each resource would need to be designed slightly differently, attending to a different way of relating that particular concept to the world around us. A cookie-cutter approach would not suffice, as learning about atomic numbers and the Periodic Table would be inherently different from studying about relative motion. Further, some amount of gamification would increase interest, in some cases e.g. when it comes to school drop-outs having difficulty with traditional ways of

learning. But not everyone and every content benefit from a gamified approach. Despite all that, VR has demonstrated that it can most definitely help with visualization, increasing the connection between learner and concept (Veative Labs, 2019). Building educational resources from 360 images and videos can provide an entire cross curricular resource bank to drive engagement across all subject areas.

As demonstrated in chapter 2.1.5 another possibility is to allow learners to build Virtual Environments and learning content on their own. In this context, VR provides not only the learner with opportunities for autonomous learning. As shown by Winn and Hoffman (1997) especially those, who did not well in conventional, symbol orientated pedagogy may benefit from building VEs.

Moreover, research conducted by Mihalíková and Líška (2006) identified three basic levels of virtual reality immersion:

1. ***Passive:*** this type of VR experience is implemented through a presentation of the resource as a "movie", that lets the learners to experience (see, hear and sense), but the learners can't influence the process or modify the elements of the VR environment.

2. ***Active:*** these types of applications allow the learners to move freely in the environment, explore it and sense virtual sounds. They are involved in the happenings and engaged with their environment, but they are not able to move objects or modify the environment.

3. ***Interactive:*** this is the most sophisticated level, where the learners can engage with the VR environment and also modify it. They can move objects, assembly etc. The learners can record the process, revise it and assess their learning.

When setting up a training course and developing resources, educators have also to take into consideration the above aspects and choose the relevant level of VR considering the appropriate level of involvement of the learners in the VR learning experience according with the learning outcomes set.

- Secondly, **consider the placement** of the VR activity **within the course schedule**.

When thinking of integrating VR in one's educational setting, there are a number of ways in which VR can help fill gaps in the learning process or compliment

it. VR, for example, can provide a valuable opportunity to visualise a conceptually challenging idea, increasing the possibility of more deeply understanding concepts which may not be clearly understood otherwise. In this context, it is important to see and use Virtual Reality as a tool to enhance and contribute to one's curricula resources, rather than replacing them. For this reason, a VR experience might for example either precede or follow discussions of the learning material during a typical class session depending on the instructional goals.

- **Make plans to measure student learning**, aligning assessment objectives with learning goals and activities.

There are a number of options to evaluate and measure learning processes initiated by the use of VR. These may include a pre-assessment prior to the VR experience and a post-assessment afterwards, the use of traditional quizzes and/or tests in addition to student reflections on their VR learning experiences. Depending on the VR application chosen, a learner might also obtain tutor feedback in real-time while participating in the VR experience.

- **Allocate time and resources for learners to learn how to use VR** – both familiarity with the hardware and software applications. Emphasise that the VR technology is a tool to support their learning.

Typically, in most VR learning environments the learner is the driver behind the learning. Learners move through the resources at a pace that is conducive for their own learning styles and needs. Each learner would naturally find areas where they may need extra time, and instances when they are sure of the subject matter and can move more quickly through. Unlike a video or a teacher-centered lesson, the control is in the hands of each learner, allowing them to control pace. This in turn increases motivation as they are the agents of their learning.

Nevertheless, like with any new technology it is important to understand first the learner's attitude towards VR. This aspect considers not only the individual perception of the technology, but also the willingness to incorporate it in their learning (Huang, Liaw, & Lai, 2013). Especially low-skilled/-qualified adult learners may have fears and reservations of using ICT specifically VR hard- and software at all. For this reason it is crucial for adult educators to support those learners to overcome their fears, to

convince them of their ability to use these technologies and to teach them how to control and exploit them.

Generally, it is also important to clearly articulate the goals of the virtual reality activity to learners and relate it to how it will help them achieve their learning outcomes prior to the start of the activity.

2.2.2.3 Training & Support for Adult Educators

As with all educational technology, the correct provision of educational support resources, including training, development, technical and teacher support is a critical component to ensuring positive adoption, and the path to a successful implementation of VR in education. Implementing any new technology in the classroom means tutors and learners need help and support to familiarise themselves with it, and to understand how best to utilise it during lessons. For this reason the Viral Skills partnership provides this "Viral Skills Compendium and E-Thek" and additionally developed a VR-course called "Viral Skills Training Programme". These should offer adult educators and those working with low-skilled/-qualified adults the opportunity to become familiar with Virtual Reality, its implementation and to learn about existing applications of VR.

In addition to this, educators should continuously update themselves through engagement with interesting research, articles, books, videos, blogs and magazines dedicated to virtual reality. Some further reading in this context shall be listed below.

Further Reading:

- *A Framework for Desktop Virtual Reality Application for Education (2016)*
- *VR Learn: Virtual Reality & Learning (2017)*
- *Cloud AR/VR Whitepaper (2019)*
- *A guide to VR & AR in education (2019)*
- *OpenXR: Virtual Reality wird einfacher (2019)*

3 Country Comparison

The VR market is now very dynamic and competitive, as in recent years several global developments have been developed. Nowadays, VR technology can be used for low-skilled and low-qualified people as it offers several benefits, engaging them more comprehensively in the learning experience than ever before. The aim of this chapter is to give a brief insight into where countries inside Europe and outside of Europe (such as China, Japan and the USA) stand with their developments concerning VR learning. In the following sections, we summarize the global developments, trends, and standards and compare the state of the art of VR learning within the European Union focusing also on low-skilled and low-qualified learners.

3.1 The state of the art of VR learning within the EU

Europe's VR ecosystem continues to grow with more and more companies entering the sector. According to the Centre for the Promotion of Imports from developing countries (CBI) there are 530 organizations related to VR located in the European Union (EU) and many of them already use VR as part of their training. Indeed, the EU supports the VR creation and technological development is the key element of the Commission's Next Generation Internet initiative. Based on the latest report of CBI (2019), Europe is responsible for a fifth of global VR market and thus is one of the major players on the VR market along with Asia and North America. In this context the European VR frontrunner countries are France, UK, Germany, Netherlands, Sweden, Spain and Switzerland. However, over the last years, emerged also important VR initiatives in Finland, Denmark, Estonia, Italy, Poland, and Greece (Bezegová, Ledgard, Molemaker, Oberč, & Vigkos, 2017).

Moreover, Europe has a rich tradition in academic VR research and VR development. European companies, hubs and research institutes benefit from research funding from both national and EU sources. Many European innovative start-ups, companies and universities, are working on the development of VR technologies and software that enable the use of VR in different application areas.

Focusing on learning, VR glasses are one example used in educational institutions in many European countries. With this technology, learners can visit places, monuments, festivals and in that way, VR is bringing knowledge even closer to a student who wouldn't be able to access it otherwise for example, due to disability.

Furthermore, special VR applications have been created exclusively to be used in formal and informal educational settings. School and universities have been experimenting with adding VR as a teaching tool or making VR lectures a part of the curriculum (Bezegová, Ledgard, Molemaker, Oberč, & Vigkos, 2017). Some companies such as "Labster" in Denmark, which created virtual labs for experiments, "Immersive Education" (IE) and "Lifeliqe" in the Czech Republic are working on VR education by providing new VR solutions for learning and exploring. In addition, education with VR also takes place in museums and galleries. In this context the example of "Virtual Dutch Men" in the Netherlands is very interesting as it has created a fictional virtual museum gathering masterpieces from different museums and exhibitions. Other galleries such as "Serpentine Galleries" in the United Kingdom are also collecting pieces in VR. One great VR initiative within the European Union is the "EuroVR Association" which is a non-profit association which provides a network for all those interested in VR. The association aims to gather not only individuals but also national chapters and associations, large companies, as well as research institutions, universities, and laboratories, with a keen interest in VR.

Regarding the low-skilled and low-qualified learners and individuals with learning challenges, VR provides an alternative medium to meet their needs and facilitate their learning experiences. Indeed, educators believe that with VR education programs those learners can increase their engagement and improve their overall performance. Also, hands-on learning techniques like VR education directly contribute to increased cognitive abilities such as memory, attention, and concentration (Chandrashekar, 2018) by brining learning to life via a virtual environment. The more a learner is able to participate in life-like engagement, the easier it is to personally feel a connection to the subject material, making it easier for application and retention of the subject matter. Examples being used in education for low-qualified learners:

- **Public Speaking VR** application helps practice the skills of public speaking. The app provides photorealistic environments, and students can prepare for a job interview of a class presentation.
- **Nearpod** provides immersive VR experiences for a wide variety including cultural visits, field trips throughout the world and even social studies plans.
- **Alchemy VR** offers 3D experiences that are lectures overlaying an immersive scene giving users an entire trip into the subject matter.

3.2 VR learning and development in Asia (Japan - China)

During the last years the Asian VR market has been growing at a high rate also driven by the support of local governments and is becoming very competitive globally. In terms of VR topics, Asia is active in content creation, however, for cultural and language reasons, it is mainly focused on the Asian market.

To start with, the Japanese VR market has a lot of strong players in the gaming field and VR has largely been used for entertainment purposes. Outside gaming, there are also some initiatives in education according to EU-Japan Centre for Industrial Cooperation. So far, VR initiatives in Japan applied in a wide variety of industries, such as medicine, tourism, retail, and manufacturing. Specifically, VR companies in Japan are working on developing VR technologies for industrial solutions and creating opportunities to commercialize those technologies.

As to China, Chinese VR ecosystem is evolving fast and it is very active in the field of VR development. It is a fact that there is amazing growth and in the next five years, China could dominate the VR market (Merel, 2018). In China, there are many start-ups that are working on software development in the area of education and workplace. The Chinese government has really committed to facilitating VR growth within the country, emphasizing the innovation and considering VR as a key technology for the development of the country (Dayan, 2017). The interest of China, regarding the VR, focuses on some key areas, like:

- **Education:** to make learning more efficient and entertaining. Schools in China already use virtual classes and virtual examinations;
- **Culture:** to promote tourism and to preserve important historical places and monuments virtually forever.
- **Health:** The use of VR for doctors' training purposes and for people's treatment.
- **Business:** VR is used in real estate, interior decoration, and apparel virtual design.

China invested in the integration of VR in education and thus the VR education market is growing fast. The recent report of Huawei shows how the transformative technology of VR is having an impact by improving education and training, and the role that operators can play in further improving the uptake of technology for the benefit of students and trainees (HUAWEI Technologies LTD Report, 2018).

One example of VR Education in China is the VRSCHOOL which focuses on vocational education. The VRSCHOOL provides a complete VR teaching solution to schools as it provides a range of education software, allowing teachers to begin using VR immediately. The software includes a VR content production engine and class management system and offers other essential services, such as class development and teacher training (Alhadeff, 2018). Moreover, in the educational area, there is also the FLY VR as one solution including hardware, software, and content for the school market. It focuses on science and vocational education, but also other aspects of school life such as fire and earthquake drill practice.

Another example is the company "NetDragon Websoft' which focuses on VR professional education and developer training and use VR to improve regular classes. NetDragon supports VR start-ups and the creation of VR labs in Higher Education and also develops some VR education content, particularly for vocational schools, such as human anatomy. Last, the initiative "Donghu VR Town" is designed with VR intertwined in every aspect from services, healthcare, education, to entertainment. Also, regarding the development of VR hardware, the Dloldo are cutting-edge glasses for better and more comfortable user experience. Other examples in the VR ecosystem include the Langzou VR in education, VR Waibao in collaboration tools, 7invensun for eye tracking addons (Alhadeff, 2018). All the above examples can be also used for learning purposes for low-skilled or low-qualified people.

3.3 VR in the USA

The USA has a leading position in the global VR market. VR software development is the main activity of several VR companies situated in the USA. A recent report by Higher Education Technology Company reports that almost half of US Colleges use VR technologies. Higher Education institutions are investigating a range of uses for VR technology, from offering virtual lab facilities for remote students, to simulated surgical procedures to train medical students. The VR market will continue to increase with lower-cost alternatives and portable devices, such as Google Cardboard and Oculus Go (Hills-Duty, 2018).

To understand the usage of VR in education within the United States, we provide some examples. NC State University is using VR in Introductory Biology as a way to immerse learners in field-based experiences. St. John's School Boston in Massachusetts is using Minecraft and VR to create immersive experiences. Penn State University in

Pennsylvania is training students to do things in the virtual world as a precursor to doing it in the real, increasing the efficacy of learning. Drury University in Missouri is teaching architecture design using VR tools. Stanford's students are using Viar360 to create virtual tours of museums. Some other educational institutions have been used the Oculus Rift to help students with special needs and to do therapeutic exercises with autistic students. The University of Michigan is using VR to let potential football playing students experience being on the field in a full stadium. Also, besides using VR for teaching or learning, a number of academics are studying the impact VR will have on society as a whole. Outside from Higher Education, some media publishers, including The New York Times have jumped into VR storytelling (Hills-Duty, 2018).

3.4 VR examples and low-skilled learners

Considering the above trends and standards, we present examples of VR in Education which can be used for low-skilled and low-qualified people, including drop-outs, refugees and students with intellectual deficits:

- **Google translate VR** provides the opportunity to translate 30 languages using the camera and watch the translation in real time. This feature is great for language students and students speaking other languages.
- **Titans of Space** offers a tour of the solar system, with voice overs and music, and was ranked a cutting-edge product to learn science and can ideally be used for students with intellectual deficits and little interest in learning science.
- **Flashcards:** This app helps students learn words in a colourful and fun environment. It transports you into a fascinating electronic world where learning is a side effect of the experience. Studying your flashcards in VR lets you see written words and images, as well as have them read aloud, aiding both the visual and auditory learner in multiple languages. Hearing foreign vocabulary words as well as seeing them is a huge boon for foreign language students.
- **Imag-n-o-tron:** Stories jump off the page and make them come to life. This grand new storybook app supports learners of any age to improve their reading. It provides the opportunity to download content while engaging with complimentary images making the VR world an educational space.

4 Target Group Survey results

4.1 Introduction and background

The design, implementation and results presentation of the current target group survey are introduced in the framework of the Viral Skills projects second project output, the Viral Skills Compendium.

To be able to achieve a maximum impact with the outcomes and result of the Viral Skills project in the sense of a successful dissemination and exploitation of results, it is crucially important to ensure a maximum of relevance of the results for the final target (user) group. For this reason, the project work programme foresees the inclusion and consideration of the potential, wishes, knowledge base, fears and challenges of the target group itself. This was implemented in the course of a target group survey, which was planned and implemented by all project partners in the partner countries of the Viral Skills project. In each of the partner countries (AT, DE, ES, IT, IE, CY) a minimum of five representatives of the target group consisting of adult education managers, educators and trainers were questioned concerning their:

- basic awareness of VR learning possibilities,
- attitudes towards this issue
- fear, expectations, needs and demands when considering applying VR learning as an integrated part of their training offers, especially to low-skilled and low-qualified learners with a focus on basic education

Based on the selected and agreed methodological considerations, all partners were supposed to implement the target group survey with a minimum of 5 representatives of the target group during the months of May and June 2019. The following pages are supposed to present the key findings and outcomes of the survey as well as deductions for the further proceedings in the curriculum development. A more detailed version including all results of this survey can be downloaded from the project website separately in English language (www.viralskills.eu/downloads).

4.2 Methodology

The information and methodological approach provided in the work programme of the project application, the target group survey is build on two pillars.

a) Conduction of a questionnaire based quantitative survey

b) Conduction of qualitative interviews with target group representatives

The methodological plan did foresee for all project partners the identification of min. 5 representatives of the target group in their country. The target group members were provided with a short quantitative questionnaire with mostly closed questions offering certain answer possibilities and categories. After that, the target group members were asked in a qualitative interview about their opinions and ideas on the basis of an open interview questionnaire/guideline. The interview guidelines provided by P1 have been developed in a way that in a first step core questions were raised and discussed in the qualitative interviews and then a number of support questions were provided for partners in case the interviewers needed an additional prompt to lead the interview in a certain direction.

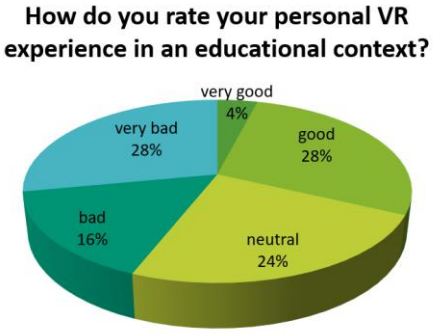
The setup of the survey was a minimum of 5 interviews per partner country resulting in a data basis of 30 interviews with adult education trainers, educators or managers. The main aim is to get an overview and insight into the needs and requirements of the target group and to use this information to maximise the target group relevance of the results and outcomes of the project, even though the data base is rather small.

Based on this, certain relevant deductions for the further development of the outputs of the Viral Skills project and especially the training programme curriculum were made. As presentation format of the quantitative data we have chosen the format of a circle diagram which allows getting an easy graphical overview of different answers and their statistical dimension / relevance. For the qualitative data we have chosen the presentation in a word cloud format. The word cloud will allow us to visualise the importance of single words used for each question and be the basis for the results interpretation and deduction of recommendations for the further project outcomes. Each visual representation of the results was also described verbally in the full version of the target group survey, in this summary, only a few key words are provided.

4.3 Quantitative Survey Results (selected examples)

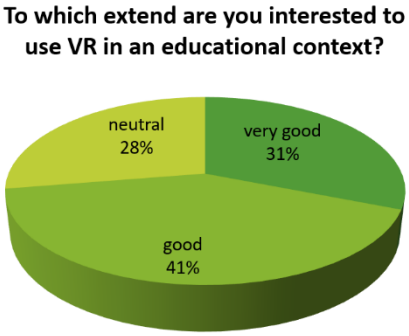
How do you rate your personal VR experience in an educational context?

The personal VR experience in an educational context appears to be diverse and critical. Only 32% of the survey participants answered this question with very positive or positive, about a quarter of the interviewees gave a neutral answer and 44% gave a negative or very negative answer. In front of this we can assume that most likely people did hardly use VR technology for educational purposes at all and did so answer this question with a quite negative scoring. However, overall we should not forget that within our target group there is a quite large share of people who already had negative experiences with VR technology in learning who should be treated carefully.



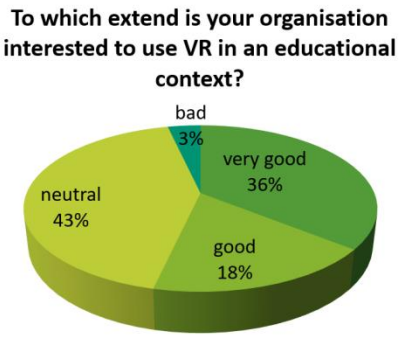
To which extent are you interested to use VR in an educational context?

