EL USO DE LA REALIDAD VIRTUAL Y AUMENTADA A TRAVÉS DE UN ESCAPE ROOM EN EL AULA DE INGLÉS

de

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TRABAJO PARA EL TÍTULO DE MÁSTER

Entregado en el Área de Atención Integral

al Estudiante (ARATIES)

de la Universidad de Almería

como requisito parcial conducente

a la obtención del título de

MÁSTER EN ESTUDIOS INGLESES: APLICACIONES PROFESIONALES Y COMUNICACIÓN INTERCULTURAL

2022

ITINERARIO: DOCENCIA E INVESTIGACIÓN

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I, the undersigned Samuel Ortiz Fernández, as a student of the Faculty of Humanities and Psychology at the University of Almeria, hereby declare under the penalty of perjury, and also certify with my signature below, that my Master's Thesis, titled:

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Dedication

To Maria del Carmen, for her eternal support

To Adrián, for always being there

To Leo, forever

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1. Introduction

Information and Communications Technology, ICT, can be overwhelming nowadays, especially whenever training has not been adequate. There is a plethora of applications and tasks that can be used within the English as a Second Language classrooms, ESL, which continues to increase the numbers of available options almost every year. Online databases, document managers, blogs, videoconferences, and message systems are some of the options that can be found within ICT applied to ESL. Nevertheless, the question of how effective these apps can be and how reliable they are for the ESL classroom remains. A question that, of course, will depend greatly on the characteristics of the students within the classroom, the resources available, and also the training of the ESL teacher. The training should be of a continuous nature, as ICT keep evolving and adapting at a considerable speed (Bates, 2001: 29), which creates a necessity for the teacher to be up to date with the latest resources when adapting his/her methodology for the desired results. The innovation in the methodology is also of critical importance, as after a period of repetition of the same methodology, there is a negative result in student performance and motivation degrees (Martin, 2006). This results in the necessity to have a varied and updated array of skills and training with different applications and methodologies, particularly those who use some of the latest trends in ICT (Bearman, 2012).

This dissertation aims at providing the necessary scaffolding in the introduction of Virtual Reality (VR), Augmented Reality (AR), and escape rooms into the ESL classroom, specifically aiming at the levels of Compulsory Secondary Education (CSE) and Post-compulsory Secondary Education (PCSE), which equals to the Spanish levels of ESO (students from 12 to 16 years old) and Bachillerato (students from 16 to 18 years old). To do so, an intervention proposal consisting of the use of VR and AR in ESL classrooms has been elaborated, taking into account the level of the student and the

desired methodology. Said intervention proposal will attempt to boost motivation and performance mainly by providing a new learning environment for the student using VR and AR alongside a previously prepared ESL escape room.

First, a look into the justification and reasons why the implementation of VR & AR ICT can be useful into the ESL classroom will take place. The general and specific objectives of the intervention proposal will be stated to be followed up by a closer look into the theoretical framework associated to the intervention proposal. A definition and overview of both Virtual Reality and Augmented Reality will be included, alongside an analysis on escape rooms and the hardware and software available to recreate the intervention proposal. Then, the development of the intervention proposal will take place, starting from a contextualization to move on to pre-tasks, the layout of the classroom, activities to develop, assessment, and the possible adaptations to the escape room. After that, possible results will be examined alongside possible limitations as well as the future projection of VR & AR ICT in education. To finish, the conclusion of the intervention proposal will be examined.

1.1 Justification

One among many issues pertaining to the field of education could be the lack of a proper array of methodologies to be applied to a particular group of students (Rivas-Rebaque, 2021). That is to say that a teacher could see an improvement in the academic performance of the students by selecting an appropriate methodology to be used with those students in particular. However, this can present some limitations on occasion due to the lack of formation or the false belief that because a concrete methodology gave positive results when applied to a particular set of students, said methodology will yield the same results with a different group of students. Methodologies change and evolve constantly, as per the Spanish legislation. To be precise, in the year 2001, the Common European Framework of Reference for Languages, or CEFRL, published a report according to the European Commission advocating for a change in learning strategies (Council of Europe, 2001). In doing so, the CEFRL effectively gave a more important role to the learning process and the competences acquired by the students instead of focusing on the figure of the teacher.

Additionally, sometimes the level of initial academic formation can be found to greatly vary among ESL teachers within the Spanish education system. It would be the year 1970 when, through the *General Education Act*, a special course dedicated to incorporate pedagogical skills to teachers called Certificate of Pedagogical Aptitude, also known as CPA. This course was mandatory in order to become a teacher within Compulsory Primary Education, or CPE, CSE, and PCSE. The CPA had a duration of 35h in total, having to be done every 5 years. It would be the year 2009 when the CPA was substituted for a master's degree named *Master's Degree in Secondary Education*. This masters, which has a duration of 60 ECTS credits, or a total amount of 1.500h, is the current mandatory pedagogical formation in order to become a teacher for CSE, PCSE and equivalent levels within the Spanish education system. Thus, one of the reasons for the varied background of ESL teachers within CSE and PCSE education systems, can be found in the variety of previous academic formation in order to become a teacher.

Similarly, the level of resources of both the school and the students can greatly differ from one to another. In the study by Colás Bravo, de Pablos Pons, and Ballesta Pagán (2015) there is an analysis of the number of devices and resources related to ICT available within the classroom. Thus, some of the elements being analysed were the availability of printers, tablets or iPads, internet, digital blackboards, projectors, a computer for both the teacher and each of the students as well as the availability of extra computers. Colás Bravo et al. concluded in their study that around 90% of their data showed the availability of both a computer for the teacher as well as the internet. This was followed by having a computer for each student, with a result of 76.9% as well as a result of 74.5% for the availability of digital blackboards within the Spanish classrooms. It is relevant to mention that the data obtained belonged to the 2014-2015 academic year, which means that results would undoubtedly vary if the study were to be reproduced again nowadays.

Another aspect to take into account is that of CSE and PCSE centres incorporating new ICT into their classrooms without proper training for the staff who will have to make use of said ICT. In other words, besides the academic formation of teachers, there is, in some cases, insufficient preparation to be able to master the huge array of possibilities that ICT can provide to the ESL classroom.

This document aims at providing scaffolding in order to be able to use VR and AR ICT in the ESL classroom. It will be carried out through an escape room, offering an

adaptation to the required academic level and resources related to the students. For that matter, the last level of CSE and PCSE will be the main focus of interest for the proposal further developed in later chapters of this document.

English has become of paramount importance nowadays due to its status as the de facto *lingua franca*, which is something that has been emphasized even more due to interconnectivity and the evolution of technologies in the last decades. Interconnectivity must be understood as the ability of being in mutual connection with one or more speakers while having the ability to both simultaneously send and receive different types of information. Nowadays, speakers are exposed to English to a higher degree than before (Qureshi, 2022). This can take place through different applications and devices, including streaming applications, voice and video chats, video console gaming, and also through the meme culture. Said culture englobes an approach to popular culture through interconnectivity as a reaction to our context being permeated by ICT, quick sharing of information related to events, ephemeral humour, and the availability of a vast database for all of its users (Ribeiro, 2020). In other words, English is quite present in our culture through many different media, which makes English a necessity nowadays for most of the speakers. For example, this can be seen in video game users playing with or against users from all over the world. In most occasions, the language of choice to communicate basic functions such as a greeting or a call to attention, will be done in English. Similarly, streaming applications such as Netflix, HBO, or Disney+, offer almost all of their content both in Spanish and in English, which eases the difficulty to access content in English.

In Spain, the Ministerio de Educación y Formación Profesional, or the Ministry of Education and Vocational Training, publishes a report every two years that analyses the context and development of ICT in public and private schools and high schools. Its last publication (Ministerio de Educación y Formación Profesional, 2022), which comprises the academic year 2020-2021, shares some promising data about the current state of ICT:

- The number of students per computer in public schools is 2.3, while in private schools is 2.8.
- The percentage of classrooms with an internet connection is 97.4%, with a total 95.9% of classrooms counting with a wireless connection.
- Laptops and tablets are the most available resources, being 59.0% of the available equipment.

- Interactive Digital Systems, or IDS, can be found in a total of 65.8% of classrooms, with a higher availability in PCE than in CSE and PCSE.
- The availability of Virtual Learning Environments, or VLE, in 68.6% of the schools. There is higher availability of VLE in CSE and PCSE levels, with a total of 85.4% of CSE and PCSE schools counting VLE.
- The availability of cloud storage and services situates at 71.5% for public and private schools and high schools, with a higher availability at CSE and PCSE levels.

It is quite remarkable how during the latest years, the appearance of VLE in compulsory education has drastically increased. There is an increasement of 23.2% of the number of VLE from the academic year 2018-2019 to 2020-2021.

From the above data, we can conclude that the didactic proposal developed in this document can be feasible due to the existence of adequate infrastructures. As developed in section 2.3.1, this data shows that the classrooms are updating their existing internet connection to faster options. The penetration of optic fibre, 5g connections and similar options allow for a higher number of options when it comes to introducing digital environments into the classroom. Thus, according to the data presented, it could be stated that the intervention proposal is feasible in terms of technical requirements nowadays. Otherwise, the data seems to suggest that the update of internet connections in schools will be only a matter of time.

1.3 Objectives of the Study

1.3.a General objective

The main objective of this proposal is to illustrate how the use of VR, AR, and escape rooms can boost performance and motivation for students in ESL classrooms. Similarly, finding out if using both VR and AR in ESL is feasible will be the next main objective. The intervention proposal will be aimed at the latest stage of CSE and PCSE, being these the levels of 4th CSE and the 1st and 2nd years of PCSE.

1.3.b Specific objectives

Five specific objectives will be the focus of this intervention proposal:

1st. To define VR and AR, as well as their use within education, specifically in the English classroom.

2nd. To review the existing theoretical framework related to VR, AR, escape rooms, as well as associated hardware and software.

3rd. To review the use of escape rooms in the English classroom.

4th. To elaborate an intervention proposal in which an escape room using ICT elements related to AR and VR in the English classroom in particular.

2. Theoretical Framework

A review of the available literature about VR, AR, escape rooms, familiar educative context, and ICT becomes essential in order to develop an intervention proposal. Similarly, an overview of the necessary hardware and software to carry out said intervention proposal must be carried out in order to explore all possible options at one's disposal. In the first place, an analysis of what benefits can VR and AR environments provide to education in general, and to ESL in particular, will take place. This will be followed by an exhaustive overview of how escape rooms can be applied to ESL, taking into account the methodology of choice. Later, we will move on to an examination of how applying familiar context to students, using known worlds and characters to develop educative content, enhances the student's learning performance. Once said examination takes place, we will continue to a closer look at ICT, how they have been implemented into the Spanish educative system as well as the actual possibilities that they present. To conclude this section, an exhaustive analysis of the available hardware and software to elaborate an escape room using the aforementioned features will take place.

Some of the questions that this section aims to find an answer to are:

- What methodologies have been tested in regards to each aspect proposed? What are its findings?
- What options do we have in regards to methodologies and/or devices?
- What improvements and disadvantages can be found?
- Is it feasible to explore and develop an aspect in particular? Does it provide more depth to the intervention proposal?

2.1 Virtual Reality and Augmented Reality

This section will attempt to address the definition and differences between VR and AR while also explaining some of the most recent papers published dealing with this topic. Also, a definition of Mixed Reality, or MR, will be provided later on for clarity purposes.

2.1.a Virtual Reality (VR)

Virtual reality has been interpreted as a 'virtual real world', in which one of its main components is its formidable interactivity, as in this digital & multimedia world, the user becomes an essential part of the action being shown on screen (Pantelidis, 1993: 23). Interactivity will be an essential aspect of what defines VR. Psotka (1995: 405) would point out that "*What distinguishes VR from all preceding technology is the sense of immediacy and control created by immersion: the feeling of 'being there' or presence that comes from a changing visual display dependent on head and eye movements*." In this sense, VR could be considered an interactive crafted digital environment which can be adapted to any user or any goal in particular. What sets it apart from, to mention an example, a video game, will be the point of view of the user. VR environments are developed with a first-person view in mind for the user, who see themselves in a digital environment taking action and interacting with their surroundings. Furthermore, perspective and depth will have a great degree of importance, as the user is not seeing an image on a monitor or tv but in the digital world itself. In addition to the above, it is also of critical importance to remember that the user will use their hand controllers, which react to movement and analogue input, to maximise the sense of immersion. For this document, the definition provided by Pantelidis (1993) will be used.

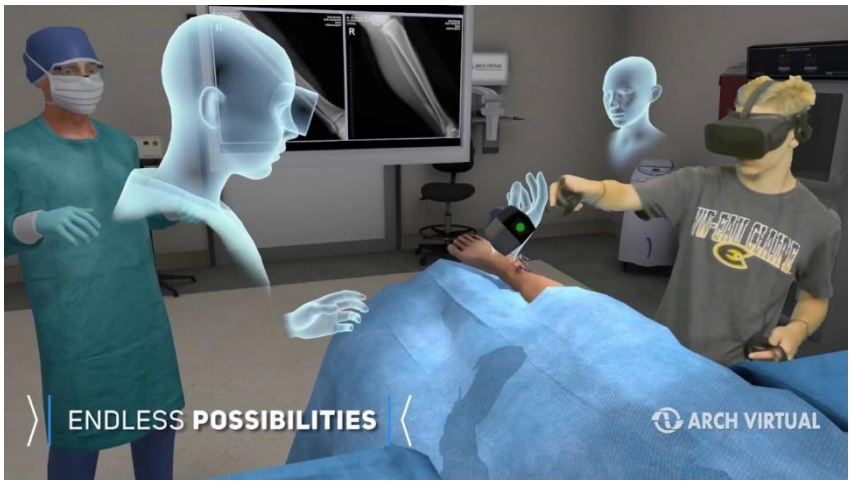

Figure 1. Inside a VR simulation (Source: Uxmmersive, n.d.).

Nonetheless, it is important not to mix the concepts of VR with artificial reality and cyberspace, as Pantelidis advises (Pantelidis, 1993: 23). The confusion between these concepts arises from the division created by the conceptual orientation in opposition to the technological orientation. It could be the case that a technological orientation arises from users to aim to promote their products. These have traditionally been associated with the actual products, or hardware, such as a headgear or a visor, hand controllers with analogue and positional input.

Figure 2. VR headset and haptic controllers (Source: Hardawar, 2021).

This hardware has also been traditionally associated with shooters or war games, as well as flight simulation (Sherman & Craig, 2003; Craig, Sherman, & Will, 2009). However, it is essential for educators in particular not to think of VR with only the technological aspects as the main pillars of the whole VR endeavour, but with the possibilities that they can create. VR can be modified and adapted to the educator's aims with only some technological settings. Thus, the central aspect to be taken into account could be that of the learning process undergone by the student. Technology is a tool to be used in consonance with the characteristics of the students at whom this didactic proposal is aimed at.

The state of VR within education could be considered as not entirely fully-fledged yet. Science and medical education in particular have been some areas within the education field that have seen a large impact of VR so far, in terms of training (Xie et al., 2021). There is a considerable number of papers that have been published in the last years about VR and education (Rojas-Sanchez et al, 2022; Mystakidis et al., 2022; Podromou, 2020). In the field of ESL, however, VR has not become a full-fledged field of study,

even if taking into account the wide variety of options and possibilities it could bring to ESL in particular, or to the teaching of a foreign language in general. This document attempts to point out said possibilities, as in the use of VR within ESL classrooms, we will be incorporating a new layer of immersive meaning for the student while using some of the latest technologies available in relation to VR. In doing so, the learning performance of students will improve, alongside the degree of engagement and motivation by the students, as the available literature reveals (Gonida et al, 2019).

2.1.b Augmented Reality (AR)

Augmented Reality, or AR, has been quite present in our society since the middle of the 20th century (Scheinerman, 2009). AR should be understood, as Feiner defined it in his 2002 article *Augmented Reality: A New Way of Seeing*, as adding extra visual input to a user's sensory perception, usually through digital displays. This means that most of the existing AR technology involves adding a superimposition of either image, text, 3d models, video, and audio to the user's view of his/her surroundings. This is usually done through a device usually worn on the head, or just with a mobile's phone camera aiming at the surroundings. However, it is important to remember that usually, through a process called registration, the device registers the position and orientation of the head of the user. This, in turn, allows for a more realistic representation of the extra information being added, as users can encounter 3d items with a realistic perspective inside the real world. If the device used for AR is not a visor, then the position sensor will register the angle from which the camera is recording and will position itself based on it. For example, with an AR visor, a user could see any 3d model in the middle of their living room. What makes it remarkable is that AR does not introduce new elements to a digital representation of our world, but to our actual environment itself. This will be done through a visor or a handheld device able to record our environment such as a mobile phone.

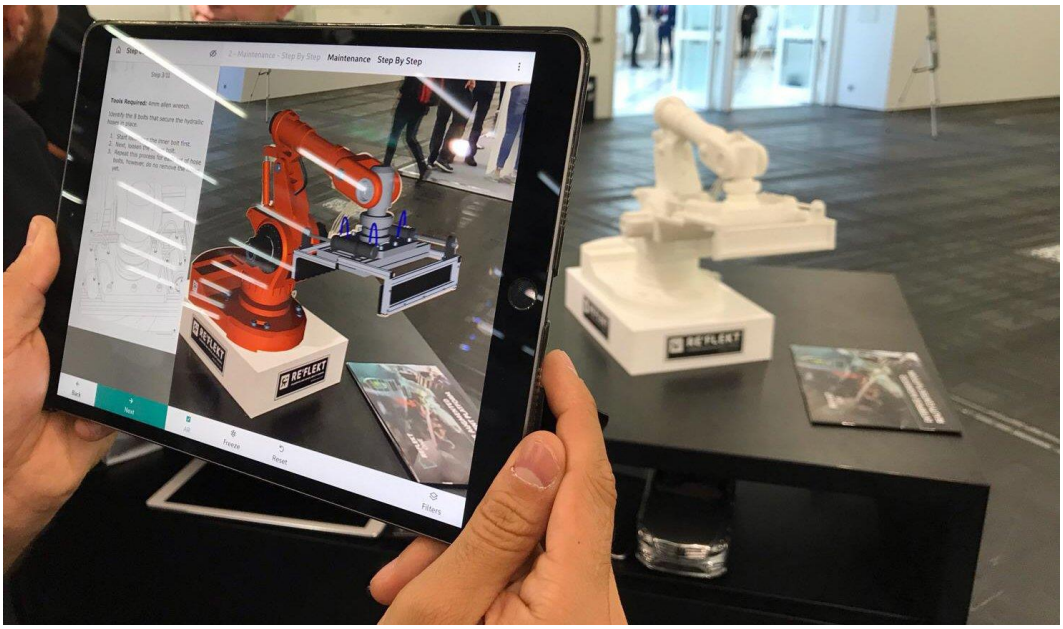

Figure 3. Registration in AR (Source: n.d.).

Not every visor or device, despite if it adds more information to our environment with its use, falls under the AR category. In order to fall under the category of AR, it must meet three different criteria, as per the definition of Azuma (1997): the mixture of real-life together with virtual elements, interaction in real-time, and the ability to register in 3D.

The mixture of real-life environments together with virtual elements becomes the first of the characteristics of AR to be taken into account, according to Azuma's (1997) definition. From a user's point of view, this characteristic means the ability to mix virtual elements, such as text, images and models, into the user's real-life environment. This cannot happen by itself, thus the necessity of a device that is able to incorporate the virtual elements arises. As a consequence, the added data finds itself being contextualized within the user's real-life environment. Accordingly, it will result in a more significative contextualization for the student, as the degree of abstraction necessary to assimilate new knowledge finds itself reduced in the use of AR.