This question provides more information about why some interviewees gave negative answers in the question above, because it seems like they simply haven't had any personal VR experiences in an educational context. Overall we can expect a large majority of adult trainers, educators or managers willing to actively use VR technology in an educational context which forms a promising basis for the dissemination and exploitation of the project results within the Viral Skills project.



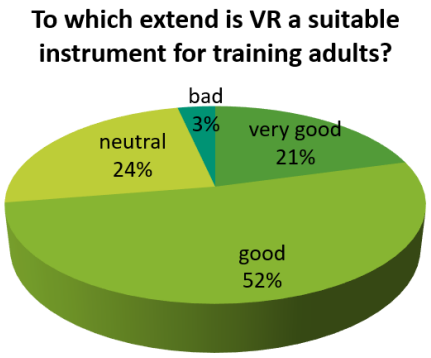
To which extend is your organisation interested to use VR in an educational context?

54% of organisations are very much or at least much willing to use VR technology in future for educational purpose,s while 43% who are not really decided and another 3% who are not interested to use VR technology in future. A possible interpretation is that the VR technology equipment, its purchasing costs



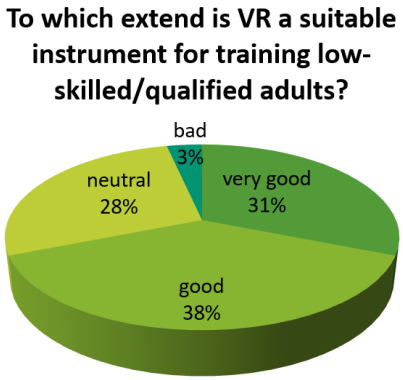
and also its maintenance effort does mean quite some financial investment for the education institutions, which they naturally fear and would probably lead to a more critical result for this question. In front of this 2 core deductions could be made for the Viral Skills project as well as on a general level.

To which extend is VR a suitable instrument for training adults?



About three quarters of the respondents state that VR is a very or at least suitable instrument for the training of adults in general. This is of course a very positive feedback that we received from our target group which also supports the assumptions and theoretical background stated in the project application of the Viral Skills project. Only 3% of respondents mention that VR would not be a suitable instrument which is basically neglectable. Overall we can build on this promising basis that with VR technology we have an innovative and suitable instrument for adult learning which is not only the view of the project partnership but also of the project direct target group, the adult educators, trainers and managers.

To which extend is VR a suitable instrument for training low-skilled / qualified adults?

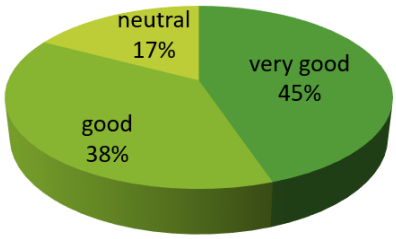


Again nearly ¾ of the respondents find the potential very good or good and only 3% see the suitability of VR technologies critical (bad). These answers do also support the assumptions in the project application and form a fruitful basis for the introducion of the Viral Skills project outputs within the target group. Also in front of this positive estimation it would be important to especially highlight the possibilties and advantages of VR technolgies for the learning of low skilled / qualified adults which are certainly located in a very much experiential learning process, a hands on learning and trial and error learning in a virtual environment.

How helpful would you consider an online handbook for adult educators on how to integrate VR in adult learning settings?

On one hand it is not surprising and on the other hand it is very positive that a vast majority (83%) of target group representatives consider a handbook about the integration of VR in adult learning settings is a very good or good instrument. None of the respondents has stated a negative feedback towards this core project output. It can therefore be assumed that this core output of the Viral Skills project will fall on very fruitful and promising ground within the target group. There is no doubt that adult educators, trainers or managers will use this output and that the project with its outputs has met current needs in adult education.

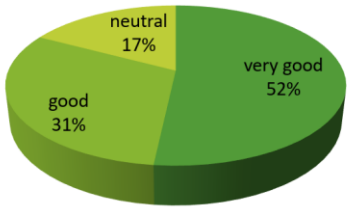
How helpful would you consider anonline handbook for adult educators on how to integrate VR in adult learning settings?



How helpful would you consider an online database of VR systems, technical / structural requirements and how to set up a VR studio?

A similar picture with slightly more very positive answers is received concerning the planned online database of VR systems. Again 83% of respondents find this output very helpful or at least helpful for their future work. Also with this output the project can expect considerable use and dissemination impact within the core target group.

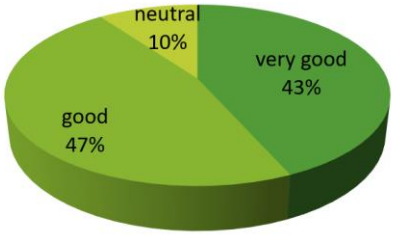
How helpful would you consider an online database of VR systems, technical/structural requirements, and how to set up a VR studio?



How helpful would you consider an online collection of VR software reviews suited for the needs of adult learners?

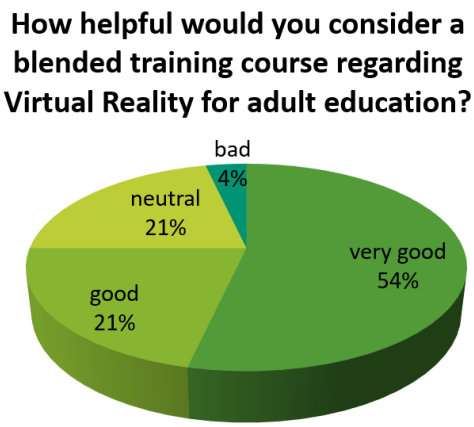
The vast majority of 90% gave a very positive or positive answer, indicating that the selection of outputs within the Viral Skills project has been a excellent as it meets the pulse of time and we can expect a high uptake of innovation and development within the target group. The partnership needs to make sure that the selected software applications are described

How helpful would you consider an online collection of VR software reviews suited for the needs of adult learners



and presented in a very clear, easy to read and understand way using visualisation as good as possible to guide adult trainers and managers when wanting to make use of single software solutions for their adult training processes.

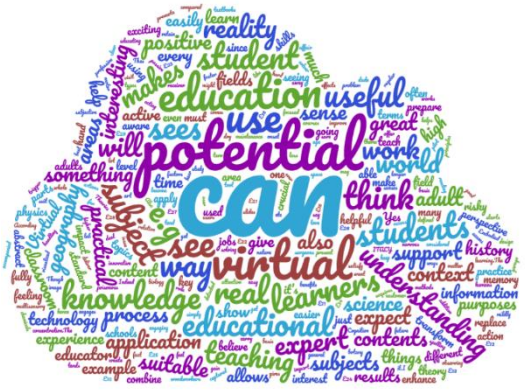
How helpful would you consider a blended training course regarding Virtual Reality for adult education with a duration of five days classroom, five days onilne featuring webinars?



Exactly 75% of all respondents would estimate also the third intellectual output of the Viral Skills project which will be a training course regarding VR for adult education. This is on one hand very positive and will also ensure a good dissemination and participation effect in the training course in the long run, however, we have to consider that also 21% have a neutral and 4% even a slightly negative opinion towards this output and offer. Deductions from feedback received should be made thoroughly and immediately. Most importantly, the partnership should be careful in their further developments.

4.4 Qualitative Survey Results

Where do you see potential for application of VR for educational purposes in general?



The by far most mentioned term is the word "can" which clearly means that in the overall opinion of all adult educators and trainers virtual reality technology can have a potential for adult learning and shows the basic positive attitude of the asked target group representative towards this technology trend. Trainers are often speaking about the potential of the technology together with its positive effects on the motivation of adult learners. There is hardly any doubt in all partner countries about the general usefulness of VR technology for adult learning.

What would be your biggest fear/concern regarding VR in an educational context with adults?

When analysing the answers more in detail we are able to identify three different levels of constraints:

a) **Trainer level:** Trainers are maybe simply not qualified enough to make full use of VR technologies in their learning processes.

b) **Health level:** Health problems could be attached to the use of VR technology, some call it dizziness, motion sickness or nausea including the loss of spatial awareness. This is unfortunately one of the biggest disadvantages of VR technology and quite difficult to control. Using the technology with caution seems to be the only solution at the moment.

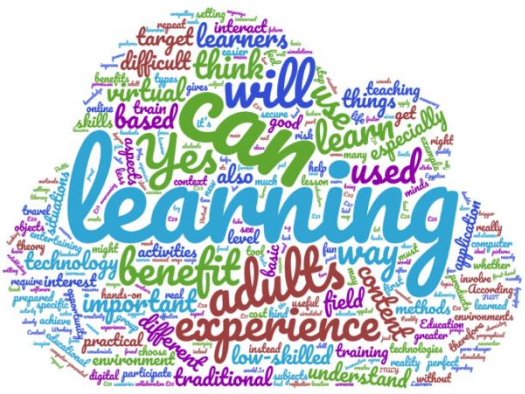
c) **Learner and social level:** The traditional education is based on personal human communication and interpersonal connections. Virtual reality is quite different as the learner is mostly alone in the virtual environment, except when a trainer is present or the software used allows real time communication with other users. Nevertheless, it is within the trainer competence to cleverly use and introduce VR technology in their didactical process and consider the risk of people getting lost in a virtual reality environment.

What kind of specific competences are required of trainers that plan to implement VR in their training?

Nearly all trainers asked in all the partner countries mention two core fields of expertise (or competences) which are relevant and needed: technical / technological competences as well as didactical competences for the use of VR in a adult learning process. Besides this, experts mention competences like planning skills, flexibility, empathy for the learners group etc. Overall, however, we can see that the outputs and offers of the Viral Skills project (and others of course) should focus on the technological as well as didactical /pedagogical competence level.

Do you think low-skilled/qualified adults could benefit from VR based learning?

The terms like yes, can, will, benefit etc. are the most important ones and this shows very clearly the positive value the adult trainers see in the use of VR technologies especially also for the learning process of low skilled or qualified adults. Mainly the arguments given by trainers refer to the fact that especially learners with low skills or qualifications are not always too confident with adapting to new situations, being flexible and react as fast as expected. The virtual learning environment puts them in a new situation where they can train certain tasks and learn about content in a nearly real environment but with the protection of their own virtual space.



4.5 Summary, Deductions and Recommendations

As mentioned initially, a high relevance of outputs for the foreseen and envisaged target group is one of the most crucial factors for success and sustainable use. This was in fact the main aim and reason for the implementation of this brief target group survey. In front of this it seems to be important to extract some core deductions and recommendations for the development of the outputs especially the handbook containing also the database of VR technology as well as software applications (IO2) and the Viral Skills training programme (IO3). On the basis of the received data from the quantitative and qualitative survey and in front of a pure phenomenological approach followed we would be able to make the following deductions worth considering:

- When trying to introduce VR technology in adult education and especially also for the target group of low skilled / qualified adults, we have to be aware that we are entering a new and **highly innovative area**. Because of this, it would be important to keep the theory of innovation uptake in mind, which divides between 5 different steps. It would be important to **identify the innovators, the early innovators, early adopters and early majority within the target group** (Rogers E., 2003). When approaching, inviting and selecting participants for the pilot tests of the training programme in the partner countries, it would be important to **focus on these three groups to foster the quick and solid adoption of innovation and in this case the application of VR technology in adult education**.

- Overall, we have seen a generally **very positive attitude towards this innovative technology** from the perspective of the target group, there seems to be a certain **curiosity** within the target group and this should be utilised when developing, testing and mainstreaming the project outputs. A large majority of the respondents have stated that they would be interested in the approach, would like to get more information and training on the subject and would also see the high potential of VR technology in adult education.

- **Finance matters.** In many answers to various questions we can see that there are some strong concerns related to the financial impact of the introduction and use of VR technology in adult education. In general, the adult education arena in Europe is not really in a very lucky financial position and respondents

largely express that there could be not enough financial resources available. This has two consequences. On the one hand when selecting and introducing and showing relevant VR technology on hard- and software level, the partnership should select examples which are **affordable to a larger group of people and institutions**. On the other hand the financial dimension should be treated as **open and transparent** as possible. For all systems introduced, the **approximate costs** should be stated, also for the software, however, especially on this level open source or at least free software should be preferred and selected in first place as far as possible. In addition to this, maybe, the project and especially the handbook and/or database could also dedicate some information to possible and potential funding mechanisms for technology investment. Learning technology and digitalisation in learning is a major political trend in most of the European countries, which may some co-funding for technology investments.

- The survey has clearly shown that there are some severe **concerns mainly related to the digital and technology competences needed on the level of adult trainers and educators**. This is even more relevant than the **challenges on pedagogical/didactical level**. The training course developed needs to include a good part of technology training, digital competence development and issues as maintenance of VR systems and trouble shooting in case of problems.

- The handbook and all databases should **clearly highlight the potential and possibilities of VR hard- and software** for the training and development of adult learners and especial low skilled and low qualified adults in the sense of basic education.

- In the survey we have discovered that the target group has some **concerns towards a too long and too theoretical training programme** which covers five days in a row etc. The partnership should be really careful with the development and curriculum design to take all these concerns into consideration.

- Despite the fact that the training course in the Viral Skills project does have a strong distance-learning dimension, the content of the whole VR embedding in adult education should basically **focus on the use of VR in face-to-face training sessions in adult education**. Quite many trainers mention that they would like to

use VR technology in their programmes, however in the course of face-to-face training setting; this should be considered in the curriculum as good as possible.

- In the qualitative survey, the trainers have mentioned a number of fears on personal level, health level and also related to the learners and their social learning dimension when working with VR in adult education. These need to be considered in the training programme setup as well also (especially for the health-related concern) become a part of the training content itself. Trainers need to be **aware of any health-related challenges or problems when using VR** in their classes of adult learners.

- In the qualitative survey, the participating trainers from the partner countries have stated a large number of important **success factors** for the core outputs of the Viral Skills project. There is no doubt that all of them should be considered as far as possible to achieve a highest possible target group relevance. However, in front of the financial and time limits within the Viral Skills project, it is certainly not possible to consider all of them fully (e.g. the production of videos for the explanations in the handbook). Out of this reason, it is suggested to categorise the received success factors into 3 categories (crucial / desirable / follow-up). At least it should be tried to achieve and implement the "crucial" success factors and some of the "desirable" ones.

Finally, we want to thank all project partners and especially the adult trainers and educators participating in this brief survey for their efforts and valuable contributions to a highest possible target group relevance of the project outputs. We are looking forward to welcoming interested target group members in the pilot testing and external evaluation of the training programme in the course of the Viral Skills project.

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ANNEX: Viral Skills E-Thek

Software Introduction

Virtual reality is already a reality in different spheres of society, including education. Although it is still an emerging technology in relation to its potential, it is already offering opportunities that were previously unthinkable. Virtual reality allows learners of all ages to experience learning in immersive settings and to break down geographical and temporal barriers, similar to when reading a novel.

In the following chapter the Viral Skills partnership provides adult trainers with the "Viral Skills E-Thek", which is a collection of more than 25 selected free VR software applications for educational uses. These VR learning programmes have been tested and analysed and are recommended by the partnership for adult learning settings in general and specifically for activities with low-skilled and low-qualified learners.

Before providing trainers with more details about the E-Thek: What are the possibilities of virtual reality in the education sector? The following section offers insight in some of its most outstanding uses and presents some VR software examples adult trainers will find in the collection provided.

Travelling without leaving classroom

Thanks to virtual reality class trips do not have to be limited to the local museum or the nearby town: learners can visit and study about the Taj Mahal, for example, without even moving from their classroom. This enriches teaching and makes it more fun while overcoming economic and geographical barriers.

One example analysed in the Viral Skills E-Thek is:

- **Google Earth VR**: Google Earth VR lets learners explore the world from totally new perspectives in virtual reality. It allows to stroll the streets of Tokyo, soar over the Grand Canyon, or walk around the Eiffel Tower. This virtual reality app lets learners see the world's cities, landmarks, and natural wonders.

Time traveling

The barriers it breaks are not only geographical, but also temporal. Adult learners will be able to witness the taking of the Bastille, for example, and learn history in a much more memorable way.

In this context, in the Viral Skills E-Thek trainers can find:

- **Google Expeditions**: Expeditions to real places in the world, historic events, space or the body.
- **Wonders of the world**: In Wonders of the world learners will visit a small number of the ancient wonders including the Colossus of Rhodes, Taj Mahal and Machu Picchu. At each of these sites they can learn about its history and its historical significance to the local area and the world through an immersive and interactive experience.

Limitless exploration

Taking learners to the moon is not a feasible option for any educational institution in the world. And it would not be the safest either. Through VR, adult learners will be able to travel through space and immerse themselves in the depths of the sea to satisfy their curiosity.

The following VR applications described in the Viral Skills E-Thek might foster learning in this context:

- **BBC Home - A VR Spacewalk:** Inspired by the NASA training programs, the Spacewalk enables learners to embark on a spacewalk 250 miles above the Earth's surface, something only 217 people have ever done for real.
- **Titans of Space:** Titans of Space provides a densely educational guided tour of the Solar System, designed first for virtual reality. Multiple versions are available for mobile and PC platforms, for VR and otherwise
- **International Space -Station Tour VR:** Moving between 8 modules adult learners can uncover over 40 key areas of the space station that serve as the living quarters and science laboratory for an international crew of astronauts and cosmonauts.

The human body

Can anyone think of a better way to study the human body than to visit it from the inside? It has to be imagined the experience of freely moving through the digestive system, identifying organs and discovering how they work through immersive learning. All this is possible with virtual reality.

In the Viral Skills E-Thek adult learners can explore:

- **Anatomyou**: Using "Anatomyou", the user becomes part of the anatomy in an immersive way, being able to navigate along anatomical structures: circulatory, respiratory, digestive, urinary, lacrimal and female reproductive system.

STEM (Science, Technology, Engineering and Mathematics)

Virtual Reality as an educational method for learning geometry, mathematics, and sciences. In this context, described VR apps in the Viral Skills E-Thek are:

- **Times Tables VR:** Times Tables VR is a fun way for learners, especially low-skilled and low-qualified adults, to practise their multiplication skills in virtual reality using only their eyes in an immersive 360 degree environment!
- **Nanome:** Nanome is a free immersive nanoscale laboratory for modern VR headsets. Learners, hobbyists, and Drug Designers use Nanome to visualize, edit, and simulate their research in real-time with friends and colleagues across the globe.
- **Calcflow:** Using the app Calcflow adult learners can manipulate vectors with their hands, explore vector addition and cross product. They can see and feel a double integral of a sinusoidal graph in 3D, a Mobius strip and its normal or spherical coordinates! In addition to that, the app allows to create one's own parametrized functions and vector fields!

Languages

This can also be a new way of learning languages; through a totally immersive VR, that would be fun and appealing.

In this context, in the Viral Skills E-Thek can be found:

- **Mondly: Learn Languages VR:** The app allows to experience the most advanced way to learn languages from the comfort of one's own couch. Mondly VR perfectly complements with Mondly's main language learning app, allowing learners to practice everything learned.
- **Virtual Vocab: Spanish VR:** With the app learners are enabled to virtually go through a school and a house. By looking at certain objects such as a TV, a chair or a painting and clicking on them, one will hear the Spanish word and one will be able to read the Spanish and English word at the same time.