Subsequently, the second characteristic of AR to be taken into account by Azuma (1997) will be the ability to interact in real-time. In other words, the elements that are set to appear in an AR simulation must react to the user or user's input. However, the question of how users can add input to an AR simulation must be addressed. Due to the digital nature of the objects presented through the visual display, a user will not be able to interact with them directly. However, it is this visor, or visual display, the one that will serve as

an interface to react to the AR elements present in their environment. Thus, for example, a user will not be able to directly touch a digital drum kit, but will be able to interact with it through an interface within the visual display. Even simpler, a user will be able to interact on a more basic level by walking around and object and being able to appreciate how their perspective of said object changes.

Additionally, the last characteristic to establish the necessary features of any AR system according to Azuma (1997) will be the ability of the device to register in 3D. This means that the immediate environment of a user must be constantly established and refreshed so that the virtual element can be established in a particular place and position. As a consequence, the size of the element displayed becomes a factor to be taken into account, as the user will directly see their environment with the added elements in it. Since the AR technology allows the user to move around his environment while displaying virtual elements, depth, size and position take a higher degree of importance than those digital elements displayed on a flat-screen. An example of this would be a plumber using AR technology and being able to see a visual representation of where all the pipes in real-life are by seeing their digital representation, allowing him with a further increased array of options.

Figure 4. AR visor (Source: Sony, n.d.).

AR is becoming more and more present in the education field due to technological improvements as well as the existence of AR visors at reduced prices when compared to decades ago. It could be said that AR is becoming more and more present in a considerable variety of different disciplines of studies. Thus, we can see many papers being published dealing with AR exploring many different aspects within education.

Some examples on this can be found in the papers being recently published dealing with astronomy (Chen et al., 2022), natural science (Chiang et al., 2014), architecture (Velaora, 2021), and gamification (Medvedeva et al., 2021).

2.1.c. Main Differences between VR & AR

As Alizadeh (2019b) explained in her paper *Virtual Reality in the Language Classroom: Theory and Practice*, in order to properly distinguish VR and AR, it is best if we follow the reality-virtuality continuum proposed by Milgram, Takemura, Utsumi, and Kishino (1995).

Milgram et al (1994), as laid-out in Figure 5, depicts a straight line with the real environment on one extreme of the line and the virtual world on the farthest extreme of the line. The real environment is a representation of the world that mankind lives in, a world we can see and interact with directly. On the contrary, the virtual environment places an individual in a world fully digitalized, which will be brimming with virtual representations of objects that might be found in the real world. If we were to move a bit further to the centre of the reality-virtuality continuum, we would find that there will be environments which mix elements of the virtual and the real world, also known as Mixed Reality (MR). Said environments could see themselves closer to a real environment, with the existence of virtual elements such as virtual objects, which would be known as Augmented Reality (AR). If, on the contrary, what we find is a virtual recreation of a place based on a location of the real world, then we will be addressing Augmented Virtuality (AV), as the real world is not directly represented but a version of it. In Figure 5, AR and VR are related to the real environment and the virtual environment, respectively. However, when we are addressing the inclusion of virtual elements, from virtual objects inside the real world to a virtual representation, we will be talking about Mixed Reality (MR).

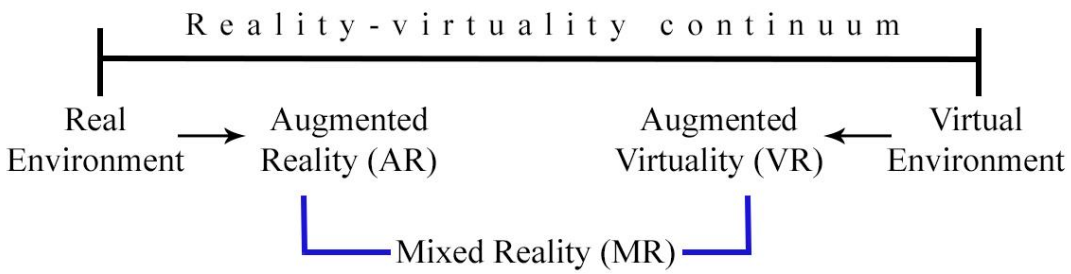

Figure 5. Adaptation of reality-virtuality continuum (Source: Alizadeh, 2019a).

To sum up, MR is the combination of both AR and VR, with VR dealing with complete virtual representations of environments while AR deals with the virtual representation of items inside a real environment. After having addressed the differences between AR, VR, and MR, it is time to move on to explore the possibilities that escape rooms bring to the ESL classroom.

2.2 Escape Room

Since the first appearance of escape rooms in 2007 by a Japanese company named SCRAP (Grande-de-Prado et al,.2021: 23), they can be found throughout every country, with an estimation of more than 50.000 escape rooms across the world (Ferguson, 2019). Nowadays, they can be found in almost every country, even in the form of video games.

As Nicholson defined them in his article *Peeking Behind the Locked Door: A Survey of Escape Room Facilities* (2015), escape rooms are team-based games in which participants discover mysteries and clues by solving puzzles. In doing so, they will acquire new hints and extra clues that will help them to keep progressing until they complete the escape room. Nonetheless, these games have the peculiarity that they require participants to be active agents who must complete the required tasks within a time limit. Otherwise, they will not be successful in their escapade.

Figure 6. A Near Perfect Crime (Source: lockacademy, 2020).

Escape rooms could be considered important because they can provide an opportunity for students to come together and work on a common goal. They also provide a way for students to test their problem-solving skills. Escape rooms have been traditionally been created due to their intrinsic entertaining nature, however, the educational possibilities that escape rooms offer will be the main approach for this document. There are many reasons why escape rooms are important for ESL classrooms. They can help students learn to work together to solve problems, develop critical thinking skills, and learn new information in a fun, interactive, and better way.

After introducing escape rooms, the question of why escape rooms are so popular nowadays still remains. Guckian et al., (2020) pointed out at 3 basic aspects of escape rooms as the reason of their increasing popularity within education.

The first reason that Guckian et al. (2020) highlight will be the characteristics of their target audience. The so-called Generation Z, or the generation of those born between 1995 and 2015, is a generation that has grown up very close to technology and mass media. Mobile devices and online games are a technology to which Generation Z could relate. As a consequence, a group of people who are characterised as tech-savvy, oriented to specific goals, and confident due to the large amount of online and offline social interactions that have taken place. Some of these traits could be extrapolated to

Generation Z or those born between 1980 and 1994. Simply put, people born between 1980 and 2015 appear to be technologically adept at using new technologies, which makes them more receptible to the use of new technologies.

The second reason pointed out will be the appearance of Gamification within education. Gamification, a term first used by Brett Terrill in 2008 on an online article no longer available, is a term that can vary considerably in its definition from one author to another. Deterding et al., (2011), one of the few authors with a peer-reviewed definition for gamification, describe gamification as the use of game elements within non-game contexts. It could be stated that Gamification motivates students while encouraging interactions in an educative context.

The final reason for the popularity of gamification within education will be the convenience of delivery that they offer (Guckian et al., 2020). Usually, these escape rooms are tasks that can be completed in under an hour, which make them possible to complete in a single session for a classroom. What makes this peculiar is the fact that in order to create an escape room from scratch, a considerable amount of time must be invested. However, once that an escape room has been created, it can be easily reused for later groups with minimal adaptations, or none at all. This allows for a creative and engaging experience for students while allowing teachers not to spend too much class time for a single activity.

Escape rooms are being used at all levels of education. However, even if taking into account the number of articles and papers dealing with the issue at hand, no exhaustive and comprehensive reports about the use of escape rooms have not been found. This seems to be even more accentuated when examining the use of escape rooms in ESL classrooms. Among the few available options for literature concerning the use of escape rooms in education, Hayden Taraldsen et al. (2022) specifically elaborated an article dealing with the issue:

> This review article focuses on the research interests of empirical projects that have studied the use of escape rooms for educational purposes. We include projects that have taken a mixed-methods approach (Ferreiro-González et al., 2019; Veldkamp et al., 2020; Zhang et al., 2018), case studies where the priority of the escape room content was to connect professional realism to the teaching (Berthod et al., 2019; Clauson et al., 2019; Eukel et al., 2017), and studies that have focused more on the 21st-century skills gained in the escape room setting than on the school subjects

> involved (Duncan, 2020; Kutzin, 2019). In this review, we aim to address the emerging and, at present, unstructured body of research on the use of escape rooms in education by bringing together and synthesising the research, with an emphasis on the implications of the use of escape rooms for teaching and learning. We also aim to identify areas that need to be addressed in future research on the use of escape rooms for educational purposes. (Hayden Taraldsen et al., 2022: 169)

As all the above points have demonstrated, the available literature concerning the use of escape rooms within education appears to be insufficient as of now in terms of exhaustivity. However, while insufficient, it is far from being non-existent. Several authors (Hayden Taraldsen et al., 2022; Guckian et al., 2020) try to examine the situation of escape rooms and the available research that has been done in the field. The use of escape rooms within ESL classrooms appears to be a not very crowded field, with only a small range of authors and papers available (Gómez López, 2019)

2.3 ICT in ESL: Hardware and Software

In order to discuss the importance of ICT in the education field, one must first understand what ICT are and how it can be used in education. ICT, or Information and Communication Technologies, are a broad term that covers a range of technologies, including computers, the internet, television, radio, and mobile phones. These technologies can be used in a variety of ways to support and improve education, from providing access to educational resources to helping students learn more effectively.

There is a growing body of evidence that suggests that ICT can have a positive impact on education. For example, a recent study by the Organisation for Economic Cooperation and Development (OECD) found that students who use computers regularly at school tend to outperform their peers in reading, mathematics, and science (OECD, 2019). Additionally, a report named *New priorities for European cooperation in education and training* by the European Commission in 2015, identified six aspect to improve upon. Among these, creating new digital innovative environments is highlighted as a key priority for state members of the European Union. Similarly, ICT can help to close the digital divide by providing access to educational resources for all students, regardless of their socioeconomic background.

Despite the potential benefits of ICT in education, some challenges should be addressed. For example, ICT can create a digital divide between students who have access to technology and those who do not. Additionally, ICT can be distracting for some students and may lead to cheating if not used properly.

The upcoming sections deal with the importance of ICT, as well as the available hardware and software options for VR and AR in education. These technologies offer new ways of teaching and learning that can be more engaging and effective than traditional methods.

2.3.a. ICT

The Spanish educative system has undergone different stages in the inclusion of ICT. According to a report published by INTEF (2017), a division from the Spanish Ministry of Education was created with intending to integrate ICT into CPE, CSE, and PCSE. INTEF is also in charge of the training of teachers concerning ICT. INTEF developed a report named in which they examined five different phases in which ICT have been slowly included in Spanish non-university educational stages.

The first or initial phase would be named *The Athena Project*, which started from 1985 to 1995. In 1985, the Ministry of Education and Science, which was still directly in charge of all educational aspects of eleven different autonomous communities, elaborated the *Athena* and *Mercury* projects. Said projects were crafted with the goal of the implementation of new digital and audio-visual technologies in the classroom. The New Information and Communication Technologies Programmes, or PNTIC according to its Spanish acronym, was created in 1989 to help with the integration of the aforementioned projects. Autonomous communities that were in charge of their educational programs developed similar programmes, such as the case of Andalusia and the *Plan Zahara XXI*. According to the technology available at the time, the most viable option for the Ministry of Education was the technology related to the personal IBM computer. Said technology saw a qualitative augment with the appearance of an updated version of Microsoft Windows, a more user-intuitive version which included a graphic interface that used a mouse and a keyboard. Some specific hardware was used for students with special needs when the need arose. Similarly, in terms of software, there was a general lack of tools aimed at education. In consequence, most of the software used was just generic office applications. Windows 3.0 would help with the worrying lack of educative software but

would help to make computers more accessible to their users. This phase saw its end with the appearance of the internet, which was a revolution, not only in what elements schools needed to integrate fully integrate ICT, but also in how lessons were carried out (INTEF, 2017).

The second phase would be related to the appearance of the internet and its inclusion in the educative spheres, a period that lasted from 1996 until 2001. In 1996, the Ministry of Education offered a connection to the internet, an electronic mail address, and a webpage to all schools and teachers. The ministry kept incorporating different hardware and software into the classrooms, even after the reluctance from previous years. This was done in 1997 through the *Digital Town Project*, or PAD according to its Spanish acronym. PAD brought modems and Internet access to the smallest schools that were under the direct management of the Ministry of Education and Science. Over 2.500 different towns, more than 7.000 teachers, as well as more than 70.000 students, participated in PAD. At the same time, the Ministry of Education and Science started a process to transfer responsibilities in regard to education to autonomous communities. Said process would see itself completed by the year 2000 when the autonomous communities saw the responsibilities related to educational matters fall on their hands. This was also followed by an increase in their financial resources to keep promoting the inclusion of ICT in education (INTEF, 2017).

The third phase, which went from the year 2000 until 2009, would be related to the formation of the CNICE and the appearance of broadband internet connections. In the year 2000 the National Centre for Educational Information and Communication, or CNICE in Spanish, was created. The CNICE included PNTIC and other statal organisations. It was in charge of the implementation of ICT in education. Additionally, the CNICE was in charge of the development of long-distance learning by using the latest trends related to ICT innovations. Later on, in 2002, the *Framework Agreement Internet at School*, or *Convenio Marco Internet en la Escuela* in Spanish (CMIE), saw the cooperation between different ministries in order to boost the use of the new ICT within the classrooms. The CMIE would provide schools with the following: broadband connection, network infrastructures, development of educational software and content, and finally an adaptation to the curricula to facilitate and improve the knowledge and use of ICT. At the same time, the CMIE provided teachers with exhaustive training in how to properly use ICT within the classroom. The CMIE was not the only initiative to promote

the use of ICT in education, with similar but smaller projects taking place at a similar time. Broadband, thus, acquired a paramount importance due to the revolution it supposed in terms of data transfer. Broadbands allowed ICT to operate in a different and more fluent way, which in turn made teachers able to use the internet to download a variety of educative resources (INTEF, 2017).

The fourth phase would take place between the years 2009 and 2011. In 2008, broadband was made available to the general public which would result in a considerable increase in the amount of bandwidth for schools, which for the first time saw a real possibility of having internet in each one of their classrooms instead of in a single space for the whole school. On a similar note, in 2009 the Spanish government approved extra funding for School Program 2.0. This initiative had a huge challenge ahead as, among the measures to be implemented were: the transformation of the levels of 5th PCE, 6th PCE, 1st SCE, and 2nd SCE into a digitalised classroom; a single computer for each student in a public school; a variety of learning methodologies for teachers to properly use the proposed ICT; and the creation and distribution of educative software to be used by teachers from different levels of compulsory education (INTEF, 2017).

Ultimately, the fifth or last phase would be from the year 2012 until present. The last phase is characterised by the appearance of the National Institute of Educational Technologies and Teacher Training, or INTEF in Spanish, which substituted the previous Institute for Educative Technologies. Among its responsibilities were the elaboration of different formation courses for teachers, as well as the elaboration of documents of a curricular nature. However, this was done systematically with every subject with the goal of all teachers of every area of knowledge to incorporate the digital world into their lessons as part of their routine. At the same time, different portals and databases were improved and boosted for all teachers and students to start using them. For the first time, private software was subsidised by the Government, making it a possibility for most students to use some of the most representative examples of different pieces of software and hardware in the classroom. The goal, thus, was to finally connect students and teachers to the network (INTEF, 2017).

2.3.b Mixed Reality (MR) Hardware

Virtual reality hardware refers to the physical equipment used to create and experience virtual reality environments. This includes headsets, gloves, controllers, and other devices

used to immerse a person in a virtual world. VR hardware has become increasingly sophisticated and affordable in recent years, making it more accessible to a wider range of people.

The importance of VR hardware lies in its ability to create realistic and immersive virtual environments that can be used for a variety of purposes, such as training, education, entertainment, and even therapy. As VR technology continues to evolve, it is likely that even more uses for VR hardware will be discovered. It is important to highlight that this section will be aimed specifically at VR hardware, not AR hardware due to the elevated cost and scarcity of AR hardware. While there are some AR visors whose price range from 600€ to 5000€, all of the required functions from AR visors will be carried out with either a mobile phone or a personal computer.

In order to address what options possible options can be found regarding VR hardware, first, a distinction must be made according to the type of hardware available. There are three different options:

There are two main types of VR visors: tethered and standalone (Angelov et al., 2020). Nonetheless, a three-way distinction will be made for this essay due to clarity purposes. Thus, for this essay, VR visors will be divided into tethered, standalone, and smartphone-powered.

Tethered VR visors are the most powerful and immersive of all of the available VR headset options. However, they require to be connected to a PC or a gaming system to receive all of the necessary data to function. As a consequence, tethered VR headset users are not able to move far from the system their headset is plugged into. In turn, this allows for a faster data transfer rate, which results in a high immersion degree. Tethered VR visors usually are aimed at users who own a computer with advanced technical specs. This will allow for truly immersive high-end virtual experiences. However, it is important to note that this type of VR visor will require a considerable amount of room space and cable management skills. Similarly, their price is usually elevated when compared to standalone and smartphone-powered VR visors. An example of a tethered VR headset can be seen in the following figure:

Figure 7. Two participants using tethered VR headsets (Source: Špakov, 2019).

Standalone VR visors are self-contained and don't require any additional hardware. Inside each standalone VR headset, processors, sensors, battery, memory and displays will be incorporated. In other words, these visors will not require to forcefully be connected to any system, which in turn allows for a wireless and immersive VR experience. These headsets are aimed at people without a computer with advanced technical specs, or for users who lack the time and space to set up an advanced system such as a tethered VR headset. As a consequence, standalone VR headsets usually have less computing power than tethered VR visors. Computing speed power is sacrificed in lieu of a wireless, portable, and more affordable experience than its wired counterpart. An example can be seen in the following figure:

Figure 8. Standalone VR headset (Source: UAL research group HUM845, 2022).

Smartphone-powered VR visors use a smartphone as their display and processor, and are usually the least expensive and least powerful option in terms of computing capacity. These headsets make use of smartphone's technology, with special relevance of the smartphone's built-in accelerometers and cameras, without requiring anything else to compute the data. Smartphone-powered VR visors are usually made of low-cost materials and usually do not have any built-in digital technology. In turn, their cost is usually significantly cheaper than its tethered and standalone counterparts. However, the degree of immersion will be considerably reduced when compared to other options, as the computing capabilities of a smartphone are severely limited when compared to a computer or a gaming system. An example of a smartphone-powered VR headset can be seen in the following figure, showing the phone itself resting at the other end of the visor:

Figure 9. Smartphone-powered VR headset (Source: Reuters, 2016).

Once a clear typology has been established, it is time to move on to see some of the most successful examples for each category of VR visors. As of 2022, these are some of the options available at the moment for each type of headset:

Table 1

VR Headset Options

Product Name	Cost	Available platforms	Type of headset
Oculus/Meta Quest 2	350€ (www.amazon.es)	PC, Android	Standalone VR headset
Sony Playstation VR	295€ (www.amazon.es)	PS4, PS5	Tethered VR headset
HTC Vive Pro 2	1.419€ (www.vive.com)	PC	Tethered VR headset
HP Reverb 2	649€ (www.hp.com)	PC	Tethered VR headset
Xiaomi Mi VR Play 2	15.99€ (www.mi.com/)	Android	Smartphone-powered VR headset
Bnext VR Pro	24.70€ (www.amazon.es)	Android	Smartphone-powered VR headset
Google Cardboard	4.90€* (www.amazon.es)	Android	Smartphone-powered VR headset

Note. Own elaboration.