VIRAL SKILLS E-THEK – The Selection Process

After this general overview, the following section will explain how the different software have been selected and evaluated, and which are their applications.

Regarding VR applications, a sample of at least 25 applications has been taken based on a first internet research.

The selected VR applications have been catalogued and categorized according to content, interactivity, video content or 360° scenes or self-creating experiences in VR.

Apart from the categorisation described, each of them has been analysed on the basis of the following parameters: Name of VR application, Category, Content, Ranking & Popularity, Cost, VR-Headset Interactive, Experience, Create Material/ Lessons, Low-skilled/ qualified learners

With all this information the partnership will have a first vision of each of the applications selected. These applications will also be analysed and tested by the Viral Skills partnership.

Each partner will proceed to test and interact with the hardware acquired the assigned applications and platforms. Each organization should try and evaluate a minimum of 4 learning apps. Since not all of the apps found through the internet research were compatible with all the VR Hardware of the partners, the original sample of VR learning applications was revised and extended by apps found either on Steam VR or the stores/platforms of the different VR hardware systems (e.g. HTC Viveport, Oculus Store, Google Play Store, etc.). Further, if any member of the team would come across new interesting applications those would be tested as well.

For the selection of the VR apps, several parameters must be taken into account:

- **Language:** VR learning applications should be in English (many apps have different languages to choose).
- **Cost:** They should be free (some apps have a very low cost, and could be considered if worth being tested additionally)
- **Target Group:** They should be suitable for adults in general and specifically for low skilled/qualified adults.

After the validation of the apps according to the selection parameters, more than 25 VR learning apps were found which can be assigned to the following thematic categories:

- Mathematics
- Chemistry
- Human body/anatomy
- Language Learning
- Space
- Virtual Museum
- World/Sites
- History – Second World War
- Sport-, Music-, Social-Events
- Visual Impairment

Further, two apps focus on "Training" and a variety of apps provide various different contents or a platform where any contents can be shared. All this VR learning software has been tested, analysed and evaluated as described in the following section.

VIRAL Skills E-THEK – The Evaluation Process

For this purpose, a template (E-Thek) has been created to facilitate the collection of data and to draw the right conclusions. The partners have used this template with each of the VR applications, all of them suitable for adult learners with low qualifications.

The E-Thek is designed to analyse the VR Application, with its corresponding name and category.

Apart from which partner has completed it and its processing date, the technical framework, the key data of each VR application and its compatibility with the different VR hardware systems, operating systems and languages will be taken into account.

As for the contents of the VR application, the partners have considered which learning content it provides and what the Learning Outcomes are after using it, based on: Knowledge, Skills, and Competences.

Also, the activities provided and whether they bring added value to low-skilled and low-qualified adult learners.

In order to better determine the analysis, a rating scale for the application has been included taking into account the application level, ease of use, gamification level as well as the pedagogic orientation and standards. The evaluation of the apps is also complemented with a SWOT analysis. The objective of the SWOT analysis, of the different selected VR applications, will facilitate the adaptation of each one of them to the most suitable learner-teacher context.

With all the data the partners of the project will be able to determine in what context it is ideal to use each of the VR applications, what instructions should be followed both for the teaching of the VR application and the previous preparation needed by the teacher or teachers in charge of it.

Finally, a set of standards/rules will be considered to improve or guide the learning through each of the VR applications.

Thanks to the analysis one of the biggest advantages of using VR technology in the education area can be seen: the possibility of living impossible or almost impossible experiences. It could be said that this is the main benefit that this technology brings to education and why it is worth it. Nevertheless, trainers still need to take into account how and when to introduce it into the classroom in order to obtain the best possible result. It should not be used for the sake of using it, there might be other more suitable and equally valid resources. That is why research is important and to test this technology in order to clarify in which situations it would be more didactically efficient.

Viral Skills E-Thek

VR Application Profile	
Name of VR Application	Creator AVR
Category	Various Content
Date of processing:	10/10/2019

Technical Framework & Key Data

Software-Provider: Google Commerce Ltd
Software-Developer: EON Reality R&D Team
Version of app: 7.8

Compatible VR hardware systems:

- ☒ Google Cardboard
- ☒ **Google Daydream View**
- ☐ Lenovo Mirage Solo
- ☐ Lenovo Explorer
- ☐ HTC Vive Pro
- ☐ HTC Vive
- ☐ Acer AH 101
- ☐ Oculus Go
- ☐ Oculus Rift
- ☐ Oculus Quest
- ☐ Samsung Gear VR
- ☐ Samsung Odyssey
- ☐ PlayStation VR
- ☐ Dell Visor

Compatible operating systems

- ☒ iOS Version: 12.0 or later
- ☒ Android Version: 7.0 and up

Languages available

- ☒ English
- ☐ Spanish
- ☐ German
- ☐ Italian
- ☒ Other: Chinese

Learning Content

Aeronautical Engineering, Medical, Chemistry, Engineering, Food and Nutrition, Humanities, Animal Life on Earth, Astrophysics & Astronomy, Automotive Engineering, Biology, Botany, Culture and the Arts, Earth Science, Food and Nutrition, General Science, Geography, History, Human Anatomy, Industrial Engineering, Mathematics, Monuments & Landmarks, Physics, Virtual Entertainment, etc.

Learning Outcomes

Knowledge

The adult learners will be able to:

- …recall detailed information about various key subjects in a variety of fields beginning from aeronautical engineering over biology to culture and arts

Skills

The adult learners will be able to:

- …locate and identify the constitutive parts of a variety of objects like artefacts, organs, machines, etc. thematised in the app
- …create their own VR learning lessons and courses about a variety of learning subjects using the Creator AVR app

Competences

The adult learners will be able to:

- …demonstrate the ability to learn about a key subject using a number of different sources of information including VR- and AR-experiences, audio recordings, videos, etc.

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Activities provided	Users can choose the learning content they are interested in from a library. Depending on the content mostly a short informational audio and video to the specific content is provided as well as exercises and quizzes. Learners can explore the content on their mobile phone, changing perspectives and illustrations with the touch function, explore the content with AR or Virtual Reality. In the VR mode learners can see the learning content in 360 degree, changing their perspective on the content with their head movements and gaze. For some contents additional 360-Tours are provided. Creator AVR offers single and multi-user mode and enables trainers to create and share educational experiences on the mobile device, with no programming experience needed.
Added value for low-skilled/-qualified adults	The app "Creator AVR" is beneficial when working with low-skilled/-qualified adult learners, especially school drop-outs, since it provides 360 degree visualizations of complex learning contents which make it easier to understand them. Further it includes quizzes which allow a more playful approach. Additionally, trainers can add their own target-group orientated contents and tasks.

SWOT analysis

• User-friendliness	1 ☐	2 ☐	3 ■	4☐
• Pedagogic orientation and standards	1 ☐	2 ☐	3 ☐	4■
• Applicability level	1 ☐	2 ☐	3 ■	4☐
• Gamification level	1 ☐	2 ☐	3 ■	4☐

**1…very poor/low; 2…poor/low; 3…OK/medium; 4…good/high; 5…very good/high*

STRENGTHS	WEAKNESSES
• …provides different learning approaches (e.g. videos, 360 graphics, quizzes, etc.) to contents • …learning contents are well structured and easy to find in library • …provides information and 360 experiences for a variety of learning contents	• …not all learning contents can be explored in VR mode • …little interaction with learning content possible in VR mode • …quality of lessons provided varies
OPPORTUNITIES	**THREATS**
• …allows in-depth understanding of various contents • …allows to create lessons on one's own • …allows a multi-user mode	• …the understanding of all functions of the app might require some time • …VR experiences might be a little bit boring • …exploring the learning content only in VR mode might have little learning effect

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Ideal application /utilization	• ***Context of ideal application*** Ideal to enhance various thematic workshops and courses beginning from engineering, over chemistry to medical contents and beyond. • ***Instructions for preparation*** - Before using the app, make yourself familiar with the learning material provided by the app. - Then either choose the learning content which you want the learners to explore from the app's library or create a lesson/course on your own. - If you want to use content provided by the app, decide yourself whether you want the learners to explore the whole lessons provided or just parts of it e.g. the VR mode to visualize content. - Dependent on this previous decision make sure to embed the app adequately in your course schedule according to the course's learning objectives. - For some lessons provided by the app it might be necessary to clarify technical terms in advance. - Provide maybe chairs (ideally revolving chairs) for the learners since the most comfortable way to explore the App (also the VR mode) might be in a seated position. Creation of content: - In order to being able to create lessons and courses, create a free account on the mobile app. - To start the creation process, tap on the "+Create"-button in the right corner at the bottom of the mobile display and choose if you want to create a new lesson or a new course. Alternatively, you can also tap the plus button in the section "My Workspace".
	- The creation of a new course works quite intuitively. - In order to create a new lesson, have a look at the following videos. Although they refer not to the latest version of the app, they should help within the creation process: ▪ https://www.youtube.com/watch?v=yP2l_O6v9WQ *[Start at minute 2:12!]* ▪ https://www.youtube.com/watch?v=aSHoY0w9ezo *[Start at minute 3:09!]* - Before starting your class, add your learners to your created course or lesson in the section "My Workspace". - Irrespectively of whether you use courses/lessons provided by the app or created on your own, you can use a multi-user mode. In this context, make sure to invite all learners in advance by tapping at "Collaborate" for the lesson you want your learners to explore. • ***Instructions for mentoring*** - Explain the structure and functionalities of the app in advance and give the learners time to become familiar with the app. - Since a lot of information is provided by the app I might be useful to state specific learning outcomes which should be achieved after using the app or parts of it (the suggested learning outcomes by the app for each lesson might be helpful in this context). - In case you created your own course or lesson, you might refer to your own formulated learning outcomes in the app.

	- It might be useful to summarise the most important information about the learning content after the app was used and/or discuss the experiences made. • ***Do's and don'ts*** - When only using the VR mode of the app provide learners with further information to the content in class. - The app might also be a successful tool in context of blended learning formats.

VR Application Profile

Name of VR Application	**NYT VR**
Category	**Various Content**
Date of processing:	29/10/2019

Technical Framework & Key Data

Software-Provider: The New York Times Company
Software-Developer: The New York Times Company
Version of app: 3.5.9

Compatible VR hardware systems:

- ☒ Google Cardboard
- ☒ Google Daydream View
- ☒ **Lenovo Mirage Solo**
- ☐ Lenovo Explorer
- ☒ HTC Vive Pro
- ☒ HTC Vive
- ☐ Acer AH 101
- ☐ Oculus Go
- ☐ Oculus Rift
- ☐ Oculus Quest
- ☒ Samsung Gear VR
- ☐ Samsung Odyssey
- ☐ PlayStation VR
- ☐ Dell Visor

Compatible operating systems

- ☐ iOS Version:……
- ☒ Android Version: Minimum 7.0

Languages available

- ☒ English
- ☐ Spanish
- ☐ German
- ☐ Italian

Learning Content

News & Documentaries

Learning Outcomes

Knowledge

The adult learners will be able to:

- Explain the backstory of conflicts, natural disasters or politics, e.g.
- Distinguish places in foreign countries and connect them to incidents reported in the NYT

Skills

The adult learners will be able to:

- Navigate through a VR environment with the use of sight and hand motion

Competences

The adult learners will be able to:

- Prioritize learning content through the choice of topics
- Understand the evolvement of opposing opinions and process behind current affairs
- Critically evaluate different opinions on current topics as perceived by the various documentaries
- Analyze future news by recognizing varying/opposing actors/parties and opinions

Activities provided

Choose a video from a gallery with the topics: Documentaries, Investigations, Science & Tech, US Politics, Travel, News, Opinion, Arts & Music. See a video with audio about the different topics or, especially in the Travel section, emerge into a virtual space.

Added value for low-skilled/-qualified adults

- Condensed collection of documentaries and news which help low-skilled adults to gain an overview over current affairs without having to process too much information at once
- Virtually travel to places which are otherwise inaccessible and emerging into the scene of war conflict or accompanying refugees on their way to safety which gives low-skilled adults the opportunity to become emotionally involved with a topic and foster interest
- Receive information with no necessity for high level reading skills which is otherwise typical for news outlets such as newspapers, etc.

SWOT analysis

• User-friendliness	1 ☐	2 ☐	3 ■	4☐
• Pedagogic orientation and standards	1 ☐	2 ■	3 ☐	4☐
• Applicability level	1 ☐	2 ☐	3 ■	4☐
• Gamification level	1 ■	2 ☐	3 ☐	4☐

**1…very poor/low; 2…poor/low; 3…OK/medium; 4…good/high; 5…very good/high*

STRENGTHS	WEAKNESSES
• Possibility to virtually emerge into the scene of the story • Different topics to choose from • Detailed background information in each video	• Low resolution especially in the 360°spaces • Very opinionated documentaries • Rough topics such as wars and genocide

OPPORTUNITIES	THREATS
• Get emotionally involved into the topic/scene displayed • Each user can find a topic which interests them • User might get captivated by a story	• Users might prefer to simply watch a video on a website • Especially low-skilled adults might not be able to comprehend that some videos display subjective opinions • It might be disturbing for some viewers to virtually emerge, for example, into a war scene

Ideal application /utilization

- ***Context of ideal application***

In a university, adult education classes or in a museum in the context of journalism, politics and current affairs.

- ***Instructions for preparation***

Be aware, that the app contains scenes and information which some users might find disturbing especially since the user might feel as if he/she is virtually in that scene, e.g. war or genocide.

- ***Instructions for mentoring***

Choose a topic to watch which the user feels comfortable with. Spend time after the use of the app to reflect and discuss the topics watched since there are sometimes subjective opinions displayed.

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	• ***Do's and don'ts*** Give a short introduction to the use of the app. Do not let learners use the app on their own without time for reflection afterwards. Especially for low-skilled adults there is a need for reflection and discussion after using the apps. The app is not suitable for children.

VR Application Profile

Name of VR Application	YouTube VR
Category	Various Content

Date of processing: 30/10/2019

Technical Framework & Key Data

Software-Provider: Google LLC
Software-Developer: Google LLC
Version of app: 1.21.50

Compatible VR hardware systems:

- ☒ Google Cardboard
- ☒ Google Daydream View
- ☒ Lenovo Mirage Solo
- ☐ Lenovo Explorer
- ☐ HTC Vive Pro
- ☐ HTC Vive
- ☐ Acer AH 101
- ☒ Oculus Go
- ☐ Oculus Rift
- ☒ **Oculus Quest**
- ☐ Samsung Gear VR
- ☐ Samsung Odyssey
- ☐ PlayStation VR
- ☐ Dell Visor

Compatible operating systems

- ☐ iOS Version:
- ☒ Android Version: 1.21.50

Languages available

- ☒ English
- ☐ Spanish
- ☐ German
- ☐ Italian

Learning Content

YouTube VR:
Through this application, you can experience your favorite YouTube videos, channels and creators in virtual reality. The YouTube VR app basically can turn any video into a virtual reality experience and makes YouTube a 3D world you can explore from the inside.

Learning Outcomes

Knowledge

The adult learners will be able to:

- Follow the basic steps to set up and use the application for learning purposes
- List at least 3 possible ways they can use the application for teaching and learning

Skills

The adult learners will be able to:

- Set up and use the application in a practical way
- Download and upload content of their interest to be viewed through the application
- Follow required steps to debug if any problems show up during the use of the application with users
- Indicate and describe ideas to integrate this application in various education contexts
- Browse and select relevant content from different channels and videos

Competences

The adult learners will be able to:

- Demonstrate capability to use successfully all functionalities of the app

Activities provided

Users can select from a variety of different topics/context/channels/videos based on the learning content and they have the opportunity to further explore the content in 3D mode/virtual reality as an introductory, evaluation or as an exploration activity.

Added value for low-skilled/-qualified adults

The application is highly suitable for HEI as an introductory practical example because it is easy to get started as a user. Even users with very limited skills can easily get started since most of the users are already familiar with the ordinary YouTube application.

SWOT analysis

• User-friendliness	1 ☐	2 ☐	3 ☐	4■
• Pedagogic orientation and standards	1 ☐	2 ☐	3 ☐	4■
• Applicability level	1 ☐	2 ☐	3 ☐	4■
• Gamification level	1 ☐	2 ☐	3 ■	4☐

**1…very poor/low; 2…poor/low; 3…OK/medium; 4…good/high; 5…very good/high*

STRENGTHS	WEAKNESSES
• Supports most devices • Offers spatial audio, where depth and distance play a role depending on where you look • Easy navigation: you can switch between voice and keyboard controls to browse and search with ease	• Limited capabilities in terms of usability • Users can not interact with the material • Large size of application to be downloaded, so it might discourage some users to do so
OPPORTUNITIES	**THREATS**
• Supports 360-degree video enhancing the interactivity with users • Suitable for learners of all levels • Gives users independence to choose material according to the chosen topic	• Limitation to sustain interest of users • Might not always give an additional value to learners. • Might be addictive to users since it has videos to watch

Ideal application /utilization

- ***Context of ideal application***

The application can be used in almost all context, since it gives users the opportunity to select any domain/ sector and select relevant channels/videos for exploration in virtual reality. It is an application which gives the flexibility to users to watch a video in virtual reality instead in 2D mode, by making the content even more interesting.

This application can also be used in almost all contexts as an additional activity to gain better understanding of a topic during a learning activity.

- ***Instructions for preparation***

The application supports most VR devices and hardware and has a single/multi-user capability. The app can be downloaded conveniently from the VR device search engine and will require registration through the account of the device.

The users do not require to move around while using this application.

It is more convenient for users to have a chair.

A microphone is useful if you also want to search video content with your voice

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	• ***Instructions for mentoring*** Ideal application for the start of a training. It is advisable that the mentor has clear learning objectives of what he/she wants to achieve before using this application. It is advisable that tutors after the initial discussion, encourage learners to experience the application individually and then work in pairs and in groups on the content that they will experience. It is also advisable that the app will not be used for a long time so users don't lose interest. • ***Do's and don'ts*** Don't use this application, without having specific objectives to be achieved, as this might make users loose easily their confidence and mispresent the additional use of this application The following link might also help finding suitable content for adult education by leading to a collection of 360° videos in English and German: https://www.vhs.at/de/vrbrille

VR Application Profile	
Name of VR Application	ARTE360 VR
Category	Various Content
Date of processing:	27/9/2019
Technical Framework & Key Data	**Software-Provider:** Microsoft Store **Software-Developer:** ARTE G.E.I.E. **Version of app:** APK 1.7.0 **Compatible VR hardware systems:** ☐ Google Cardboard ☐ Oculus Rift ☐ Google Daydream View ☐ Oculus Quest ☐ Lenovo Mirage Solo ☐ Samsung Gear VR ☐ Lenovo Explorer ☐ Samsung Odyssey ☐ HTC Vive Pro ☐ PlayStation VR ☐ HTC Vive ☐ Dell Visor ☐ Acer AH 101 ☒ Other: **ACER OJO500** ☐ Oculus Go **Compatible operating systems** ☐ iOS Version:…… ☐ Android Version:…… ☒ Other: WINDOWS Version: 10 version 16299.0 or higher **Languages available** ☒ English ☒ Italian ☒ Spanish ☒ German
Learning Content	ARTE360 VR is the first broadcasting platform dedicated to distribute immersive, interactive, narrative cinema experiences in 360 degree and Mixed Reality.