According to Table 1, as of 2022 the variety within the standalone VR category is considerably scarce, with only Oculus/Meta having their second version of their Quest product line as a representative. Oculus/Meta Quest 2 is one of the most complete VR headsets in the market which does not need another computing system to function. Oculus/Meta Quest 2 is perfect for middle to advanced experiences. The lack of cable management opens a whole new array of possibilities within the classrooms due to the advantages it presents.

As for tethered VR headsets, there are a considerable number of products to choose from. Tethered VR headsets, which are often used with high-spec computers, could pose

a problem for users due to their low affordability. That is not the case with the Sony PlayStation VR headset, with the inconvenience of being a headset dedicated to a gaming console instead of a computer. This, in turn, means that the grade of customization for its software will be considerably limited, as well as forcefully needing a gaming computing system. HTC Vive Pro2 will make an appearance into the list as one of the most advanced and expensive VR headsets in the markets at the moment as well.

Lastly, smartphone-powered VR headsets make an appearance as the most affordable headsets within the above list. Due to smartphone-powered VR headsets consisting of a mount for a smartphone strapped and secured in front of the face, their cost is significantly reduced, with a large amount of possibilities in the market. The case of Google Cardboard remains a particular case, as Google offered the blueprints of the visor to be able to be built by their users without any additional cost. Said blueprint is shown in Figure 10.

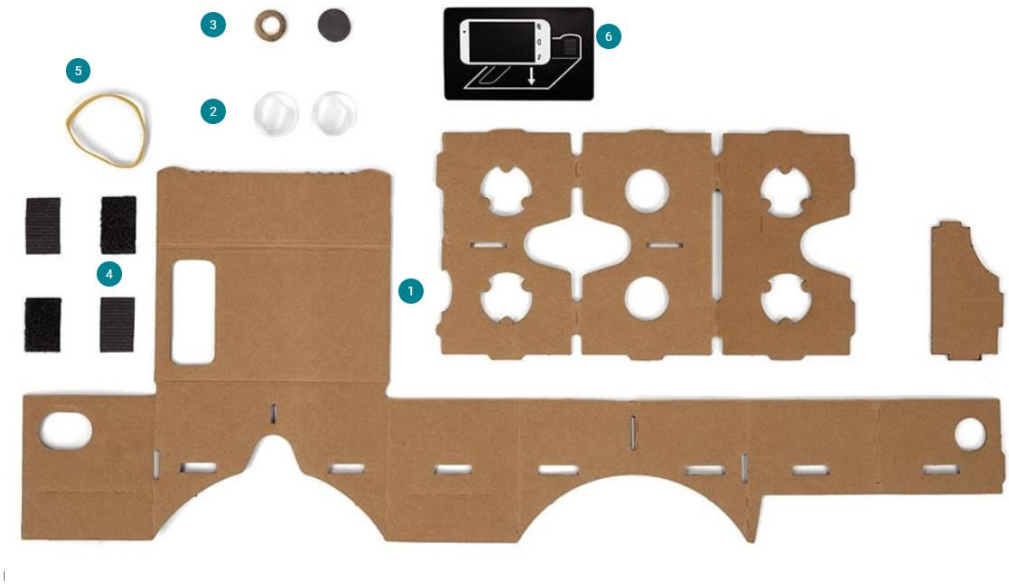

Figure 50. Google Cardboard blueprints (Source: Google, 2016).

Another option is simultaneously offered by Google, which allows the possibility of acquiring an already-built Google Cardboard visor if the user wants to avoid the hassle of building it himself/herself. The only materials the user will need to build a Google Cardboard VR visor will be cardboard, lenses, magnets, Velcro, and a rubber band. On a similar note, it is relevant to mention that, when using smartphone-powered VR headsets, the input from the user becomes quite limited. The interface being used, the smartphone,

will be contained inside the VR visor, which will result in the need for a way to be able to introduce input to the software at hand. For doing so, a Bluetooth or wireless controller compatible with Android systems will be needed. Some examples are found in Centitenk MOCUTE 051, or VR PARK Y1 VR, both being traditional Bluetooth buttons-and-joystick controllers paired to android smartphone devices.

Figure 61. Smarthphone controller (Source: Mocute, n.d).

An example of a Centitenk MOCUTE 051 can be seen in Figure 11. For this experiment, the student will mainly use the left joystick to choose the characters that will compose his answer and will move from one character to another with the buttons located on the right side of the controller. Any controller that can replicate these options will be valid for the development of the intervention proposal contained within this document

2.3.c Mixed Reality (MR) Software

There are a considerable number of choices when it comes to the software to use for creating VR content. However, one critical distinction must be made: that of game engines, software development kits (SDK) and additional software.

A game engine is a software framework designed for the creation and development of digital environments, such as video games and movie CGI, amongst others. The content created through a game engine can be reproduced on a variety of platforms, as long as that platform, in particular, supports the game engine of choice. There are a

number of game engines available for creating VR content. Some popular choices include Unity, Unreal Engine, CryEngine, Godot, and GameMaker. Each has its strengths and weaknesses, depending on the type of project in mind, so it's important to choose one that will fit the specific needs of the project at hand. An example of Unreal Engine, a game engine used for a multitude of possibilities, can be seen in the following figure:

Figure 72. Game engine interface (Source: California Business Journal, 2021).

In Figure 12, we can see how both the 3d model rests at the right of the screen, and the actual scene that is being set up using said 3d model is located on the left-half of the image.

A Software Development Kit, or SDK, is a collection of software development tools that allow for the creation of applications for a specific platform. They will allow the developer to introduce, duplicate, and move 3d objects inside the 3d environment, with some of them even allowing a drag and drop option to further customize the desired VR content of the developer. However, sometimes an SDK can be used for creating VR content to be used in more than one hardware. Some examples are Amazon Sumerian and Google VR for everyone. Amazon Sumerian is a VR engine compatible with almost all platforms and devices. Amongst its advantages, some of the most important include its accessibility and the lack of obligation of learning programming in order to prepare VR content. Google VR for everyone is Google's version of Amazon Sumerian for both VR and AR. One of its most important distinguishing points against Amazon Sumerian is the availability of very specific guides for the creation of particular VR content, including content for Oculus Quest and Google Cardboard VR. Besides this, Google VR for everyone is completely free to access.

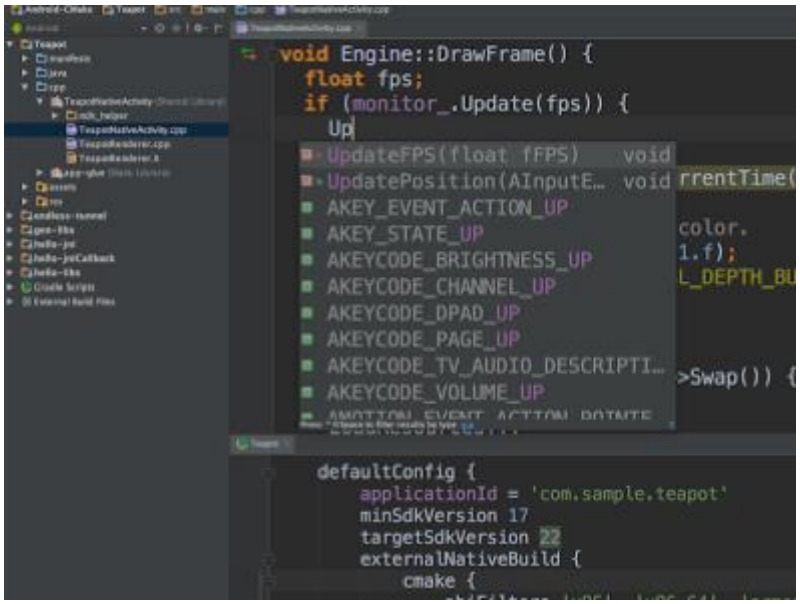

Figure 83. Google VR for everyone (Source: Google, n.d).

Besides these, an array of external software dedicated to different aspects related to VR can be found. For example, if a picture needs to be modified for a specific VR content, then an image editor will be needed. Video editors, music compositors, and 3d map scanners will be some of the examples of software found in this category. A further example will be RoomMapper, which recently appeared into the market. RoomMapper allows users to scan a room of their choice and start adding digital content to it, easily creating a VR environment with minimal prior knowledge. However, this option is only available for Oculus Quest 2 at the moment as the technology is quite recent. Nonetheless, it is expected to appear on different platforms in due time.

Finally, one last software application that will be needed to create AR content is www.ar-code.com. On it, we will be able to easily create text, 3d models and further options in order to easily be seen with an android smartphone. The only requirements for the smartphone are that it has the most updated version of Google Chrome and Google Play Services for VR, with both of them being free in the Android store.

Figure 94. 3D model in AR (Source: Virtence, 2020).

The next section will be devoted entirely to develop the intervention proposal, including a contextualization and a number of variables to take into account.

3. Intervention Proposal

As previously stated, this document aims at trying to provide a scaffolding about how to successfully implement VR and AR elements into the ESL classroom, as well as to check the degree of motivation caused to the students because of this.

When creating an intervention proposal, there may be limitations on what can be realistically accomplished given the resources available. For example, a limited budget may prevent a student from completing a project to the fullest extent possible. Other limitations may include time constraints, lack of access to certain resources, or lack of expertise in a particular area. In the case of the intervention proposal presented on this essay, there has been time and money constraints. Due to this, section 3 of this document has been designed as a theoretical intervention proposal, as it has not been possible to count with the necessary amount of time and resources to do a practical application. It is important to be aware of these limitations when planning a task, so that realistic expectations can be set, and alternative plans can be made, if necessary.