Learning Outcomes	**Knowledge** *The adult learners will be able to:* • …list at least 3 possible ways they can use the application for teaching and learning **Skills** *The adult learners will be able to:* • …indicate and describe ideas to integrate this application in various education contexts • …browse and select relevant content about various topics **Competences** *The adult learners will be able to:* • …demonstrate capability to use successfully all functionalities of the app • …choose the right content to investigate a subject
Activities provided	ARTE360 provides immersive and interactive experiences in 360° video and mixed reality. It allows users to step inside a movie and to see the scenes unfold all around themselves as if they were there.

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Added value for low-skilled/-qualified adults	Thanks to the VR ARTE360 app, low-skilled/-qualified learners will be able to explore a wide range of topics by immersing themselves in a film, being able to see the scenes unfold around themselves as if they were there and might therefore understand learning content much easier than with traditional methods.
SWOT analysis	• User-friendliness 1 ☐ 2 ☐ 3 ■ 4■ • Pedagogic orientation and standards 1 ☐ 2 ☐ 3 ☐ 4■ • Applicability level 1 ☐ 2 ☐ 3 ■ 4☐ • Gamification level 1 ☐ 2 ☐ 3 ☐ 4■ **1…very poor/low; 2…poor/low; 3…OK/medium; 4…good/high; 5…very good/high*

STRENGTHS	WEAKNESSES
• …improves learning • …content is regularly and continuously updated • …stimulates critical thinking	• …dependence on the hardware platform • …is part of the specific brand • …difficulty finding qualified teaching staff
OPPORTUNITIES	**THREATS**
• …software creation for many application fields • …links between different devices • …insert elements of AR	• …potential privacy problems • …any technical problems or delays in the application development phase • …failure to reach the required level of experience

Ideal application /utilization	• ***Context of ideal application*** Cultural education. • ***Instructions for preparation*** It is very important for the positive outcome of the activity to prepare the virtual reality laboratory in advance. Each personal computer with the connected VR viewer must have all the management software (operating system, drivers) updated. The display must be perfectly calibrated. The ARTE360 VR software will need to be installed as a system administrator and the launcher icon will be available on the desktop. The learner will not in any way be able to change all the system settings. • ***Instructions for mentoring*** The instructor will explain how ARTE probes collective and individual memories, opening a personal gateway to contemporary history. The adult educator will be able to intervene immediately where there are problems of a technical or learning nature. The adult educator must have prepared a small guide to explain to the learner all the steps of the activity to be performed with the viewer and the ARTE360 VR software. At the end of the activity a questionnaire will be given to assess the activity performed. • ***Do's and don'ts*** Due to small delays (latencies) and small inaccuracies of the gyroscope it is good to move slowly and alternate the virtual immersion activity with pauses by removing the viewer.

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VR Application Profile	
Name of VR Application	Unimersiv
Category	Platform - Various Content
Date of processing:	01/10/2019

Technical Framework & Key Data

Software-Provider: Unimersiv
Software-Developer: Unimersiv
Version of app: 4.05

Compatible VR hardware systems:

- ☒ Google Cardboard
- ☒ Google Daydream View
- ☐ Lenovo Mirage Solo
- ☐ Lenovo Explorer
- ☐ HTC Vive Pro
- ☒ HTC Vive
- ☐ Acer AH 101
- ☒ Oculus Go
- ☒ **Oculus Rift**
- ☐ Oculus Quest
- ☒ Samsung Gear VR
- ☐ Samsung Odyssey
- ☐ PlayStation VR
- ☐ Dell Visor

Compatible operating systems

- ☐ iOS Version: ……
- ☒ Android 5.0 (with Google VR Services) or higher
- ☒ Other: Windows Version: 7 or higher

Languages available

- ☒ English
- ☐ Spanish
- ☐ German
- ☐ Italian
- ☒ Other: French

Learning Content

Unimersiv claims to be the largest platform for VR educational experiences and applications available. The app itself provides access to a number of different learning experiences which include field trips (ISS, Acropolis of Athens etc.) which enable users to learn using VR technologies.

Currently available for free (on oculus devices only), the learning content includes VR experiences covering the following:

- Human Body / Human Brain
- International Space Station
- Historical places
- Dinosaurs
- Titanic

More elaborate learning content in respect of all of these topics are available through the paid version of the app. The platform provider, Unimersiv, also offers customised VR training solutions (e.g. VR forklift training), however, this is an additional paid service.

Learning Outcomes

Knowledge

The adult learners will be able to:

- Identify core concepts and process of learning through a VR experience
- Recall the anatomy of a human body and the functions of the brain
- Describe conditions on the International Space Station

	• Identify some of the most important historical civilisations and places in Europe, including the city of Ancient Rome and the Acropolis of Athens in Greece • Describe 12 different types of dinosaur and how they interacted with their environment • Describe both the interior and exterior of the famous Titanic cruise liner
	Skills
	The adult learners will be able to: • Complete simple steps and task required to use the application and complete the tasks assigned • Use the VR equipment effectively in order to complete assigned tasks • Control and navigate through the different environments using a number of physical movements and actions
	Competences
	The adult learners will be able to: • Demonstrate the ability to undertake and complete an engaging VR experience • Demonstrate the ability to follow instructions and complete tasks as required • Demonstrate the ability to interact with and learn from a number of different sources of information including visual and audio. • Learn independently using the resources provided as part of the app

Activities provided	Each app provides different activities for learners to undertake and these are tailored toward the content of each of the modules. These can be roughly summarised into the following: • Open world exploration • Guided, liner tours (interaction with menus) • Audio descriptions which learners listen to as they progress through the activity
Added value for low-skilled/-qualified adults	High potential for added value for low-skilled/qualified adults which include: • Fully guided experiences with good quality learning content throughout • Wide variety of learning experiences which motivate learners to continue with experiences • VR experiences, while immersive, are suitable for beginners • The content is learning oriented rather than focused on gaming, as such it affords learners the ability to proceed at their own pace rather than being pressured to completed set or defined tasks

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SWOT analysis

• User-friendliness	1 ☐	2 ☐	3 ☐	4■
• Pedagogic orientation and standards	1 ☐	2 ☐	3 ■	4☐
• Applicability level	1 ☐	2 ☐	3 ■	4☐
• Gamification level	1 ☐	2 ■	3 ☐	4☐

**1…very poor/low; 2…poor/low; 3…OK/medium; 4…good/high; 5…very good/high*

STRENGTHS	WEAKNESSES
• Wide variety of learning experiences suitable for all learners • Majority of content is free if using Oculus based equipment • Good quality of learning content, easy to use and navigate through different apps	• Some apps are better than others (i.e. The Human Brain vs Titanic) • Some learning content is very linear which lessens the immersive effect of learning through VR • Limited number of apps currently
OPPORTUNITIES	**THREATS**
• Scope to add many new learning apps within Unimersiv • No similar platform/app focused on providing learning experiences • Capacity to upgrade graphics/content on a regular basis as platform is well supported	• Content updates are stopped or become less regular • Liner nature of some apps provide for the possibility of limited engagement by learners • Best experienced with more expensive VR equipment which may limit its impact for individual learners without access to this equipment

Ideal application /utilization

- ***Context of ideal application***
  - Well suited as an effective tool for educating low-skilled and low-qualified persons about the topics such as: human body and brain, historical places, history – dinosaurs and Titanic, Space etc.
  - The platform offers development of customized training programmes (as a paid services), one of the existing training apps include Forklift training which could be useful for the learners as training supporting their future employability
  - Useful for use in classroom-based situations where groups of learners could be taken through the individual apps supported by the tutor
- ***Instructions for preparation***
  - The tutor should have a good working knowledge of the app and the learning content to be able to objectively set the learning outcomes for each learner and also to be able to support and advise learners throughout the experience
  - While not strictly necessary, the tutor should ensure that all learners have sufficient space to properly utilise the controls
- ***Instructions for tutoring***
  - The tutor should advise the learners about immersive VR experiences in general, although this app is suitable for beginners or less experienced learners
  - The tutor is advised to be available to the learner to offer support in case of any obstacles or to further explain the learning content / tasks

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	- The app can be viewed by all learners while it is running, it would be advisable to allow learners to observe the tutor undertaking the basics first. - The tutor should request feedback from learners in order to properly assess the benefits/impacts of the app in addition to what other VR resources would be the most suitable to support the learner's further learning. • ***Do's and don'ts*** - Highly advisable that learners are properly briefed on the use of the VR equipment in order to make the experience as comfortable as possible.

VR Application Profile	
Name of VR Application	Engage
Category	Platform - Various content
Date of processing:	22/10/19

Technical Framework & Key Data

Software-Provider: immersivevreducation
Software-Develop: immersivevreducation
Version of app: 1.2

Compatible VR hardware systems:

- ☐ Google Cardboard
- ☐ Google Daydream View
- ☐ Lenovo Mirage Solo
- ☐ Lenovo Explorer
- ☒ HTC Vive Pro
- ☒ HTC Vive
- ☒ Acer AH 101
- ☐ Oculus Go
- ☒ **Oculus Rift**
- ☒ Oculus Quest
- ☐ Samsung Gear VR
- ☐ Samsung Odyssey
- ☐ PlayStation VR
- ☒ Dell Visor
- ☒ Other: Valve Index
  Dell Windows MR
  Asus Windows MR
  Acer Windows MR
  HP Windows MR

Compatible operating systems

- ☐ iOS Version:.....
- ☐ Android Version:.....
- ☒ Other: Windows Version : 8 and later

Languages available

- ☒ English
- ☐ Spanish
- ☐ German
- ☐ Italian

Learning Content	Training and education platform
Learning Outcomes	**Knowledge**

The adult learners will be able to:

- Identify core concepts and process of learning in a VR environment

Skills

The adult learners will be able to:

- …prepare meetings and events in VR
- …design, build and upload recordings in a VR environment

Competences

The adult learners will be able to:

- …prepare themselves successfully for various challenging situations in which presentation and soft skills are needed e.g. public speaking, training large groups, etc.
- …express and present themselves or/and prepared content adequately and successfully within the frame of these mentioned situations.

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Activities provided	Engage allows a variety of activities: Users can… - …have live meetings, events and virtual reality training and collaborate live with people from all over the world as if they were there in the room. - …broadcast their presentations, videos and 360° videos. - …record everything within their sessions, including their own voice, the character's movement, as well as the rest of the meeting component and all the elements used. - …create simple tests, feedback forms and quizzes for others and deliver them in virtual reality during their live sessions, training and events. In this context, they can measure the learning success and learn from event attendees.
Added value for low-skilled/-qualified adults	Engage can help low-skilled/-qualified learners to improve their verbal communication, to facilitate their socialization with peers and can foster knowledge gain thanks to the existing videos and documents. Further, the app might encourage creativity through avatar and meeting costume design.

SWOT analysis

• User-friendliness	1 ☐	2 ■	3 ☐	4☐
• Pedagogic orientation and standards	1 ☐	2 ■	3 ☐	4☐
• Applicability level	1 ☐	2 ☐	3 ■	4☐
• Gamification level	1 ☐	2 ■	3 ☐	4☐

**1…very poor/low; 2…poor/low; 3…OK/medium; 4…good/high; 5…very good/high*

STRENGTHS	WEAKNESSES
• Organization of meetings. Cooperation between educators and learners without meeting in the same place face to face. • Simple tests, comment forms and questionnaires can be created for others and delivered in virtual reality during the sessions. • Training and VR experiences are created in minutes: anyone can create training or VR experiences in minutes using the easy-to-use recording tools and content creation editor in ENGAGE	• It has yet to develop its full potential in terms of application content • Every time you enter a conference you have to create an avatar or character. • The creation environments are quite simple

	OPPORTUNITIES	THREATS
	• Its use as a platform to create documentation • The interactivity of the application supporting multiple participants at the same time on a conference • The development you can have thanks to the partners	• It has not yet been developed for mobile platforms. • It needs the input of developers and VR teachers to improve content • It takes a long time to connect to the environment

Ideal application /utilization

- ***Context of ideal application***

- Meetings and experimental classes
- For sessions with many adult learners
- Non-contact sessions
- Team Discussions
- Useful for use in classroom-based situations where groups of learners could be taken through the individual apps supported by the tutor

- ***Instructions for preparation***

- Choose the learning content which you want the learners to explore from the app's library and make yourself familiar with the learning material provided by the app.
- Provide and use ergonomic and suitable chairs if possible
- You can upload all kinds of documents, including videos, etc

- ***Instructions for mentoring***

- The mentor must have a good working knowledge of the VR application. As well as the content to work on in order to establish objectively the learning results for each learner and also to be able to support and advise the learners.

- ***Do's and don'ts***

- Do not use for a long period of time. It creates a feeling of instability or dizziness

- Special attention to people that have problems with dizziness, lightheadedness or hypersensitivity
- Leave a security space around each learner
- Give a margin for joining the session and then do not interrupt

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VR Application Profile	
Name of VR Application	Within
Category	Platform - Various content
Date of processing:	23/10/19

Technical Framework & Key Data

Software-Provider: Within Unlimited, Inc
Software-Developer: Within Unlimited**, Inc.**
Version of app :5.6.824

Compatible VR hardware systems:

- ☒ Google Cardboard
- ☒ Google Daydream View
- ☐ Lenovo Mirage Solo
- ☐ Lenovo Explorer
- ☒ HTC Vive Pro
- ☒ HTC Vive
- ☐ Acer AH 101
- ☐ Oculus Go
- ☒ **Oculus Rift**
- ☐ Oculus Quest
- ☒ Samsung Gear VR
- ☐ Samsung Odyssey
- ☒ PlayStation VR
- ☐ Dell Visor
- ☒ Other: Gear VR, Valve Index, Windows Mixed R

Compatible operating systems

- ☒ iOS Version: 9.0 and later
- ☒ Android Version: 4.4 and later
- ☒ Other: Windows 7 and later

Languages available

- ☒ English
- ☐ Spanish
- ☐ German
- ☐ Italian
- ☒ Other: Some content in Russian and Spanish.

Learning Content

Award-winning VR documentaries, animation, music videos, horror, etc. Photo-real people & places: everything is captured with cameras or rendered CGI (=Computer Generated Imagery).

Learning Outcomes

As indicated above, you can choose from over a hundred high quality film experiences through which you can achieve various learning outcomes. One of them is the CNN documentary "Toro Bravo".

Knowledge

The adult learners will be able to:

- Explain what the running of the bulls is
- Explain what the fiestas of Pamplona are, with Toros Bravos (bulls) etc.
- Describe what happens in Pamplona

Skills

The adult learners will be able to:

- Identify the different participants or characters of the running of the bulls: lads, bulls, bullocks, the keepers…
- Identify a bullring, the bullfighters, the public, the horses,

Competences

The adult learners will be able to:

- To locate, identify and differentiate the different participants of Pamplona's fiesta and their relationship with the bull and the ceremony.

Activities provided	Users can choose from the various contents of the VR application at the moment, divided into New Releases, Horror, Documentaries, Animation, Experimental, Music, Archives…
Added value for low-skilled/-qualified adults	The VR application "Within" is beneficial when working with low-skilled adult learners as it provides VR displays of high-quality content that facilitate their understanding and learning by educating and informing them about current issues, as well as other historical, visual and artistic facts etc.
SWOT analysis	• User-friendliness 1 ☐ 2 ☐ 3 ☐ 4■ • Pedagogic orientation and standards 1 ☐ 2 ☐ 3 ■ 4☐ • Applicability level 1 ☐ 2 ☐ 3 ■ 4☐ • Gamification level 1 ■ 2 ☐ 3 ☐ 4☐ **1…very poor/low; 2…poor/low; 3…OK/medium; 4…good/high; 5…very good/high*

STRENGTHS	WEAKNESSES
• The contents are varied. • They are relatively short in viewing time and well-focused on the information. • Very good quality of all contents overall	• Can't interact too much with the application • Some of the contents are very short in duration • The quality of some content is lower than others

OPPORTUNITIES	THREATS
• It allows a quick understanding of some of the topics covered • It is very easy to use • Many of the contents serve to generate opinion and debate	• You may have just seen the content of some topics that are not very broad and have to resort to another VR to expand. • It has virtually no playful activity or game. • Some topics must be prepared in advance because of their difficulty in summarizing in so few minutes.

Ideal application /utilization

- ***Context of ideal application***

It is interesting to apply it to generate broad or specific knowledge of various current topics

- ***Instructions for preparation***
  - You have to choose a topic or content which you want to display.
  - Specific instructions and didactic materials shall be given on the content in advance.
  - Provide and use ergonomic and suitable chairs if possible

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	• ***Instructions for mentoring*** You must work on the contents beforehand to be able to deepen, guide and advise the learners. Many of the contents could generate later a work or debate or sharing after the VR application. • ***Do's and don'ts*** - The application can be an ideal complement to work on a specific topic. - Learners can be given the opportunity to propose a topic to be debated or discussed in greater depth after using the application. - Take into account learners with certain sensitivities.

VR Application Profile	
Name of VR Application	International Space Station Tour VR
Category	Space
Date of processing:	27/9/2019
Technical Framework & Key Data	**Software-Provider:** Microsoft Store **Software-Developer:** The House of Fables Robaszyński-Janiec sp.j. **Version of app:** v1.01 **Compatible VR hardware systems:** ☐ Google Cardboard ☐ Oculus Rift ☐ Google Daydream View ☒ Oculus Quest ☐ Lenovo Mirage Solo ☐ Samsung Gear VR ☐ Lenovo Explorer ☐ Samsung Odyssey ☐ HTC Vive Pro ☐ PlayStation VR ☐ HTC Vive ☐ Dell Visor ☐ Acer AH 101 ☒ Other: ACER OJO500 ☐ Oculus Go **Compatible operating systems** ☐ iOS Version:…… ☐ Android Version:…… ☒ Other: WINDOWS Version: Windows 10 version 10240.0 or higher **Languages available** ☒ English ☐ Italian ☐ Spanish ☐ German
Learning Content	Educational tour of the ISS space station. Incredible 360° technology allows you to feel like an astronaut.

Learning Outcomes	**Knowledge**
	The adult learners will be able to: • …recall the functions of Space Station • …recognize physical laws
	Skills
	The adult learners will be able to: • …navigate through a VR environment with the use of sight and hand motion
	Competences
	The adult learners will be able to: • …convince of the added value of the ISS as if they were personally there
Activities provided	Moving between 8 modules you will uncover 40 key areas of the space station that serve as the living quarters and science laboratory for an international crew of astronauts and cosmonauts. Gain an insider's view of what it is like to live and work onboard the longest, continually inhabited space station to orbit Earth.

Added value for low-skilled/-qualified adults	The user of this app can virtually join the European Space Agency (ESA) astronaut Samantha Cristoforetti having the feeling of being on board the International Space Station. Guided by the record holder for the longest uninterrupted space flight for a European astronaut, the low-skilled/-qualified adult will learn, without having any specific notion, to know the internal mechanisms of the International Space Station. In this context, the app might provide a much more engaging and motivating way to learn than traditional methods ever could.
SWOT analysis	• User-friendliness 1 ☐ 2 ☐ 3 ☐ 4■ • Pedagogic orientation and standards 1 ☐ 2 ☐ 3 ☐ 4■ • Applicability level 1 ☐ 2 ☐ 3 ☐ 4■ • Gamification level 1 ☐ 2 ☐ 3 ☐ 4■ **1…very poor/low; 2…poor/low; 3…OK/medium; 4…good/high; 5…very good/high*

STRENGTHS	WEAKNESSES
• …improves learning • …improves the spatial visualization capabilities of astronomical figures • …stimulates critical thinking	• …dependence on the hardware platform • …discontinuous updates • …difficulty finding qualified teaching staff

OPPORTUNITIES	THREATS
• …software creation for many application fields • …links between different devices • …insert elements of AR	• …potential privacy problems • …any technical problems or delays in the application development phase • …failure to reach the required level of experience

Ideal application /utilization

- ***Context of ideal application***

Astronomy and physical laws training.

- ***Instructions for preparation***

It is very important for the positive outcome of the activity to prepare the virtual reality laboratory in advance. Each personal computer with the connected VR viewer must have all the management software (operating system, drivers) updated. The display must be perfectly calibrated.
The International Space Station Tour VR software will need to be installed as a system administrator and the launcher icon will be available on the desktop. The learner will not in any way be able to change all the system settings.

- ***Instructions for mentoring***

The instructor should explain the astronomy and physical laws concept and give a graphic representation of it on the blackboard through a lecture. The instructor will explain how through virtual reality it will be possible to see in 3D what is shown on the blackboard.

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	The adult educator will be able to intervene immediately where there are problems of a technical or learning nature. The adult educator must have prepared a small guide to explain to the learner all the steps of the activity to be performed with the viewer and the International Space Station Tour VR software. At the end of the activity a questionnaire will be given to assess the activity performed. • ***Do's and don'ts*** Due to small delays (latencies) and small inaccuracies of the gyroscope it is good to move slowly and alternate the virtual immersion activity with pauses by removing the viewer.

VR Application Profile	
Name of VR Application	BBC Home – A VR Spacewalk
Category	Space
Date of processing:	27/09/2019

Technical Framework & Key Data

Software-Provider: BBC
Software-Developer: BBC Media Applications Technologies Limited
Version of app: 1.4

Compatible VR hardware systems:

☐ Google Cardboard	☒ **Oculus Rift**
☐ Google Daydream View	☐ Oculus Quest
☐ Lenovo Mirage Solo	☐ Samsung Gear VR
☐ Lenovo Explorer	☐ Samsung Odyssey
☐ HTC Vive Pro	☐ PlayStation VR
☒ HTC Vive	☐ Dell Visor
☐ Acer AH 101	☒ Other: Valve Index
☐ Oculus Go	

Compatible operating systems

☐ iOS Version: .....
☐ Android Version: .....
☒ Other: Windows Version: 7 or higher

Languages available

☒ English	☐ Italian
☐ Spanish	
☐ German	

Learning Content

Inspired by the NASA training programs, the Spacewalk enables learners to embark on a spacewalk 250 miles above the Earth's surface, something only 217 people have ever done for real. They are tasked with making a repair on the outside of the International Space Station, before being confronted with a terrifying emergency situation.[2]

In general, the learning content is minimal but does include:

- Basic knowledge of a spacewalk
- Understanding and following commands
- Independent thinking in time-sensitive / dangerous situations
- Critical thinking and situational analysis

Learning Outcomes

Knowledge

The adult learners will be able to:

- Identify some of the core concepts and process of learning through use of VR experiences
- Recall some basic activities implemented by NASA during a spacewalk
- Relate to the importance of science and technology in spaceflight
- Identify the physical and emotional requirements of an astronaut during a spacewalk
- Recognise the responsibility and pressure of completing a defined task within a short timeframe

[2] https://www.bbc.co.uk/mediacentre/latestnews/2017/vr-spacewalk

	Skills The adult learners will be able to: • Complete simple steps and task required to use the application and complete the spacewalk • Use the VR equipment effectively in order to complete assigned tasks • Analyse the situation and improvise solution to be taken in order to complete defined tasks, both expected and unexpected • Identify and implement effective strategies to complete the tasks under the pressures of both stress and time
	Competences *The adult learners will be able to:* • Demonstrate the ability to undertake and complete an intensive and immersive VR experience • Demonstrate the ability to follow simple instructions and complete tasks as directed • Demonstrate the ability to independently use the equipment required to complete the task • Demonstrate the ability to work under pressure and within time-restricted deadlines

Activities provided	The learners are tasked with making a repair on the outside of the International Space Station, before being confronted with a terrifying emergency situation.[3]
Added value for low-skilled/-qualified adults	Limited added value to low-skilled/qualified adults, however, the following do apply: • Clear explanation of the tasks to be completed with narrative supports throughout the learning process; this approach supports learners in the belief that they can succeed in the completion of tasks despite obstacles faced • The learning process is straight forward with a set of simple tasks to be accomplished, with the possibility to repeat these processes and practice the tasks until they are accomplished successfully • Short and interesting learning experience; ideal for those unfamiliar with VR experiences • The game gives learners space for independent learning and make them feel "responsible" for their own actions

[3] https://www.bbc.co.uk/mediacentre/latestnews/2017/vr-spacewalk

SWOT analysis

• User-friendliness	1 ☐	2 ■	3 ☐	4☐
• Pedagogic orientation and standards	1 ■	2 ☐	3 ☐	4☐
• Applicability level	1 ☐	2 ■	3 ☐	4☐
• Gamification level	1 ☐	2 ■	3 ☐	4☐

**1…very poor/low; 2…poor/low; 3…OK/medium; 4…good/high; 5…very good/high*

STRENGTHS	WEAKNESSES
• Interesting and immersive insight into basic activities of an astronaut on the ISS, the voice guidance and narratives are of a high quality • Game is straightforward and controls are easy to master, even as a novice. • Suitable for all types of learners, even those unfamiliar with gaming	• Intense VR experience (even on basic settings) which can present challenges even to those familiar with VR. • Only available in one language • App is limited in scope and is very linear in nature, it doesn't include any specific/practical learning content that could be practically utilised by the learners
OPPORTUNITIES	**THREATS**
• Definite capacity to expand learning content • Graphics could be updated to increase engagement	• Idea is easy to replicate – other 'Spacewalk' apps already available through Oculus store. • App is no longer supported as such no further updates will be released.

Ideal application /utilization

- ***Context of ideal application***
  - Well suited as a basic introduction to learning through VR
  - Could be used as a taster/introduction to STEM subjects and as an introduction to space exploration
  - Can be used to introduce the importance of technology and science in a practical setting
  - Can be used as an assistive tool for users to overcome irrational fears (heights, claustrophobia etc.)
- ***Instructions for preparation***
  - Ensure that an adequate amount of space is available to move around
  - It may be advisable to create a dedicated learning space which allows learners to feel safe and to fully engage with an immersive VR experience
  - The option to play the game while seated could be offered to learners. While this may lessen the impact or the VR experience it can assist in overcoming some of the drawback of an intense VR experience.
- ***Instructions for tutoring***
  - The tutor should advise the learners about the 2 options of intensity and level of difficulty. It would be advisable that learners be warned that the experience can be uncomfortable regardless of what level of intensity is chosen.
  - The tutor should stay in the room and support the learner in case of there is any additional help required.

	- The app can be viewed by all learners while it is running, it would be advisable to allow learners to observe the tutor undertaking the basics first. - The tutor should request feedback from learners in order to properly assess the benefits/impacts of the app in addition to what other VR resources would be the most suitable to support the learner's further learning. • ***Do's and don'ts*** - Highly advisable that learners are properly briefed on the use of the VR equipment in order to make the experience as comfortable as possible. - Ensure that headset is fitted correctly and that the learners vision is not blurred/impaired as this can exacerbate the effects of motion sickness/nauseous and will lead to a poor outcome for the learner, particularly in the context of using VR again in the future.

VR Application Profile	
Name of VR Application	Virtual Vocab: Spanish in VR
Category	Language Learning
Date of processing:	29/10/2019
Technical Framework & Key Data	**Software-Provider:** Google **Software-Developer: dragonkoiVR** **Version of app:** 1.0 **Compatible VR hardware systems:** ☒ Google Cardboard ☐ Oculus Rift ☒ Google Daydream View ☐ Oculus Quest ☒ **Lenovo Mirage Solo** ☒ Samsung Gear VR ☒ Lenovo Explorer ☐ Samsung Odyssey ☒ HTC Vive Pro ☐ PlayStation VR ☐ HTC Vive ☐ Dell Visor ☐ Acer AH 101 ☐ Oculus Go **Compatible operating systems** ☐ iOS Version:…… ☒ Android Version: Minimum 4.4 **Languages available** ☒ English ☐ Italian ☒ Spanish ☐ German
Learning Content	Spanish Vocabulary

Learning Outcomes	**Knowledge** *The adult learners will be able to:* • Explain the meaning of around 15 basic Spanish words in the context of a school and a house **Skills** *The adult learners will be able to:* • Pronounce those Spanish words since they can be listened to in the app in Spanish **Competences** *The adult learners will be able to:* • Study independently and with initiative since the selection of different furniture is necessary in the app to learn about the meaning of the word in Spanish
Activities provided	Virtually go through a school and a house. By looking at certain objects such as a TV, a chair or a painting and clicking on them, one will hear the Spanish word and one will be able to read the Spanish and English word at the same time.
Added value for low-skilled/-qualified adults	Listening to new vocabulary and seeing the objects while hearing the words helps low-skilled adults to learn a new language more easily with the connection sight and hearing. The small number of new words to learn in Spanish in the app can also help the target group to focus and not be overwhelmed since the object can also be clicked on as often as needed.

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SWOT analysis

• User-friendliness	1 ■	2 ☐	3 ☐	4☐
• Pedagogic orientation and standards	1 ☐	2 ■	3 ☐	4☐
• Applicability level	1 ■	2 ☐	3 ☐	4☐
• Gamification level	1 ■	2 ☐	3 ☐	4☐

**1…very poor/low; 2…poor/low; 3…OK/medium; 4…good/high; 5…very good/high*

STRENGTHS	WEAKNESSES
• Hearing the vocabulary • Seeing the object while getting to know the Spanish words for it • Interactive learning environment	• Very limited vocabulary offered (Only two settings (school and house) with a few with a few objects) • Very artificial set-up (rooms do not look real) • Voice has slight American accent while pronouncing the words
OPPORTUNITIES	**THREATS**
• Connecting visual and listening skills • Fun while learning new words	• No added value for people who want to get to know vocabulary from different settings • Missing the feeling of "virtual reality" might lead to less interest in the app • Learning vocabulary with a "wrong" pronunciation

Ideal application /utilization

- ***Context of ideal application***

In a language learning environment for low-skilled individuals-

- ***Instructions for preparation***

One must look at the different object and click on it, to receive audio and written words.

- ***Instructions for mentoring***

After the use of the App, review which words were learned.

- ***Do's and don'ts***

Do not use the App for people who already know Spanish since there is no option to go to different levels and the amount of new words might be quite small. Highly qualified people might not get a benefit from the app.

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VR Application Profile

Name of VR Application	**Google Expeditions**
Category	**World/Sites**
Date of processing:	26/09/2019

Technical Framework & Key Data

Software-Provider: Google LLC
Software-Developer: Google Commerce Ltd.
Version of app: 2.3.190826066

Compatible VR hardware systems:

- ☒ Google Cardboard
- ☒ Google Daydream View
- ☒ **Lenovo Mirage Solo**
- ☐ Lenovo Explorer
- ☐ HTC Vive Pro
- ☐ HTC Vive
- ☐ Acer AH 101
- ☐ Oculus Go
- ☒ Oculus Rift
- ☐ Oculus Quest
- ☒ Samsung Gear VR
- ☐ Samsung Odyssey
- ☐ PlayStation VR
- ☐ Dell Visor

Compatible operating systems

- ☒ iOS Version: 8.0 or later
- ☒ Android Version: Minimum 4.4

Languages available

- ☒ English
- ☐ Spanish
- ☐ German
- ☐ Italian

Learning Content

Expeditions to real places in the world, historic events, space or the body.

Learning Outcomes

Knowledge

The adult learners will be able to:

- Recall information of animals, places, nature and processes

Skills

The adult learners will be able to:

- Navigate through a VR environment with the use of sight and hand motion
- Implement desk-research (for expeditions quiz) and self-learning (only in guide modus) independently

Competences

The adult learners will be able to:

- Prioritize learning content through the choice of an area to explore
- Learn more independently as the app fosters this in its setup with the need to self-explore an environment

Activities provided

Choose a place to explore, e.g. an underwater area. Explore different scenes and learn through an audio guide or written information about the place, flora, fauna, natural phenomenons, the body etc. by pointing on different elements in the space.

All tours can be managed and instructed by a tour guide by use of a tablet – ideal for teaching and learning in classes.

An Expeditions quiz can also be taken.

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Added value for low-skilled/-qualified adults	Explore places which are otherwise not physically reachable and gain a visual impression of them. Receive condensed information about the area also through an audio guide. Especially low-skilled adults can profit from the combination of exploration by sight and receiving information through audio.
SWOT analysis	• User-friendliness 1 ☐ 2 ☐ 3 ■ 4☐ • Pedagogic orientation and standards 1 ☐ 2 ☐ 3 ■ 4☐ • Applicability level 1 ☐ 2 ☐ 3 ■ 4☐ • Gamification level 1 ■ 2 ☐ 3 ☐ 4☐ **1…very poor/low; 2…poor/low; 3…OK/medium; 4…good/high; 5…very good/high*

STRENGTHS	WEAKNESSES
• Exploration of places that are normally not reachable: e.g. space, underwater, the inside of the body • Detailed information on the place, things and persons • Possibility to look around and choose places of interest	• No movement possible in the explored space • No possibility to zoom in on points of interest • No moving object/people in the space • Expeditions-Quiz: Users need quite some knowledge as answers to some questions cannot necessarily be deduced from expeditions (picture) content

OPPORTUNITIES	THREATS
• Get a vision of places which cannot be explored physically • Gain knowledge of a specific place. • Explore places according to one's interest.	• Exploration is limited on a few defined areas • Points of interest cannot be explored in detail • Limit on the authenticity/feeling of reality of a place

Ideal application /utilization

- ***Context of ideal application***

Medical training; history, geography, biology, physics education contexts

- ***Instructions for preparation***

Introduction to the topic is beneficial. It might be beneficial to consider the learning setting and choose a few destinations to explore. Since there is wide variety of places, in a medical context, the exploration should possibly be limited to the human body, etc.

- ***Instructions for mentoring***

The educator can encourage to look around and find places of interest where additional information is provided.

VR Application Profile

Name of VR Application	**Google Earth VR**
Category	**World/sites**
Date of processing:	28/10/19

Technical Framework & Key Data

Software-Provider: Google
Software-Developer: Google
Version of app: 1.5

Compatible VR hardware systems:

- ☐ Google Cardboard
- ☐ Google Daydream View
- ☐ Lenovo Mirage Solo
- ☐ Lenovo Explorer
- ☒ HTC Vive Pro
- ☒ HTC Vive
- ☐ Acer AH 101
- ☐ Oculus Go
- ☒ **Oculus Rift**
- ☐ Oculus Quest
- ☐ Samsung Gear VR
- ☐ Samsung Odyssey
- ☐ PlayStation VR
- ☐ Dell Visor
- ☒ Other: Valve Index

Compatible operating systems

- ☐ iOS Version:.....
- ☐ Android Version:.....
- ☒ Other:... Windows 8.1 and later

Languages available

- ☒ English
- ☐ Spanish
- ☐ Italian
- ☐ German

Learning Content

Physical and Urban Geography Contents

Learning Outcomes

Knowledge

The adult learners will be able to:

- Explain what the physical geography of a particular place looks like
- List the different geographical features of a particular area
- Explain what the World Heritage Sites are

Skills

The adult learners will be able to:

- Locate various geographic accidents in a specific area of the Earth
- Identify the most outstanding monuments in each country
- Locate the most important rivers in the world

Competences

The adult learners will be able to:

- Determine the different existing landscapes on the earth or in a particular area and relate it to the climate in that same area

Activities provided

Google Earth allows users to explore the VR world from totally new perspectives in virtual reality. The app allows to stroll the streets of Tokyo, soar over the Grand Canyon, or walk around the Eiffel Tower. This virtual reality app lets users see the world's cities, landmarks, natural and wonders. Users can fly over a city, stand at the top of the highest peaks, and even soar into space. Cinematic Earth Comes with VR tours and hand-picked destinations that send users to the Amazon River, the Manhattan skyline, the Grand Canyon, the Swiss Alps, and more.

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Added value for low-skilled/-qualified adults	The VR application "Google Earth" can be very interesting and beneficial when it comes to providing knowledge about Physical-Urban or Social Geography to low-skilled/qualified adult learners. Especially those who have difficulties with traditional learning methods, as the application provides an extraordinary perspective of concepts and content of Physical-Urban Geography. It allows learners to immerse themselves in the world by exploring it at their own pace and, consequently, can improve the understanding of Geography in general.
SWOT analysis	• User-friendliness 1 ☐ 2 ☐ 3 ☐ 4■ • Pedagogic orientation and standards 1 ☐ 2 ☐ 3 ☐ 4■ • Applicability level 1 ☐ 2 ☐ 3 ☐ 4■ • Gamification level 1 ■ 2 ☐ 3 ☐ 4☐ **1…very poor/low; 2…poor/low; 3…OK/medium; 4…good/high; 5…very good/high*

STRENGTHS	WEAKNESSES
• Very good quality and development of the application • It is very easy to use • It gives users an extraordinary perspective of the contents	• Information for some areas not updated • Users can see people and coordinates. Privacy can generate debate • It doesn't reach everywhere.

OPPORTUNITIES	THREATS
• It can help to know more about physical geography • It allows to see the cities as we have never seen them before. With great clarity • It allows a quick understanding of the topics covered.	• Not yet available on many VR glasses platforms • You have to have some previous knowledge of geography so you don't get lost • Lack of interactivity between user and application

Ideal application /utilization

- ***Context of ideal application***

The Google Earth VR application is ideal for teaching and learning Physical-Urban and Social Geography, providing learners with knowledge and data that will improve their understanding of the subject in general and other more specific issues.