As a consequence, the level of communicative competence, as well as the economic resources of both the students and the teaching body who wishes to adapt the intervention proposal developed in this document will be taken into account. However, first, contextualization of the proposal becomes necessary.

3.1 Contextualization

This intervention proposal has been elaborated with the levels of 4th CSE, 1st PCSE and 2nd PCSE, which correspond to students aged 15-18years old, depending on the time of the year in which the intervention proposal is carried out. The reason behind this choice can be narrowed down to legal requirements and economic reasons as later developed in

this chapter. This intervention proposal can be carried out with a computer. However, should this option stopped being a possibility, using mobile phones becomes an alternative to use a standalone or a tethered VR headset. In order for this to happen, a written authorization will be sent to the parents of the students, asking them for students to be allowed to use a mobile phone during the ESL lesson. In doing so, using a smartphone will become a possibility as long as the directive board agrees to mobile phones being used in the classroom under the supervision of the teacher. Should said options fail, a few physical printed copies of the tasks developed in the escape room will be held by the teacher, in case some students lack the option of using a laptop, tablet, smartphone, or just lacking the legal authorization to use one of said devices. More information about this aspect can be found in section 3.5.

In regards to the levels of difficulty of the task, 3 different levels can be prepared: easy, medium, and advanced. These levels correspond to the difficulty choice pertinent to the content developed during the levels of 4th CSE, 1st PCSE and 2nd PCSE, respectively. For doing so, the tasks to be developed will be adjusted based on the difficulty chosen by the teacher, which will be elaborated based on the contents seen during the academic year. More complex vocabulary, less input from the escape room and different answers are some of the measures that can be taken to adapt the level of difficulty of the escape room.

At the same time as the intervention proposal using VR and AR technology, it should be contextualized into a setting with which students feel familiar and comfortable beforehand. In other words, the content and task developed through the escape room should use examples, characters and stories that students are already familiarised with. In doing so, students' motivation and performance will greatly improve (Gonida et al, 2019), which will yield better results than using generic items, characters and stories. For this reason, the escape task developed in the following section will be based on the world of *Stranger Things*, a tv show that started airing in 2016 on the streaming platform Netflix. The promotional image related to *Stranger Things* season 4 can be seen in figure 15:

Figure 105. Promotional poster for Stranger Things' 4th season (Source: Netflix, 2022).

In *Stranger Things*, a group of young students will face a series of paranormal events that take place in their hometown, with the final confrontation with a different enemy in each of their seasons. For the escape room, students will have to escape the curse of a villain monster named Vecna, as shown in Figure 16, by solving a series of puzzles and tasks, each student in order. Some of the protagonists of this series also have magical powers, which will be put into practice by students using the available VR and AR input, such as grabbing an item from the wall by simply pointing at it, without the need of moving from the seat.

Figure 116. The origins of Vecna (Source: Jawwaby Club, 2022).

3.2 Pre-task: *The Curse of Vecna*

For a correct development of the task, an explanation of the task that is to come becomes a necessity for students to be able to successfully complete the escape room. To do so, a paper sheet will be distributed to the students the day before the escape room is carried out, either as a physical copy or a digital one via email. If possible, a physical copy will be preferred so students can refer to the instructions again if they need to do so. The paper will have a set of instructions stating the basic elements of the escape room, explaining time limits, the necessity to cooperate to salve the cursed one and also the elements of the escape room. However, in order for students to become familiarised with AR technology, these instructions can contain a QR code that, when scanned by students using a smartphone or a computer's camera, will reveal further hints and clues via an AR text.

During the pre-task, the essential aspects that must be clearly explained are the turns and the time limit of the cursed one, the existence of different sheets of information for each round, the answer sheet, and an explanation of how the cursed one must introduce the information that will be received from the rest of the group.

Additionally, if the smartphone of the students will be used, it will be essential that all the required software is installed, updated and validated prior to the development of the escape room. In doing so, the group will not have to waste time updating any software, and will have already used at least once the software needed for the escape room, which should reduce the degree of uncertainty for the whole classroom and groups.

3.3 Layout of the Classroom & Resources

For the intervention proposal, the classroom will be divided into four different groups, always trying to have the same number of participants in each group, if possible. For the optimal development of the escape room, between four and seven members are recommended for each group. Every group will operate following the same rules, which means that only one set of rules needs to be developed. The reason behind this choice is to be able to have a higher degree of automation, allowing the teacher to supervise the four groups and answer any doubts that may arise. At the same time, the teacher will be able to make sure that all four groups are following the instructions of the escape room. On a similar note, by having four groups of students focused only on their group, the dimension of the classroom does not necessarily have to be quite large, as students will

only move from one seat to the next within their group. Figure 17, also found in Appendix 2, will show what a classroom could look like:

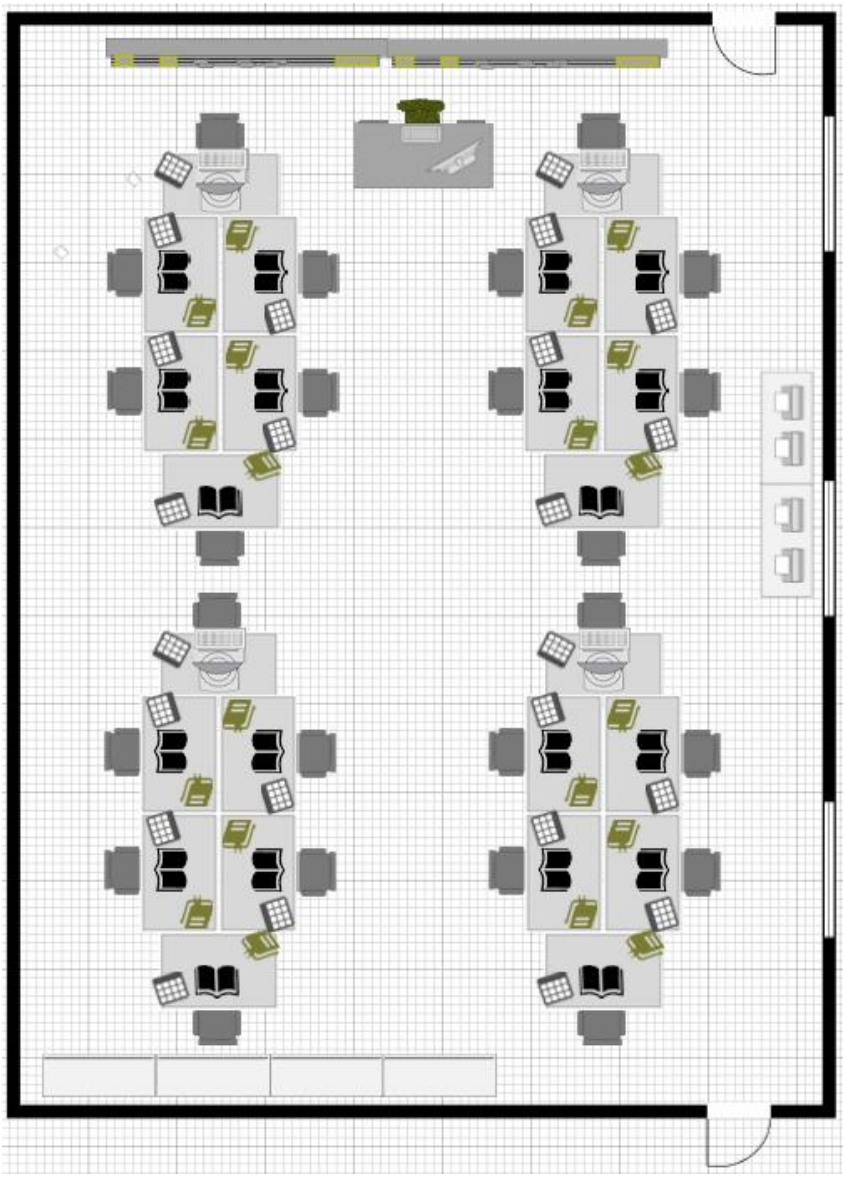

Figure 127. Layout of a classroom for *The Curse of Vecna* (own image).

After this, one person will assume the role of the 'cursed one' by Vecna for the first round, which will be the student using the VR or AR headset. This student must sit on the seat where the VR or AR headset is located. This position corresponds to the seat located besides number one in Figure 17. The whole group will only have 5 minutes to try to save the cursed one from Vecna. After the timer runs out, every student will rotate to their left space, having only 30 seconds to do so between rounds, until they have returned to their original seat, as shown in the next figure corresponding to Appendix 3:

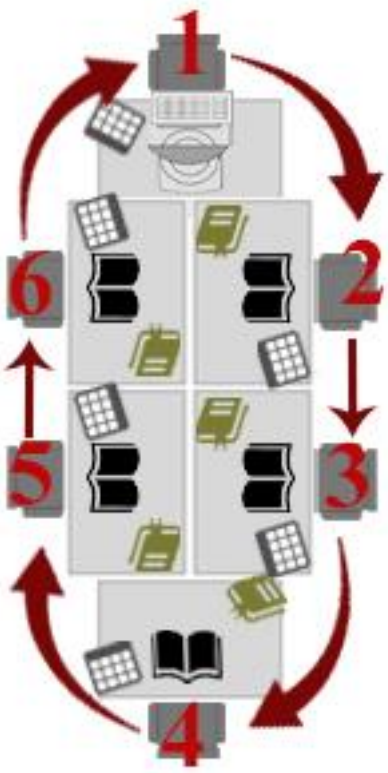

Figure 138. Turn distribution for *The Curse of Vecna* (own image).

This means that every student will have at least one round in which they will be the cursed one, which will allow for every student to use the AR or VR headset once during this escape room. The escape room will have rounds based on the number of players comprised in the group. Thus, if a group has 6 players, that group will have 6 rounds in total to successfully complete the escape room.

Once the turns of the escape room have been established, it is time to explore the different resources that will be needed for the intervention proposal. To do so, Figure 19 will introduce the elements to be taken into account:

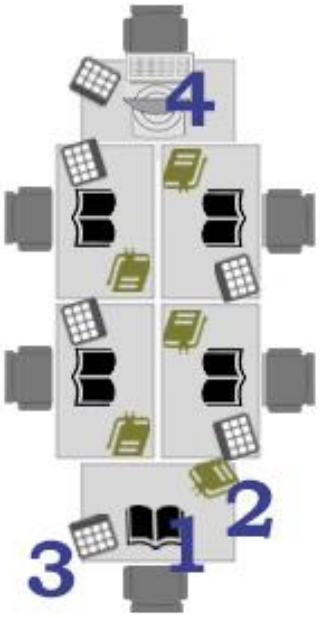

Figure 19. Elements of *The Curse of Vecna* (own image).

Each student will have the same resources available, with the particularity of the cursed one having a different configuration of elements during that round in particular. First, each student minus the cursed one will be a labelled datasheet, which corresponds to Appendix 4. The label will be either A or B and the number of the task. For example, in the first round for a group of six students, there will be two 'A-01' and three 'B-01' datasheets. These datasheets will have a variety of information alongside two individual minor questions. One of them can be answered with the information presented on the datasheet itself, the other question will need the cooperation of another student with the opposite datasheet. All datasheets will be labelled with numbers, being left facing down or in different envelopes on the corner of the table so students do not access the information beforehand. This is represented with by number 2 in Figure 19. Similarly, an answer sheet that will be used to track answers will be provided to every student. These answer sheets must be named and kept between rounds, as they will be the means to assess how well every student and group performed and the choice of answers during the escape room. In Figure 19, answer sheets are represented with a 3. It is very important to note that the cursed one will also use their answer sheet to check up to what stage in the VR simulation they have reached when they played as the cursed one. This will be further developed in section 3.4.

In addition to the previously stated, the figure of the cursed one becomes particularly relevant. Each turn, there will be a student who sits on the first seat, as indicated in Figure 19. On the seat labelled with 1, there will not be any datasheets, but the VR or AR headset and a QR code will kickstart the VR/AR simulation. The cursed one will have to share the information that they can see with their partners, usually a question that prompts everyone within the group to start debating and searching for clues in the provided datasheets. Once the round ends, the chosen one will be given a code within the VR simulation which must be written on the answer sheet. The rest of the students must write down the answers they have agreed upon into their datasheets, as well as the answers to the individual questions posed in their datasheet.

As an example of how a turn would unfold, an example will be provided. During the second round, three students will have an 'A-03', as the version of the datasheet is version a and the task is the third task for the third round. At the same time, as this is a group of six students and one is the cursed one, the two students left will have a 'B-03' datasheet. On 'A-03', a student will be able to locate the information needed in the provided text to successfully answer the first question posed. However, in order to answer the second question on 'A-03', said student will have to interact with the rest of the group, as the required information will be located on 'B-03' datasheets. This will happen in opposite ways, forcing all students to cooperate if they want to answer their questions and accumulate points to be able to complete the escape room.

3.4 Activities: *The Curse of Vecna*

The activities developed in the escape room must be a reflection to the contents related to the academic year of the student. Thus, the contents developed for a student from the level of 4th CSE could include, for instance, 'Participation in simple, short conversations using correct vocabulary and pronunciation' and 'Wh- and auxiliary questions', as developed by the *Order 15th January* (BOJA, 2021) for the autonomous community of Andalusia.

First, it will be advantageous to think of the central task of the round. This task will be what the cursed one will see through the headset, which they will have to communicate to the rest of the group. For instance, the cursed one would put on the VR headset and, after a brief introduction through the characters of Stranger Things, or related to it, the

first question will be posed for the cursed one. Besides this, the cursed one will be able to see a 5 minutes timer on the upper part of the visor which will show the remaining time to successfully complete the task. For illustration purposes, Figure 20, as ilustrated in Appendix 5, will show what a VR environment based on *Stranger Things*, plus the task and timer, could look like:

Figure 140. Cursed one's task in *The Curse of Vecna* (own image).

At the same time as the cursed one is experiencing the introduction elaborated by the teacher, the rest of the students will open their datasheet folder and bring out datasheet number 1 for the first round from their clues folder. As mentioned earlier, all of the files and elements of the escape room will be based in the world of *Stranger Things*, to have a higher entertainment and motivation value. Similarly, this will make all of the tasks developed in the escape room cohesive and coherent.

After opening the datasheet folder and picking up the first datasheet, students will have to communicate between themselves to find out the information that the cursed one needs in order to be freed. If they manage to release the cursed one from Vecna's curse, they will have a few remaining minutes to see if they can answer the questions on their version of the first task. As previously stated, every round will have different datasheets for students. There will be, at least, a version A and a version B of the datasheet, which will have two questions which will be different, based on the selected version. Thus, for the first round, datasheets A and B should be available. In doing so, students will have to

cooperate to free the cursed one as well as to find a solution to their questions. An example of a datasheet, found under Appendix 6 as well, will be located in the following figure:

Figure 151. Datasheet A-01 for *The Curse of Vecna* (own image).

Once the time runs out, datasheet 1 will be put away and students will make sure that they have answered on their answers sheet. In the case of the cursed one, he must write the provided code at the end of the VR simulation, which will be based on the results obtained. The cursed one will only have to fill one field in the answers sheet, as he will not have a datasheet with two questions during the round in which he/she is the cursed one. The datasheets of the whole classroom will be collected by the teacher at the end of the escape room. To further illustrate how a datasheet could look, an example has been elaborated, as well as being found under Appendix 7:

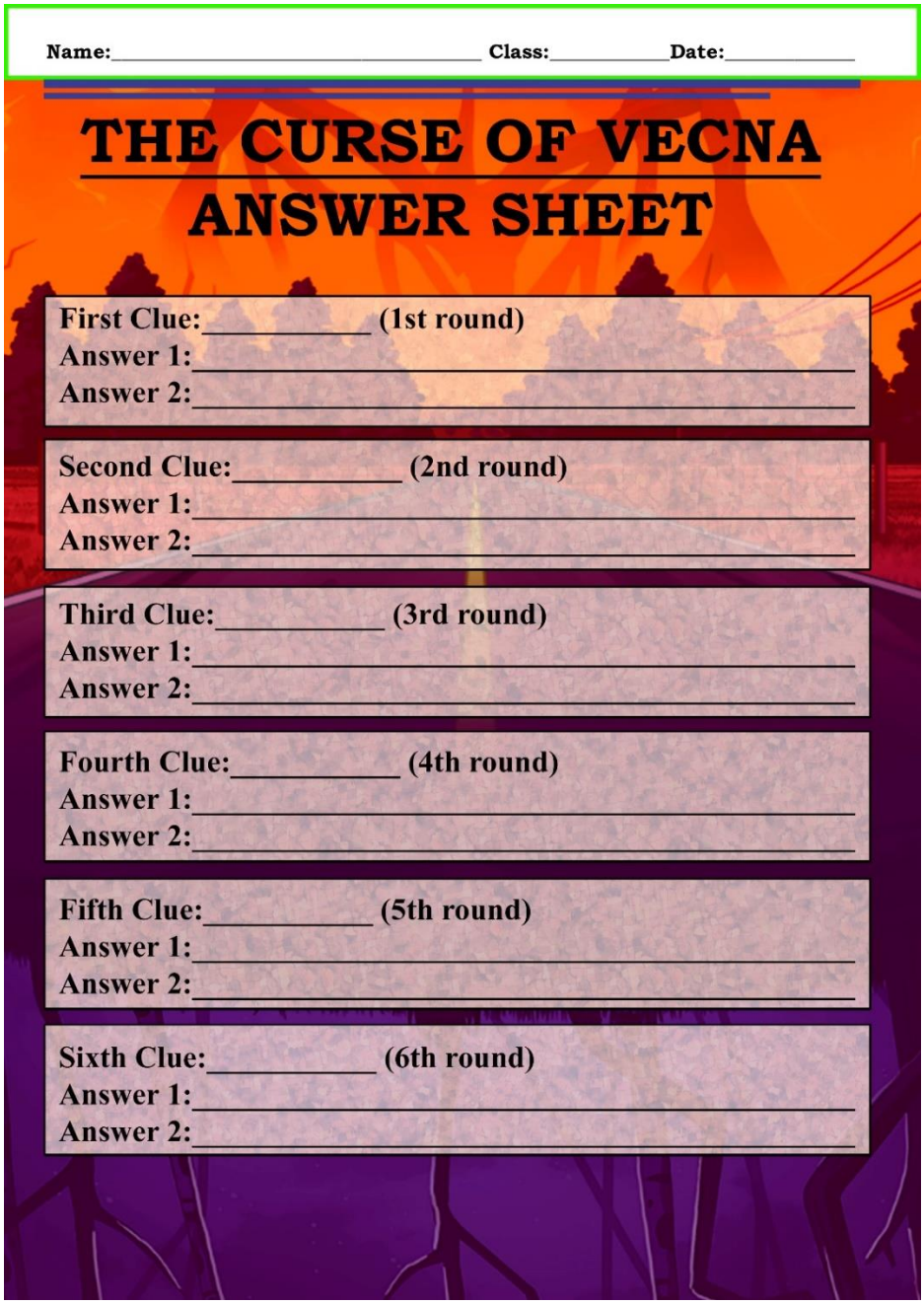

Figure 162. Answer sheet for *The Curse of Vecna* (Source: own image).