- ***Instructions for preparation***

The teacher or instructor must previously select what to work on and visualize, in order to better adapt to the content.

Previously, didactic and pedagogical materials should be provided to initiate the subject.

The application is simple and intuitive and does not need much previous explanation.
Ergonomic and adequate chairs should be used, as well as enough space to visualize the application.

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	• ***Instructions for mentoring*** You must work on the contents beforehand to be able to deeper guide and advise the learners. A possible task for the learners could include choosing an ancient city and exploring it and seeing the different expansions it has undergone throughout its history, differentiating the typology and urban organization of it. Many Geographic contents can generate later a work or debate or discussion after using the VR application • ***Do's and don'ts*** The application can be an ideal complement to work on a specific topic. Thinking mainly in the Physical and Urban Geography Learners can be given the opportunity to propose other searches at a later session after using the application. After the session, they could solve a common problem, debate, ask questions, provide documentation, etc. Take into account learners with certain sensibilities because the application requires movement. As well as situations with a certain impact

VR Application Profile

Name of VR Application	**Wonders of the World**
Category	**World/Sites**
Date of processing:	02/10/2019

Technical Framework & Key Data

Software-Provider: MATTERVR LLC
Software-Developer: MATTERVR LLC
Version of app: 1.0.12

Compatible VR hardware systems:

☐ Google Cardboard	☐ Oculus Rift
☐ Google Daydream View	☐ Oculus Quest
☐ Lenovo Mirage Solo	☒ **Samsung Gear VR**
☐ Lenovo Explorer	☐ Samsung Odyssey
☐ HTC Vive Pro	☐ PlayStation VR
☐ HTC Vive	☐ Dell Visor
☐ Acer AH 101	
☒ Oculus Go	

Compatible operating systems

☐ iOS Version:
☒ Android Version: 5.0 (with Google VR Services) or higher

Languages available

☒ English	☐ Italian
☐ Spanish	
☐ German	

Learning Content

In Wonders of the world learners will visit a small number of the ancient wonders including the Colossus of Rhodes, Taj Mahal and Machu Picchu. At each of these sites they can learn about its history and its historical significance to the local area and the world through an immersive and interactive experience.

Learning Outcomes

Knowledge

The adult learners will be able to:

- Identify core concepts and process of learning through a VR experience
- Connect the significance of historical events/buildings to the present day
- Recognise of what day-to-day life was like for individuals living at the time

Skills

The adult learners will be able to:

- Complete simple steps and task required to use the application and complete the tasks assigned
- Use the VR equipment effectively in order to complete assigned tasks
- Solve simple puzzles/games to obtain information relevant to the completion of tasks
- Navigate in an open world environment
- Navigate through the app including working the controls and handling interactions with NPC's (non-player characters)

Competences

The adult learners will be able to:

- Demonstrate the ability to undertake and complete an engaging VR experience
- Demonstrate the ability to follow instructions and complete tasks as required
- Demonstrate the ability to extract and sort information relevant to the completing of tasks
- Demonstrate the capacity to think critically about a number of different situations and to apply information gain in the correct context

Activities provided	The learning outcomes will be achieved by: • Visiting the historical locations‘ first hand’ • Interacting with historical individuals throughout the game • Completing puzzles/games/tasks • Taking on the role of an individual from each time period and immersing themselves in the world
Added value for low-skilled/-qualified adults	While there is limited added value for low-skilled/qualified adults, the following do assist in making the application easy to engage with for all users: • Clear instructions provided throughout • The application is particularly visual in nature, offering user friendly graphics which would benefit those not used to interactive experiences or gaming • Application is learning oriented but those so through gamification rather than through traditional learning techniques • The learning process can be implemented according to the learners’ skills and abilities, allowing for engagement with a wide audience

SWOT analysis

• User-friendliness	1 ☐	2 ☐	3 ☐	4■
• Pedagogic orientation and standards	1 ☐	2 ☐	3 ■	4☐
• Applicability level	1 ☐	2 ☐	3 ■	4☐
• Gamification level	1 ☐	2 ■	3 ☐	4☐

**1…very poor/low; 2…poor/low; 3…OK/medium; 4…good/high; 5…very good/high*

STRENGTHS	WEAKNESSES
• ‘Open World’ elements encourage exploration and independent learning • Not overly immersive which can alleviate any potential issues with VR/motion sickness • Learning provided for each site is interesting and encourages the user to learn	• Only available on limited number of devices • Limited scope in learning further about each civilization • Only available in one language
OPPORTUNITIES	**THREATS**
• Could be expanded significantly, taking in other wonders • Could be ported to other operating systems or devices • Learning experience could be easily broadened with more interactivity with the environment/NPC’s	• Limited in scope, may not be of much use for experienced learners • App is now two years old, unlikely to be supported/receive further updates • Better more interactive experiences offer by other apps including Google Earth VR

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Ideal application /utilization	• ***Context of ideal application*** - The application can be utilised in education to further understanding about local history and the some of the most important historical places and civilizations - It can also be an effective way of introducing the learners to an interactive VR experience - Easy and user-friendly way of teaching about historical sites • ***Instructions for preparation*** - The tutor should have a good working knowledge of the app and the learning content to be able to objectively set the learning outcomes for each learner and also to be able to support and advise learners throughout the experience - While external movement will be limited it is still advisable to ensure that learners have an appropriate amount of space to move around the environment • ***Instructions for tutoring*** - The tutor should advise the learners about immersive VR experiences in general, although this app is suitable for beginners or less experienced learners - The tutor is advised to be available to the learner to offer support in case of any obstacles or to further explain the learning content / tasks - The app can be viewed by all learners while it is running, it would be advisable to allow learners to observe the tutor undertaking the basics first.
	- The tutor should request feedback from learners in order to properly assess the benefits/impacts of the app in addition to what other VR resources would be the most suitable to support the learner's further learning. • ***Do's and don'ts*** - Highly advisable that learners are properly briefed on the use of the VR equipment in order to make the experience as comfortable as possible.

VR Application Profile	
Name of VR Application	Nanome - The future of molecular design and exploration
Category	Chemistry
Date of processing:	27/9/2019

Technical Framework & Key Data

Software-Provider: Nanome on STEAM
Software-Developer: Nanome, Inc.
Version of app: 1.13.

Compatible VR hardware systems:

☐ Google Cardboard	☐ Oculus Rift
☐ Google Daydream View	☐ Oculus Quest
☐ Lenovo Mirage Solo	☐ Samsung Gear VR
☐ Lenovo Explorer	☐ Samsung Odyssey
☐ HTC Vive Pro	☐ PlayStation VR
☐ HTC Vive	☐ Dell Visor
☐ Acer AH 101	☒ Other: ACER OJO500
☐ Oculus Go	

Compatible operating systems

☐ iOS Version:.....
☐ Android Version:.....
☒ Other: WINDOWS Version: 7 and upper

Languages available

☒ English	☐ Italian
☐ Spanish	
☐ German	

Learning Content

Chemistry and Nanotechnology (chemicals & proteins)

Learning Outcomes

Knowledge

The adult learners will be able to:

- …summarize the knowledge gained with the help of atomic, molecular and protein visualization

Skills

The adult learners will be able to:

- …create more engaging presentations
- …host more effective cross site design meetings
- …foster structural understanding across teams
- …customize the app's virtual workspace and save VR sessions for future presenting or collaboration
- …use the app to collaborate in real time from anywhere

Competences

The adult learners will be able to:

- …use the app successfully to go through rapid idea generation & validation within the fields of chemistry and nanotechnology
- …integrate the app successfully into current research workflows in these fields

Activities provided

Activities provided by the app include:

- Loading structures from RCSB Protein Databank
- Hosting public workspaces
- Joining public workspaces
- Basic molecular views
- Basic editing features
- Loading up to 2 molecules at a time

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Added value for low-skilled/-qualified adults	With "Nanome" low-skilled/-qualified adult can learn how to manipulate chemicals and proteins with their hands, explore chemistry and nanotechnology from a completely new perspective, collaborate with others, learn and create like never before.
SWOT analysis	• User-friendliness 1 ☐ 2 ☐ 3 ■ 4☐ • Pedagogic orientation and standards 1 ☐ 2 ☐ 3 ■ 4☐ • Applicability level 1 ☐ 2 ☐ 3 ■ 4☐ • Gamification level 1 ☐ 2 ■ 3 ☐ 4☐ **1…very poor/low; 2…poor/low; 3…OK/medium; 4…good/high; 5…very good/high*

STRENGTHS	WEAKNESSES
• …improve learning • …improves the spatial visualization in Duplicate, Split, Color molecules • …stimulates critical thinking	• …dependence on the hardware platform • …discontinuous updates • …difficulty finding qualified teaching staff
OPPORTUNITIES	**THREATS**
• …software creation for many application fields • …links between different devices • …insert elements of AR	• …potential privacy problems • …any technical problems or delays in the application development phase • …failure to reach the required level of experience

Ideal application /utilization

- ***Context of ideal application***

Mathematical and geometry training.

- ***Instructions for preparation***

It is very important for the positive outcome of the activity to prepare the virtual reality laboratory in advance. Each personal computer with the connected VR viewer must have all the management software (operating system, drivers) updated. The display must be perfectly calibrated.
The Nanome software will need to be installed as a system administrator and the launcher icon will be available on the desktop. The learner will not in any way be able to change all the system settings.

- ***Instructions for mentoring***

The instructor should explain as import molecules from public databases, analyze and explore structures and give a graphic representation of it on the blackboard through a lecture. The instructor will explain how through virtual reality it will be possible to see in 3D what is shown on the blackboard.
The adult educator will be able to intervene immediately where there are problems of a technical or learning nature.
The adult educator must have prepared a small guide to explain to the learner all the steps of the activity to be performed with the viewer and the Nanome software.
At the end of the activity a questionnaire will be given to assess the activity performed.

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	• ***Do's and don'ts*** Due to small delays (latencies) and small inaccuracies of the gyroscope it is good to move slowly and alternate the virtual immersion activity with pauses by removing the viewer.

VR Application Profile	
Name of VR Application	Google Arts & Culture
Category	Virtual museum
Date of processing:	26/09/2019

Technical Framework & Key Data

Software-Provider: Google LLC
Software-Developer: Google Commerce Ltd.
Version of app: 7.2.16

Compatible VR hardware systems:

- ☒ Google Cardboard
- ☒ Google Daydream View
- ☒ **Lenovo Mirage Solo**
- ☐ Lenovo Explorer
- ☐ HTC Vive Pro
- ☐ HTC Vive
- ☐ Acer AH 101
- ☐ Oculus Go
- ☒ Oculus Rift
- ☐ Oculus Quest
- ☒ Samsung Gear VR
- ☐ Samsung Odyssey
- ☐ PlayStation VR
- ☐ Dell Visor

Compatible operating systems

- ☒ iOS Version: Minimum 10.0
- ☒ Android Version: Minimum 5.0

Languages available

- ☒ English
- ☐ Spanish
- ☒ German
- ☐ Italian

Learning Content

Arts & Culture (Paintings specifically)

Learning Outcomes

Knowledge

The adult learners will be able to:

- Know and be able to differentiate between at least 5 famous painters and their paintings
- Recall background information about the era, stories and motif of a painting and being able to differentiate between them

Skills

The adult learners will be able to:

- Navigate through a VR environment with the use of sight and hand motion

Competences

The adult learners will be able to:

- Prioritize interests through the choice of a gallery
- Demonstrate holistic thinking by connecting knowledge about paintings and related era and culture.
- Show more open-mindedness towards different cultures and backgrounds.

Activities provided

Choose from a set of art galleries with different topics. Pick a gallery and find various paintings to explore. For each painting there is an audio guide with information regarding the painter, description of the painting, era, pictorial motif and background story. One can also additionally find an informative text for each painting and there is the possibility to explore the painting visually.

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Added value for low-skilled/-qualified adults	- Collection of interesting paintings and focus on important background information such as eras and cultural characteristics. The pre-selection of the content and the assignment to different topics enables low-skilled adults to navigate through the information easily. - The information is given through an audio guide so that there is no necessity for high level reading skills. - Explore paintings visually without having to physically be at a museum, etc.
SWOT analysis	• User-friendliness 1 ☐ 2 ☐ 3 ■ 4☐ • Pedagogic orientation and standards 1 ☐ 2 ☐ 3 ■ 4☐ • Applicability level 1 ☐ 2 ☐ 3 ■ 4☐ • Gamification level 1 ■ 2 ☐ 3 ☐ 4☐ **1…very poor/low; 2…poor/low; 3…OK/medium; 4…good/high; 5…very good/high*

STRENGTHS	WEAKNESSES
• Paintings from all over the world • Clear arrangement through different topics • Background information of paintings	• Limited information for each painting • Not very many interactive elements • limited amount of paintings to explore

OPPORTUNITIES	THREATS
• Possibility to choose galleries of interest • Learn about famous paintings and their stories and thereby develop an understanding of cultures and eras • Explore paintings visually	• Individuals with background knowledge might not be provided with further information • Videos or guided tours might be more interesting • Further research must be done elsewhere

Ideal application /utilization

- ***Context of ideal application***

In art or history education contexts or museums (to provide a wider range of possible paintings to explore)

- ***Instructions for preparation***

No necessary instructions for preparation. The App is quite intuitive and simple in structure. You can choose a gallery topic and then painting in which you are interested.

- ***Instructions for mentoring***

Short introduction regarding the topics of the paintings and what to expect.
A possible task for the learner could include to choose one gallery and explore the topic, different paintings and backgrounds in detail to gain a thorough understanding instead of trying to gather information about every topic/gallery at once.

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	• ***Do's and don'ts*** Give a short introduction regarding the structure of the app in advance. Discuss the different exploration paths of the learner, e.g. which galleries were chosen, which paintings were explored, and which information was the most relevant and interesting?

VR Application Profile

Name of VR Application	Sketchfab VR
Category	Virtual Museum
Date of processing:	24/10/19

Technical Framework & Key Data

Software-Provider: sketchfab
Software-Developer: sketchfab
Version of app: 1.5

Compatible VR hardware systems:

- ☒ Google Cardboard
- ☒ Google Daydream View
- ☐ Lenovo Mirage Solo
- ☐ Lenovo Explorer
- ☒ HTC Vive Pro
- ☒ HTC Vive
- ☐ Acer AH 101
- ☐ Oculus Go
- ☒ **Oculus Rift**
- ☐ Oculus Quest
- ☐ Samsung Gear VR
- ☐ Samsung Odyssey
- ☐ PlayStation VR
- ☐ Dell Visor
- ☒ Other: Microsoft Mixed R.

Compatible operating systems

- ☒ iOS Version:9.0 and later
- ☒ Android Version: 4.4 and later
- ☒ Other: Windows 8 and later

Languages available

- ☒ English
- ☐ Spanish
- ☐ German
- ☐ Italian

Learning Content

Platform to publish and explore in 3D and VR:
Visits to museums, nature, sites, science, animals, games

Learning Outcomes

This application is interesting for learning results related to the creation of 3D models and sharing them later. It is also very useful for learning about museums and works of art. We will focus on the 3D models "Vincent van Gogh 3D models":

Knowledge

The adult learners will be able to:

- Describe how Vincent van Gogh lived and where
- Name objects from his everyday life and his paintings

Skills

The adult learners will be able to:

- Locate the works of Vincent van Gogh
- Differentiate between the works of this author and others
- Identify Vincent Van Gogh's way of life, through his room

Competences

The adult learners will be able to:

- Determine the importance of Vincent van Gogh in the post-Impressionist art movement, the characteristics of the movement, and link both.

Activities provided	The application allows users to teleport to Rome, hold a beating heart or walk among dinosaurs. Sketchfab VR allows users to discover a showcase of explorations through remote places, fantastic creatures, game worlds, cultural heritage, science and other wonders. Sketchfab is the platform to publish and explore a million things in 3D and VR. With a community of over half a million creators, it is the largest library of VR content in the world generated by users.
Added value for low-skilled/-qualified adults	The "Skechfab" application can be beneficial for low-skilled and low-qualified adult learners. The creativity of learners will be encouraged through the use of 3D models, either by creating or analyzing them. Furthermore, through the virtual visits to the more than 600 museums contained in the application.

SWOT analysis

- User-friendliness 1 ☐ 2 ☐ 3 ■ 4☐
- Pedagogic orientation and standards 1 ☐ 2 ☐ 3 ■ 4☐
- Applicability level 1 ☐ 2 ☐ 3 ■ 4☐
- Gamification level 1 ☐ 2 ☐ 3 ■ 4☐

**1…very poor/low; 2…poor/low; 3…OK/medium; 4…good/high; 5…very good/high*

STRENGTHS	WEAKNESSES
• Sketchfab is a social platform that allows you to visualize 3D models quickly and easily. • It allows anyone to see, touch and feel the cultural heritage in a completely innovative way and and with all types of devices. • One of the key pillars of Sketchfab - beyond video games or engineering - is cultural heritage. In fact, over 600 institutions and museums around the world already have virtual collections on the platform	• The 'look down' menu is quite intrusive and makes it difficult to enjoy anything that has a floor or content underneath you. This has to go. I'd rather have a button pressed that would make the menu appear instead. • The music is very canned and has a hockey feel to it. It moves away from the content you're experiencing. • There has to be a way to freely rotate the model in front of you in addition to the pre-positioned views. No one is going to have enough space to walk around completely

	OPPORTUNITIES	THREATS
	• It can help to know more in depth concrete works of art • Can help foster creativity by making your own 3D models • The exchange and creation of 3D models is continuous and increases the content repository	• Some of the applications of 3D Models are paid • Learners who don't like art can be distracted • The excess of 3D models offered does not allow perhaps to concretize a topic and we will only visualize one after another

Ideal application /utilization

- ***Context of ideal application***

It is interesting especially for learning and getting knowledge of cultural heritage and it is recommended for the promotion of creative 3D models.

- ***Instructions for preparation***

The teacher or instructor must previously select what to work on and visualize, in order to better adapt to the content.

Previously, didactic and pedagogical materials should be provided to initiate the subject.

Ergonomic and adequate chairs should be used, as well as enough space because this application needs a lot of space for movement.

- ***Instructions for mentoring***

You must work on the contents beforehand to be able to deepen, guide and advise the learners.

Many of the contents, especially the cultural ones, could be the subject of a later work or debate or sharing after the VR application.

- ***Do's and don'ts***

The application can be the ideal complement to work on a specific topic. Thinking mainly in the area of Art and Culture

It can be facilitated to the learners and propose them to create some 3D model after using the application

Take into account learners with certain sensitivities since the application requires movement.

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VR Application Profile	
Name of VR Application	**Notes on Blindness**
Category	**Visual impairment**
Date of processing:	30/10/2019
Technical Framework & Key Data	**Software-Provider:** ARTE Experience **Software-Developer:** ARTE Experience **Version of app:** 4.5 **Compatible VR hardware systems:** ☒ Google Cardboard ☒ Oculus Rift ☐ Google Daydream View ☒ **Oculus Quest** ☐ Lenovo Mirage Solo ☒ Samsung Gear VR ☐ Lenovo Explorer ☐ Samsung Odyssey ☐ HTC Vive Pro ☐ PlayStation VR ☐ HTC Vive ☐ Dell Visor ☐ Acer AH 101 ☒ Oculus Go **Compatible operating systems** ☒ iOS Version: 1.1 ☒ Android Version: 20 **Languages available** ☒ English ☐ Italian ☐ Spanish ☒ Other: French ☐ German
Learning Content	A virtual reality journey into a world beyond sight. Specifically, the protagonist, after decades of steady deterioration, he became totally blind. To help him make sense of the upheaval in his life, he began documenting his experiences on audio cassette.

	These original diary recordings form the basis of this six-part VR experience, an interactive non-fiction using new forms of storytelling and gameplay mechanics to explore his cognitive and emotional experience of blindness.
Learning Outcomes	**Knowledge** *The adult learners will be able to:* • recall the major differences of needs and perception of the world of a blind and a sighted person according to this app **Skills** *The adult learners will be able to:* • Demonstrate empathy towards blind people **Competences** *The adult learners will be able to:* • Raise awareness about disabled people and disabilities in general • Demonstrate a positive attitude and respect towards people with disabilities • Show respect for people with disabilities and especially for blind people
Activities provided	The application gives the opportunity to explore the protagonist‘s cognitive and emotional experience of blindness through diary recordings. Each chapter addresses a memory, a moment and a specific location from the protagonist’s audio diary. Through the application, you get a visual spectacle of sound and how it affects the environment around you for someone that is blind.

Added value for low-skilled/-qualified adults	This application has a low floor- meaning that it can be used by anyone without any difficulty. This application does not require any interaction with the hardware, so people with no-prior knowledge can use it without knowing anything specific about VR. Users can just watch animated chapters, experience them and reflect on what they are watching.
SWOT analysis	• User-friendliness 1 ☐ 2 ☐ 3 ■ 4☐ • Pedagogic orientation and standards 1 ☐ 2 ☐ 3 ■ 4☐ • Applicability level 1 ☐ 2 ■ 3 ☐ 4☐ • Gamification level 1 ☐ 2 ■ 3 ☐ 4☐ **1…very poor/low; 2…poor/low; 3…OK/medium; 4…good/high; 5…very good/high*

STRENGTHS	WEAKNESSES
• Ideal for beginners using VR hardware • Available in multiple VR platforms • Available for all ages (7+)	• Only single user game mode • No flexibility in content or in navigation in content to experience the app (No buttons in the application for easy navigation to the menu) • Large size of application to download it

OPPORTUNITIES	THREATS
• the VR components of this app (especially the directional sound) really help to picture yourself as the author	• Limit in sustaining interest of users if there is no structure of what the learner is required to do (purpose)

Ideal application /utilization

- ***Context of ideal application***

This application can be used in various adult educational contexts such as in Higher Education with students of specific programs of studies (psychology, education with special needs, etc.).

This application can also be used in other trainings for adult education, dependent to the interests and backgrounds of participants.

- ***Instructions for preparation***

Internet connection is not required and it is an application can be used almost in every place- it doesn't require any specific preparation in terms of space or location. Learners are prompted to experience this application in a quiet environment.

Notes on Blindness VR is viewable with or without virtual reality headset (cardboard mode or smartphone mode).

- ***Instructions for mentoring***

Trainers may start this activity by introducing users to the world of disability and start a discussion. The application then can be watched by users individually. At the end, users are encouraged in groups to express feelings, attitudes and opinion about what they watched.

	For full user experience, please encourage users to use headphones, raise the volume and increase the luminosity of your phone. • ***Do's and don'ts*** It would be useful to start a discussion to introduce the thematic of this application, before prompting users to use it.

VR Application Profile	
Name of VR Application	Calcflow
Category	Mathematics
Date of processing:	27/9/2019

Technical Framework & Key Data

Software-Provider: Nanome on STEAM
Software-Developer: Nanome, Inc.
Version of app: 5.6.2f1.

Compatible VR hardware systems:

- ☐ Google Cardboard
- ☐ Google Daydream View
- ☐ Lenovo Mirage Solo
- ☐ Lenovo Explorer
- ☐ HTC Vive Pro
- ☒ HTC Vive
- ☐ Acer AH 101
- ☐ Oculus Go
- ☐ Oculus Rift
- ☐ Oculus Quest
- ☐ Samsung Gear VR
- ☐ Samsung Odyssey
- ☐ PlayStation VR
- ☐ Dell Visor
- ☒ Other: **ACER OJO500**

Compatible operating systems

- ☐ iOS Version:.....
- ☐ Android Version:.....
- ☒ Other: WINDOWS Version: 7 and upper

Languages available

- ☒ English
- ☐ Spanish
- ☐ German
- ☐ Italian

Learning Content

Foundations of vector calculus

Learning Outcomes

Knowledge

The adult learners will be able to:

- …recall the foundations of vector calculus
- …recall Parameterized Functions
- …recall Integral modeling functionality

Skills

The adult learners will be able to:

- …manipulate 3D Graphs in a VR environment
- …tinker with Mathematical Modeling in a VR environment
- …edit mathematical parameters in a VR environment

Competences

The adult learners will be able to:

- …apply mathematical principals and knowledge more intuitively and confidently

Activities provided

CalcFlow is built for everyone who wants to better understand the foundations of vector calculus. With the app learners can analyze, visualize, and design vector calculus in an interactive environment.
Further, it allows teams to collaboratively solve problems in real time.

Added value for low-skilled/-qualified adults

CalcFlow allows you to study and visualize vector calculus in an interactive and accessible environment even for those with minimal skills in the subject. Exploration is much more intuitive (just move your head!) and the perfect depth information that learners perceive feels almost like an additional input channel to the brain.

SWOT analysis

• User-friendliness	1 ☐	2 ☐	3 ■	4☐
• Pedagogic orientation and standards	1 ☐	2 ☐	3 ■	4☐
• Applicability level	1 ☐	2 ☐	3 ■	4☐
• Gamification level	1 ☐	2 ■	3 ☐	4☐

**1…very poor/low; 2…poor/low; 3…OK/medium; 4…good/high; 5…very good/high*

STRENGTHS	WEAKNESSES
• …improve learning, the app helps to grasp the biggest ideas in vector calculus • …improves the spatial visualization capabilities of geometric figures • …stimulates critical thinking	• …dependence on the hardware platform • …discontinuous updates • …the app requires qualified teaching staff in vector calculus to mentor the learning process
OPPORTUNITIES	**THREATS**
• …software creation for many application fields • …links between different devices • …insert elements of AR	• …potential privacy issues such as the collection of personal information • …possible malware insertions within the application update • …failure to achieve the required learning objectives

Ideal application /utilization

- ***Context of ideal application***

Mathematical and geometry training.

- ***Instructions for preparation***

It is very important for the positive outcome of the activity to prepare the virtual reality laboratory in advance. Each personal computer with the connected VR viewer must have all the management software (operating system, drivers) updated. The display must be perfectly calibrated.
The Calcflow software will need to be installed as a system administrator and the launcher icon will be available on the desktop. The learner will not in any way be able to change all the system settings.

- ***Instructions for mentoring***

The instructor should explain the mathematical concept and give a graphic representation of it on the blackboard through a lecture. The instructor will explain how through virtual reality it will be possible to see in 3D what is shown on the blackboard.
During the use of the viewer and the application it will constantly follow the learner in analyzing the mathematical concept.
The adult educator will be able to intervene immediately where there are problems of a technical or learning nature.
The adult educator must have prepared a small guide to explain to the learner all the steps of the activity to be performed with the viewer and the Calcflow software.
At the end of the activity a questionnaire might be useful to assess the activity performed.

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	• ***Do's and don'ts*** Due to small delays (latencies) and small inaccuracies of the gyroscope it is good to move slowly and alternate the virtual immersion activity with pauses by removing the viewer.

VR Application Profile	
Name of VR Application	Oculus Venues
Category	Sport-, Music-, Social-Events
Date of processing:	30/11/2019
Technical Framework & Key Data	**Software-Provider: Oculus** **Software-Developer: Oculus** **Version of app:** 1.12.8 **Compatible VR hardware systems:** ☐ Google Cardboard ☐ Oculus Rift ☐ Google Daydream View ☒ **Oculus Quest** ☐ Lenovo Mirage Solo ☒ Samsung Gear VR ☐ Lenovo Explorer ☐ Samsung Odyssey ☐ HTC Vive Pro ☐ PlayStation VR ☐ HTC Vive ☐ Dell Visor ☐ Acer AH 101 ☒ Oculus Go **Compatible operating systems** ☐ iOS Version:…… ☒ Android Version: 1.3.9 **Languages available** ☒ English ☐ Italian ☐ Spanish ☒ Other: Japanese ☐ German
Learning Content	Opportunity to be present in several different kind of events (such as comedy shows, concerts, sporting events, in an immersive way in VR).

Learning Outcomes	**Knowledge** *n/a* **Skills** *The adult learners will be able to:* • Demonstrate improved communication and networking skills • Navigate effectively through the app to access the different "uses" of the app: 'social sharing', 'people options', 'settings' etc. to get the most out of this application **Competences** *The adult learners will be able to:* • Show social competences and handle social interactions effectively
Activities provided	This social co-viewing application allows viewers to chat with their friends as they watch events around the worlds. The application also allows multiple user interaction, which means a tutor can accompany the learner in the VR space. The application allows group interaction, which highlights the capabilities of VR. The group interaction also demonstrates much of the communication dynamics, interaction and pedagogical considerations of VR environments.
Added value for low-skilled/-qualified adults	The application is essentially a social platform rather than a learning platform but is valuable as it allows users to learn the first basic skills needed within a VR environment including, communication, navigation and group interaction.

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SWOT analysis

• User-friendliness	1 ☐	2 ☐	3 ■	4☐
• Pedagogic orientation and standards	1 ☐	2 ☐	3 ■	4☐
• Applicability level	1 ☐	2 ☐	3 ☐	4■
• Gamification level	1 ☐	2 ☐	3 ■	4☐

**1…very poor/low; 2…poor/low; 3…OK/medium; 4…good/high; 5…very good/high*

STRENGTHS	WEAKNESSES
• Opportunity to experience different kind of live events (sports events, comedy shows, etc), from the comfort of your own space for free, even in front seats • Amazing graphics and sense of being 'there' • Available in multiple VR platforms	• It only allows you to connect via a Facebook account to have access in application's content • It always requires internet connection • Frequent interruptions in connections with events
OPPORTUNITIES	**THREATS**
• Multiplier game mode allowing group interaction • Social platform and interactions among users who get to participate in the same venue/event-it includes social features, so users can watch videos with headset-wearing friends • Users can create their avatar representing themselves • Participating in an event which might not be able to participate in real life	• Effect of dizziness due to interruptions in the streaming when internet connection is not stable • Not always available: Need to wait to use the application until there is an event available

Ideal application /utilization

- ***Context of ideal application***

Introduction to a specific settings, when not available to attend in person. Users get to live an experience in the comfort of the place they choose to be at the time of the event. Users with the same interest get to know each other and exchange information, interact in a safe environment and learn from others

- ***Instructions for preparation***

Internet connection is required. It also requires a connection with a Facebook account to let you use the application.

Check in advance when available events take place, because there is not always something you can do with this app. Events are advertised in the application approximately 1-2 months in advance.

- ***Do's and don'ts***

Do:

1) start planning in advance, so you have specific activities in mind to take advantage of this application

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	2) ensure your internet connection works properly and is stable Don't: 1) Don't plan activities with your trainees in case you do not know what the content will be about. Do research and know the content well in advance. *2)* Have a plan B in case the event does not load as expected. Sometimes, this application does not work properly if the internet connections is not very stable.

VR Application Profile	
Name of VR Application	Anne Frank House VR
Category	History - Second World War
Date of processing:	30/11/2019

Technical Framework & Key Data

Software-Provider: Force Field
Software-Developer: Force Field
Version of app: 1.0

Compatible VR hardware systems:

- ☐ Google Cardboard
- ☐ Google Daydream View
- ☐ Lenovo Mirage Solo
- ☐ Lenovo Explorer
- ☐ HTC Vive Pro
- ☐ HTC Vive
- ☐ Acer AH 101
- ☒ Oculus Go
- ☐ Oculus Rift
- ☒ **Oculus Quest**
- ☒ Samsung Gear VR
- ☐ Samsung Odyssey
- ☐ PlayStation VR
- ☐ Dell Visor

Compatible operating systems

- ☐ iOS Version:.....
- ☐ Android Version:.....
- ☒ Other: Oculus Version: 1.0

Languages available

- ☒ English
- ☒ Spanish
- ☒ German
- ☐ Italian
- ☒ Other: Dutch, Portuguese.

Learning Content

The history of Anne Frank House. The application gives the opportunity to travel back to the years of the Second World War and wander through the rooms of the Annex that housed the group of 8 Jewish people as they hid from the Nazis.

Learning Outcomes

Knowledge

The adult learners will be able to:

- Recall the story of Anne Frank and what happened to the brave inhabitants

Skills

The adult learners will be able to:

- Navigate in the virtual environment to grab things, solve clues
- Demonstrate critical thinking skills via the navigation to the virtual environment
- Gain control of their education and learn at their own pace

Competences

The adult learners will be able to:

- Tell the story of Anne Frank as if they were there personally

Activities provided	This application can really transform the way the educational content about this topic can be delivered. Users can interact in the interactive and immersive application to learn the history of Anne Frank in a safe, controlled way. The tutor can make breaks between the interaction of users with this application in order to deepen in specific aspects that is needed and then let the learner continue its experience in this award-winning experience.
Added value for low-skilled/-qualified adults	This application can stimulate the interest and motivation of low-skilled/qualified adults to be engaged in history and learn about the 2nd world war and the case of Anne Frank. The application is really engaging and has strong gamifications characteristics which will make enthusiastic all learners to be engaged in this environment and learn as much as they can. The application due to the power of VR can support learners to find out what happened to the Annex' brave inhabitants. Additionally, since this is a single mode application, learners can learn in their own pace.

SWOT analysis

• User-friendliness	1 ☐	2 ☐	3 ■	4☐
• Pedagogic orientation and standards	1 ☐	2 ☐	3 ☐	4■
• Applicability level	1 ☐	2 ☐	3 ■	4☐
• Gamification level	1 ☐	2 ☐	3 ☐	4■

**1…very poor/low; 2…poor/low; 3…OK/medium; 4…good/high; 5…very good/high*

STRENGTHS	WEAKNESSES
• Available in various languages • No internet connection is required to use the app • Strong game-based learning element	• Only single user game mode • Takes large space to be downloaded • Users cannot choose what to do and see: the application follows a specific flow
OPPORTUNITIES	**THREATS**
• Learn about the second world war and the history of Anne Frank in a really interactive way • Provides a greatly immersive environment and sense of 'being there' due to its realistic graphics	• The application might cause the effect of dizziness, because its required enough amount of time to explore it fully • Limited to be used probably only one or two times by each user max

Ideal application /utilization	• ***Context of ideal application*** Documentary & History and educational contexts with history element. • ***Instructions for preparation*** An introductory discussion would be good to be made. The application works in a single game mode, so equipment should be sufficient for all participants. The application required that participants are not so close to each other, so they can interact safely in the VR environment. • ***Instructions for mentoring*** Tutors can encourage some breaks between activities in the application to deepen in specific aspects and also so that they avoid learners to become dizzy from long interactions with the application. • ***Do's and don'ts*** Do: have enough VR devices for all participants since the experience takes time. Alternatively, you can create groups that will work with the VR in a row, while others interact with other relevant material. Don't: Don't let users be close to each other. The application needs some space for participants to move and grab or transfer things.

VR Application Profile	
Name of VR Application	Anatomyou
Category	Human body/anatomy
Date of processing:	15/10/2019

Technical Framework & Key Data

Software-Provider: Google Commerce Ltd
Software-Developer: Healthware Canarias S.L
Version of app: 2.0.3

Compatible VR hardware systems:

- ☒ Google Cardboard
- ☒ **Google Daydream View**
- ☐ Lenovo Mirage Solo
- ☐ Lenovo Explorer
- ☐ HTC Vive Pro
- ☐ HTC Vive
- ☐ Acer AH 101
- ☐ Oculus Go
- ☐ Oculus Rift
- ☐ Oculus Quest
- ☐ Samsung Gear VR
- ☐ Samsung Odyssey
- ☐ PlayStation VR
- ☐ Dell Visor

Compatible operating systems

- ☒ iOS Version: 9.0 or later
- ☒ Android Version: 4.4 and up

Languages available

- ☒ English
- ☒ Spanish
- ☐ German
- ☐ Italian

Learning Content

Human anatomy

Learning Outcomes

As stated beneath in the section “Activities provided” with the app a variety of anatomical structures can be explored and therefore various learning outcomes achieved. The learning outcomes stated below can be achieved with the free version of the app:

Knowledge

The adult learners will be able to:

- …explain the functionality of various parts of the circulatory, digestive, lacrimal and female reproductive system such as the functionality of the heart valves or the esophagus, etc.
- …explain the exact location of various parts of the systems mentioned above such as the location of the aortic arch or fallopian tupe, etc.
- …explain the purpose of various parts of the systems mentioned above such as the purpose of the tongue, the tear duct or uterus, etc.

Skills

The adult learners will be able to:

- …locate and identify anatomical structures like the gastrointestinal, the female reproductive, the lacrimonasal and digestive tract as well as the arterial and venous system of the head.
- …recognise relevant parts of the anatomical structures mentioned above from the inside and locate them in the human body.

Competences

The adult learners will be able to:

- …locate, identify and differentiate between the most important parts of the circulatory, digestive, lacrimal and female reproductive system.

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Activities provided	Using "Anatomyou", the user becomes part of the anatomy in an immersive way, being able to navigate along anatomical structures like the digestive, lacrimal, female reproductive and circulatory system (arterial & venous) for free. Additional navigation routes to explore e.g. the respiratory or urinary system, etc. can be purchased. Anatomyou VR can be used in two different modes: Virtual Reality and Fullscreen. In VR mode users can interact with navigation controls and anatomical information elements by aiming them.
Added value for low-skilled/-qualified adults	The app "Anatomyou" might be beneficial when trying to impart knowledge about the human anatomy to low-skilled/-qualified adult learners, especially those having difficulties with traditional learning methods, since the app provides an extraordinary perspective of various anatomical structures. Anatomyou allows the learners to immerse into the human body, explore it at their own pace and consequently might improve the learners' understanding of the human anatomy.

SWOT analysis

• User-friendliness	1 ☐	2 ☐	3 ■	4☐
• Pedagogic orientation and standards	1 ☐	2 ■	3 ☐	4☐
• Applicability level	1 ☐	2 ☐	3 ■	4☐
• Gamification level	1 ■	2 ☐	3 ☐	4☐

**1…very poor/low; 2…poor/low; 3…OK/medium; 4…good/high; 5…very good/high*

STRENGTHS	WEAKNESSES
• …offers a navigations tutorial so that users understand the handling of the app • … provides an extraordinary perspective of various anatomical structures • …visualization of anatomical structures is quite realistic	• …not all navigation routes are for free • …navigation ends if learner stops too long e.g. for reading info boxes • …information provided about anatomical structures is limited
OPPORTUNITIES	**THREATS**
• …can help to gain an idea of the human body and anatomical structures • …allows an internal and an external view of the human body • …might arouse learners' interest about anatomical structures they see and encourage to learn more about them	• …understanding of content might require prior knowledge of technical terms used • …regulation of pace might cause difficulties (navigation might be too fast) • …if learners do not look regularly at overview-picture on the left, they might lose orientation

Ideal application /utilization	• ***Context of ideal application*** Ideal to enhance medical training or courses about human anatomy. • ***Instructions for preparation*** - Choose the anatomical structure which you want the learners to explore and make yourself familiar with the learning material provided by the app. - Embed the application of the app in your course context and prepare further learning material about the learning subjects and/or opportunities for learners so that they can get additional information themselves. - Provide maybe chairs (ideally revolving chairs) for the learners since the most comfortable way to explore the App might be in a seated position. • ***Instructions for mentoring*** - Provide your learners with a short introduction to the app and its functionality in advance and give the learners enough time to become familiar with the handling. - For its application it might be useful to advise your learners to regularly look at the overview-picture on the left, so that they can identify their location in the human body during the navigation. - Make sure to clarify technical terms if needed. - After the application of the app it might be useful to discuss the experiences made by the learners.

	- ***Do's and don'ts*** - Do see and use the app as an additional tool that can support the understanding of the human body or/and increase the learners' interest in the subject, rather than as a replacement of your own lectureship. - Provide learners with enough time so that they can navigate in the human body at their own pace and repeat tours if needed.

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VR Application Profile

Name of VR Application	**Virtual Speech - VR Course**
Category	**Training**
Date of processing:	21/10/2019

Technical Framework & Key Data

Software-Provider: Google Commerce Ltd
Software-Developer: VirtualSpeech Ltd.
Version of app:2.24

Compatible VR hardware systems:

- ☒ Google Cardboard
- ☒ **Google Daydream View**
- ☐ Lenovo Mirage Solo
- ☐ Lenovo Explorer
- ☐ HTC Vive Pro
- ☐ HTC Vive
- ☐ Acer AH 101
- ☒ Oculus Go
- ☐ Oculus Rift
- ☐ Oculus Quest
- ☒ Samsung Gear VR
- ☐ Samsung Odyssey
- ☐ PlayStation VR
- ☐ Dell Visor

Compatible operating systems

- ☒ iOS Version: 9.0 or later
- ☒ Android Version: 5.0 and up

Languages available

- ☒ English
- ☐ Spanish
- ☐ German
- ☐ Italian

Learning Content

Soft Skills Training (Training of presentation skills, public speaking, networking, communication, etc.)

Learning Outcomes

As stated beneath in the section "Activities provided" the app provides a variety of scenarios to practice one's soft skills and therefore various learning outcomes can be achieved. The learning outcomes stated below can be achieved with the free version of the app:

Knowledge

The adult learners will be able to:

- …describe how different challenging scenarios like a job interview situation, presentation scenario in a conference or meeting room or a training delivery situation in class could look like.
- …recall at least 10 different questions which might be asked during a job interview for at least six different job interview situations.

Skills

The adult learners will be able to:

- …speak in front of people in challenging situations like in meetings, at conferences, in front of trainees in class or a jury within the frame of a job interview situation.
- …hold eye contact while speaking to people in the situations mentioned above.
- …better estimate the time needed for tasks like holding a presentation or answering an interview question, etc.
- …present themselves and answer at least ten different job interview questions in front of a jury within the frame of a job interview situation.

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	Competences *The adult learners will be able to:* • …prepare themselves successfully for various challenging situations in which presentation and soft skills are needed e.g. job interview situations, public speaking, etc. • …express and present themselves or/and prepared content adequately and successfully within the frame of these mentioned situations.
Activities provided	The App "VirtualSpeech" provides various scenarios where users can practice their soft skills. Training rooms include public speaking, sales pitching, networking, business storytelling, media training and more. In this context the "Interview Preparation"-, "Conference Room"-, "Meeting Room"- and "Training Delivery"-Scenario can be used for free. The user can enter and exit rooms by pointing the hand controller towards them and activating the trigger button or aiming the VR headset at them. The rooms provide realistic environments with realistic avatars where users can practice their own public speeches, presentations, train interview situations, etc. Depending on the room users might be able to use provided transcripts of famous speeches for practice or be confronted with prepared questions (e.g. in the interview preparation scenario). On the VirtualSpeech website (www.virtualspeech.com) users can also purchase a variety of VR courses which combine traditional online classes with practice in VR. When purchasing one of the courses further features are available such as speech analyses and real time feedback, the upload of one's own slides, eye contact rating, the opportunity to record and save speeches, sound and visual distractions that make the environment even more realistic, etc.

Added value for low-skilled/-qualified adults	The App "VirtualSpeech" might be also beneficial in terms of low-skilled and low-qualified adult learners, especially for those having difficulties to express themselves as it's often the case in terms of migrants and refugees. Embedded in a broader training setting the app might help the learner to become more confident in speaking while allowing learners to repeat training situations as often as needed. Especially the app environment "Interview preparation" might be a useful scenario for low-skilled/-qualified adults, particularly for those who have been long-term unemployed.
SWOT analysis	• User-friendliness 1 ☐ 2 ☐ 3 ☐ 4■ • Pedagogic orientation and standards 1 ☐ 2 ■ 3 ☐ 4☐ • Applicability level 1 ☐ 2 ☐ 3 ☐ 4■ • Gamification level 1 ■ 2 ☐ 3 ☐ 4☐ **1…very poor/low; 2…poor/low; 3…OK/medium; 4…good/high; 5…very good/high*

STRENGTHS	WEAKNESSES
• …offers a variety of scenarios and speaking situations • …scenarios and avatars are quite realistic so that adult learners are more likely to immerse in the training situation and learning outcomes can be more easily transferred to real life • …offers an app-guide so that users	• …app description promises a variety of features which in the end are mostly not for free (costs are between 50-450) • …app doesn't track hand gestures or other body movements than head movements • …app is only available in English, so are instructions and questions e.g. in the

	understand the handling of the app	"Interview Preparation" environment
	OPPORTUNITIES	**THREATS**
	• …can work as an efficient and safe form of exposure therapy when fearing public speaking (or any other kind of speaking) • …online courses combined with practice in VR might provide a comprehensive soft skill training • …training situation can be repeated as often as required without any real world consequences	• …free version of app for itself might have less learning/training effect since users to not get any feedback or instructions by the app to improve their speaking • …courses might be too expensive if adult learners only have a limited budget • …in order to being able to provide each learner with adequate feedback, using free version of app might require small or single training settings
Ideal application /utilization	• ***Context of ideal application*** Ideal to enhance any soft skills training beginning from presentation training over public speaking to job interview training and beyond. • ***Instructions for preparation*** - Choose the virtual environment which you want the learners to use for their soft skills training according to the course's learning objective and make yourself familiar with the simulation. - Embed the application of the app in your course context. Since the free version of the app does not provide any instructions make sure to prepare all necessary information and instructions the adult learners need for their soft skills training. You might also prepare some training material you will provide for the learners. - Make sure the audio of the smartphones used for the VR simulation is switched on since the app provides sound effects to make the simulation even more realistic. - Depending on the environment provide maybe chairs (ideally revolving chairs) for the learners. E.g. for the "Interview Preparation" environment a seated position might be the most realistic way for training. • ***Instructions for mentoring*** - The App is quite intuitive and simple in structure. Provide your learners just with a short introduction to the app and give them a few minutes to become familiar with it. - Guide your trainees through the training process! Provide them with all necessary information in advance, give them time to practice in the VR environment what they have learned theoretically and provide them with feedback so that they can improve their performance. - After the application of the app it might be useful to discuss the experiences made by the learners.	

	• ***Do's and don'ts*** - Do see and use the free version of the app as a training and practice environment, rather than a comprehensive soft skills training course that can replace your own lectureship. - In order to being able to analyse the trainees' speeches and presentations when using the free version of the app, the Voice Memo feature of the smartphones could be useful. - Use small group or single training settings in order to provide trainees with adequate live feedback and coaching when using the free version of the app.

VR Application Profile	
Name of VR Application	Amazon Sumerian
Category	Training
Date of processing:	10/10/2019

Technical Framework & Key Data

Software-Provider: Amazon
Software-Developer: Amazon
Version of app: N/A

Compatible VR hardware systems:

- ☒ Google Cardboard
- ☒ Google Daydream View
- ☒ Lenovo Mirage Solo
- ☒ Lenovo Explorer
- ☒ HTC Vive Pro
- ☒ HTC Vive
- ☐ Acer AH 101
- ☒ Oculus Go
- ☒ Oculus Rift
- ☒ Oculus Quest
- ☒ **Samsung Gear VR**
- ☒ Samsung Odyssey
- ☐ PlayStation VR
- ☐ Dell Visor
- ☐ Other:……

As Sumerian is a developer platform, the apps created are compatible with most VR hardware systems.

Compatible operating systems

- ☐ iOS Version:……
- ☐ Android Version:……
- ☒Other: Windows Version: 7 or higher recommended

Languages available

- ☒ English
- ☐ Spanish
- ☐ German
- ☐ Italian

Learning Content	No learning content per se. Tutorials are provided on how to use Sumerian for its various different applications. Essentially, Sumerian is a service that lets you create and run 3D, AR and VR applications. You can build immersive and interactive scenes that run on AR and VR, mobile devices, and web browsers.
Learning Outcomes	**Knowledge** *The adult learners will be able to:* • Identify basic concepts behind the creation of 3d 'scenes' and VR apps • Operate WebGL 2 and WebVR programming utilities **Skills** *The adult learners will be able to:* • Create their own 3D, VR and AR scenes and populate these with their own content include 3D 'hosts' • Undertake some basic programming **Competences** *The adult learners will be able to:* • Create easy to use VR interfaces • Upload own content to the Amazon Sumerian platform • Amend and update existing 'scenes' on the Amazon Sumerian platform, when needed
Activities provided	Tutorials are provided in respect of the creation or 3D web content, AR and VR application.

Added value for low-skilled/-qualified adults	Benefit to low-skilled/qualified adults may be minimal. While the platform is relatively easy to use, some degree of proficiency in utilizing IT/VR equipment is required. This platform is much better suited to being used by a tutor in the creation of content for use in a learning environment rather than being used by the end learner.
SWOT analysis	• User-friendliness 1 ☐ 2 ☐ 3 ■ 4☐ • Pedagogic orientation and standards 1 ☐ 2 ■ 3 ☐ 4☐ • Applicability level 1 ☐ 2 ■ 3 ☐ 4☐ • Gamification level 1 ■ 2 ☐ 3 ☐ 4☐ **1…very poor/low; 2…poor/low; 3…OK/medium; 4…good/high; 5…very good/high*

STRENGTHS	WEAKNESSES
• Very useful resource for creation of VR content • Free for up to 12 months (Free Tier) • Fully supported by Amazon	• Not particularly suitable for the end learner • Ultimately this is a paid service • Free Tier only allows 50mb storage
OPPORTUNITIES	**THREATS**
• Wide range of applications in an educational setting • Easy to use so potential for involving learners in the process	• Services could become unsupported in the future • Subscriptions prices may be subject to change over time

Ideal application /utilization	• ***Context of ideal application*** - Used in teaching of the creation of own VR content • ***Instructions for preparation*** - Amazon AWS account must be created - A credit card or payment option must be chosen (even for free tier) - Access to internet and desktop/laptop • ***Instructions for tutoring*** - As much of the content creation can be taught through the use of tool tips or tutorials there is limited requirement for tutoring - Any tutor should be well versed in the use of Sumerian and should have a good understanding of the tools used for content creation • ***Do's and don'ts*** - Sumerian would not be recommended for use with learners but instead should be used for content creation by the tutor organisation(s) or the tutor themselves.

Additional Recommendations:

VR Application Profile	
Name of VR Application	Mondly: Learn Languages VR
Category	Language Learning
Date of processing:	20/11/2019

Technical Framework & Key Data

Software-Provider: Google Commerce Ltd
Software-Developer: ATi Studios
Version of app: 3.0.2

Compatible VR hardware systems:

- ☐ Google Cardboard
- ☒ **Google Daydream View**
- ☐ Lenovo Mirage Solo
- ☐ Lenovo Explorer
- ☒ HTC Vive Pro
- ☒ HTC Vive
- ☐ Acer AH 101
- ☒ Oculus Go
- ☒ Oculus Rift
- ☐ Oculus Quest
- ☒ Samsung Gear VR
- ☐ Samsung Odyssey
- ☐ PlayStation VR
- ☐ Dell Visor

Compatible operating systems

- ☐ iOS Version:……
- ☒ Android Version: 7.0 and up

Languages available

- ☒ English
- ☒ Spanish
- ☒ German
- ☒ Italian
- ☒ Other: a lot more

Costs: ~3,79€ - 7,99€

Learning Content

Language Learning (American English, British English, German, Italian, Spanish, French, Portuguese, Chinese, Japanese, Korean, Arabic, Hindi, Vietnamese, Indonesian, Dutch, Russian, Norwegian, Danish, Swedish, Hebrew, Greek, Rumanian, Croatian, Ukrainian, Polish, Czech, Finnish, Hungarian, Thai and Turkish)

Learning Outcomes

As stated above the app supports language learning for nearly all world languages. Independent of the language chosen, the following learning outcomes can be achieved:

Knowledge

The adult learners will be able to:

- …list at least five relevant vocabulary and phrases for each of the following topics: animals, space, vegetables and fruits
- …list relevant phrases for various scenarios (e.g. in a train, at the hotel reception, at a restaurant, etc.) which can be used to lead a conversation

Skills

The adult learners will be able to:

- …translate at least five relevant vocabulary and phrases for each of the following topics: animals, space, vegetables and fruits
- …pronounce at least three relevant vocabulary and phrases for each of the following topics correctly: animals, space, vegetables and fruits
- …translate and pronounce relevant phrases for various scenarios (e.g. in a train, at the hotel reception, at a restaurant, etc.) correctly

	Competences *The adult learners will be able to:* • …lead a conversation and express oneself adequately in various scenarios (e.g. in a train, at the hotel reception, at a restaurant, etc.)
Activities provided	In the App "Mondly: Learn Languages VR" users can choose either between six different settings to learn vocabulary beginning from fruits over vegetables to animals or decide to enter one of the eight conversation-scenarios by pointing the hand controller towards them and activating the trigger button. • In all vocabulary learning settings, an avatar introduces the learners to relevant vocabulary and phrases by referring to the provided environment in the app and invites the learners to repeat words and phrases aloud. • Regarding the conversation-scenarios users are provided with authentic situations beginning from a dialog in a train to Berlin over a taxi ride in Hong Kong to check-in situation in a Hotel in Paris. In all scenarios, users can get to talk to avatars while adequate phrases as well as its translations are suggested for help. In the conversation scenarios as well as in the vocabulary settings immediate feedback ensures that words and phrases spoken by the learners are pronounced correctly.

Added value for low-skilled/-qualified adults	The App "Mondly: Learn Languages VR" might be also beneficial in terms of low-skilled and low-qualified adult learners, especially for refugees and migrants who are often challenged to become familiar with a completely new language and culture. Unlike traditional language learning the VR app allows to learn the new language in an interactive way, to practice speaking in realistic scenarios and consequently prepares the learners for everyday situations.
SWOT analysis	• User-friendliness 1 ☐ 2 ☐ 3 ☐ 4■ • Pedagogic orientation and standards 1 ☐ 2 ☐ 3 ■ 4☐ • Applicability level 1 ☐ 2 ☐ 3 ☐ 4■ • Gamification level 1 ■ 2 ☐ 3 ☐ 4☐ **1…very poor/low; 2…poor/low; 3…OK/medium; 4…good/high; 5…very good/high*

STRENGTHS	WEAKNESSES
• …offers language learning for nearly all world languages • …provides learners with immediate feedback on their pronunciation • …allows to learn languages in interactive and realistic scenarios	• …provides only limited vocabulary settings and vocabulary • …when using the App with Daydream smartphone gets really hot after some time • …is not for free (depending on VR hardware may cost up to ~8 Euros)

	OPPORTUNITIES	THREATS
	• …can be ideal to learn the most important phrases and vocabulary for certain scenarios e.g. scenario "Hotel: Reception" • …might arouse learners' interest for language learning • …allows learners to practice their pronunciation	• …vocabulary settings might get a little bit boring after a while since the avatar is speaking really slowly • …some vocabulary settings might be not that relevant for everyday situations e.g. setting "space" • …in order to learn the language properly an additional language course might be needed since the app imparts no further knowledge about grammar, etc.

Ideal application /utilization

- ***Context of ideal application***

Ideal to enhance a language learning course

- ***Instructions for preparation***

- Choose one or more scenarios and/or vocabulary learning settings which you want the learners to explore and make yourself familiar with the content.
- Embed the application of the app in your course context.
- Make sure that the audio as well as the microphones of the smartphones used for the VR simulation are switched on so that learners can practice their pronunciation and hear the guidance of the avatars.
- Provide maybe chairs (ideally revolving chairs) for the learners since the most comfortable way to explore the App might be in a seated position.

- ***Instructions for mentoring***

- The app is quite simple in structure. Provide your learners with a short introduction to the app and give them some time to watch the tutorials of the app so that they can become familiar with the handling.
- It might be useful to write down the most important phrases or vocabulary of each scenario/vocabulary learning setting. Alternatively, you could also ask the learners to write them down after the VR lesson.
- After the application of the app it might be useful to discuss the experiences made by the learners and/or to let them summarize what they've learned.

- ***Do's and don'ts***

- Do see the app as an additional learning and teaching tool which can help to learn important phrases in a language, rather than an app which can replace a comprehensive language learning course.
- In order to embed the app in a more comprehensive learning context, it might an idea e.g. to explain grammar rules based on the phrases learned in the app or to provide learners with further possibilities to enrich their vocabulary about contents addressed.

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	- If the course content fits with the vocabulary learning settings provided by the app the exploration of these might be an interesting way to introduce the new topic. - The app might be also a successful tool in context of blended learning formats. In this context, learners could e.g. be provided with certain tasks or be encouraged to use the app as a practice tool.