After the first round has finished, students will have to rotate to the left and the next round will start. The next datasheet will be brought out by students from the available datasheet folder on their table. Again, the next datasheet should follow the topic and theme of previous datasheets, further developing the content desired by the teacher. For instance, the questions on the first datasheet will be based on questions that will improve students' level of mastery in regards to relative clauses. Said content, which must be taught during the 4th year of CSE for Andalusian high schools, can be further developed with subsequent datasheets. There will need to be as many datasheets as there are rounds. Moreover, each datasheet should have, at least, two versions in order to motivate students to cooperate and interact.

Now it will be time to explore how the results of the escape room can be assessed, and what variables will be measured in particular.

3.5 Assessment

The intervention proposal developed on this paper has been crafted with a series of assessable parameters that will be further explained in this section.

The most important item to assess how successful were students in completing the escape room will be the answer sheet, which has been previously developed in section 3.3. However, now a look in detail becomes of paramount importance.

The first thing that must be checked from an answer sheet will be the group it belongs to, indicated at the top. This will be left blank to try to stimulate students' imagination by asking them to select a name for their group while the escape room is being made ready by the teacher.

Each round, every student will mark down both an answer and the datasheet that they are doing, indicating both the round and the version of the datasheet in the clue section of each box, as previously stated. This will be done even if they do not successfully answer the question posed on the datasheet or even if they fail to help the cursed one to escape. It will have to be done every round to successfully keep track of the game, which is the reason that there are two ways of keeping track of the round: on the answer page, there will be the number of the round specified beside the clue field while the clue field answer also contains this information.

The case of the cursed one will be different to his peers during that round. Based on the number of attempts, as well as if the student successfully answers the question posed within their headset, a specific code will be designated that would look, for instance, like 'CO-05A'. The first two letters, CO, refer that this is a code for the cursed one. Separated by the hyphen, the number of times that an answer has been attempted, as well as if the correct one was provided will be seen in the code. Thus, the example 'CO-05A' would mean that this is a cursed one code, that the question was attempted a total amount of five times, and a result of A which means that the question was successfully provided. If the parameters would have been the same, then the previous example would have looked like 'CO-05B', meaning that it was attempted a total amount of five times, however, the correct answer was not provided and the cursed one was not saved.

In regards to the question field within each box, whenever a student is the cursed one, said fields will not be needed. All of the information related to that round that will be needed by the teacher will be contained within the cursed one code.

With the previous set of rules, the ability to record how well a student did, based on the number of correct answers to his individual questions, as well as how that student performed as a cursed one alongside their group, can be recorded and checked. On a similar note, in order to determine if the group successfully escaped Vecna's curse, the teacher can opt to give and subtract extra points, based on how the group performed. In other words, the teacher, for example, can give one point to the group per valid individual answer and three points for each saved cursed one per round. Similarly, if the group fails to save the cursed one, the group can see three points subtracted from their total of points up to that round. The values of the points awarded and subtracted can be modified by the teacher as deemed appropriate. On a similar note, the necessary number of points for each group to successfully escape from *The Curse of Vecna* can also be modified in order to aim for a higher difficulty.

The options above stated allow for the possibility to assess students both individually and as a group by the teacher. In doing so, a whole array of options become possible, as many different aspects of the teaching reality can be assessed through an escape room. For example, communicative competence, as developed by the *Order 15th January* (BOJA, 2021), will be fostered. Competence in linguistic communication and digital competence are some of the examples that can be assessed by *The Curse of Vecna*.

For clarity purposes, an example of how an answer sheet could look after playing the developed escape room has been incorporated into the present section, as well as under Appendix 8:

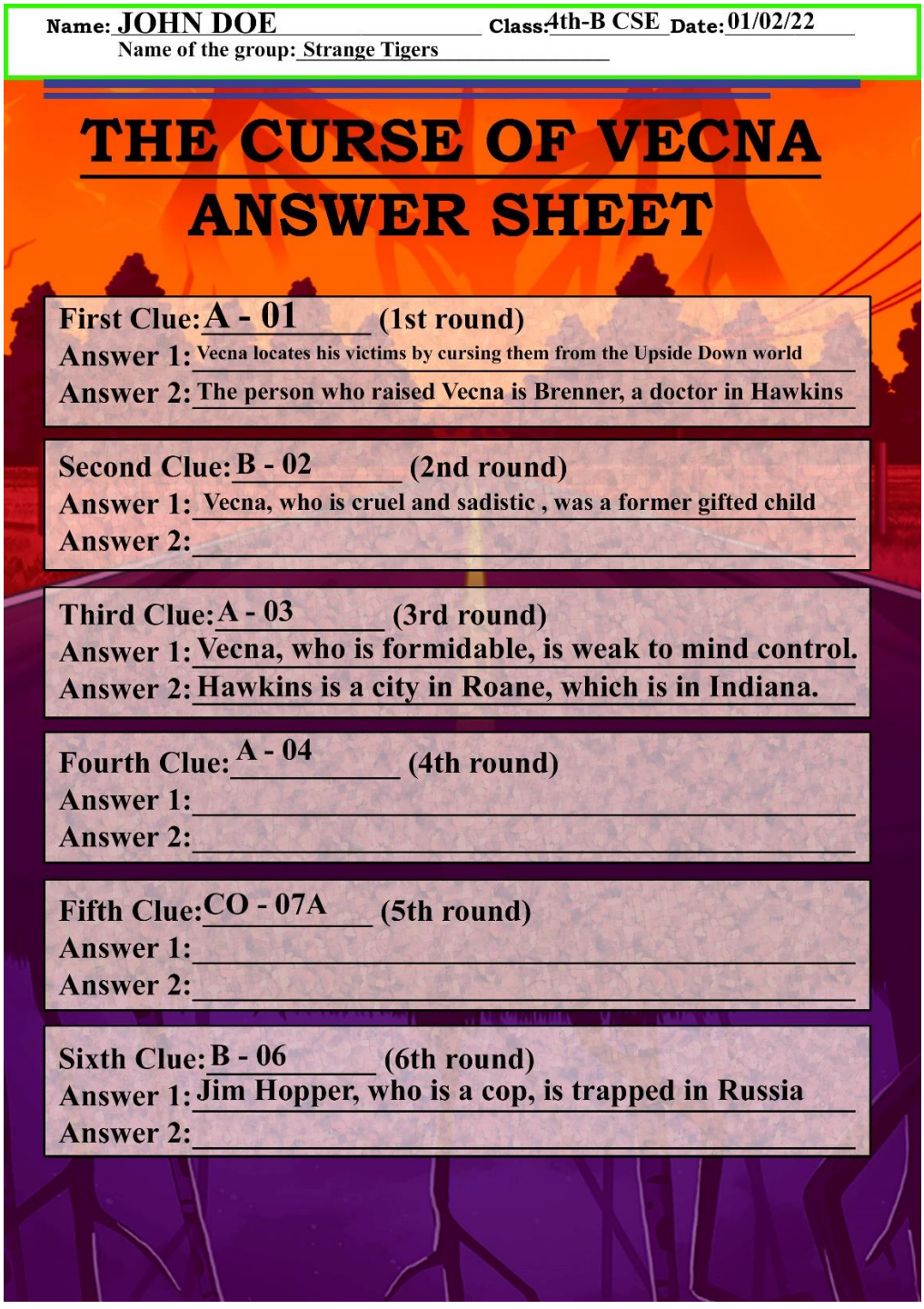

Figure 173. Example of a used answer sheet for *The Curse of Vecna* (Source: own image).

In this example, we can see that a fictitious student named John Doe belongs to a group named *Strange Tigers*. During the first round, the student had the version A of the first datasheet. He managed to complete both answer 1 and answer 2 for this round. Over

the next round, the student only managed to answer the first question of the version B of the second datasheet. In contrast, for the third round the student managed to answer both questions of the version A of the third datasheet. After this, for the fourth round, this student had version A of the datasheet. However, the student did not manage to answer any questions. Nevertheless, over the fifth round, the student was the cursed one as a cursed one is provided. For this example, the student attempted to answer 7 times and managed to successfully answer the question. In the sixth round, the last one for this example, the student had version B of the datasheet and was successful in answering only the first answer. If the teacher were to give one point per correct answer and three points per saved cursed one, this student would have a total of six correct answers and was saved from the curse. As a consequence, he would be providing 9 points out of 13 possible points to the team that the student belongs to. If said team were to be integrated by 6 students, and each student can provide a maximum of 13 points, 78 points would be the maximum number of points possible for that team. If the threshold for successful completion is set at 60% of the possible points, if the team manages to get at least 47% (rounded up from 46.7%), that team will have successfully completed *The Curse of Vecna*.

After assessing how measurements can be made for this example of an escape room, it will be time to explore what are the options to adapt this escape room based on a variety of factors.

3.6 Adaptations for *The Curse of Vecna*

In order for an activity to be successful, it should count on the ability to adapt to a variety of contexts. In the present case, the intervention proposal in this paper will count on adaptations based on difficulty, resources and attendees.

To begin with, the number of students to carry out the escape room can be altered. It is recommended to have the same number of groups with the same number of participants per group as the results will be more similar for comparison purposes. However, in the case that one or more groups have more members than the other groups then there will be two different options. The first option will be to have as many datasheets as there are participants. For example, if group A has six members, then group A will need six different datasheets while if group B has seven members, group will need seven

different datasheets. Since the escape room will be assessed with a percentage from the possible total number of points, the number of datasheets should not have a negative impact. The second option will be to incorporate the role of the 'watcher' for that table. The watcher is a student who has been designated to make sure that the rules are being followed during that round, acting as a judge for the table. It is recommended that, after a student has become the cursed one, the next round they fulfil this role if deemed necessary. Said student will have the recent experience of using the VR or AR headset and will be able to help the cursed one in the set-up and any possible questions concerning the functioning of the round. The watcher should not have any datasheets, as their role will be that of a judge and a helper for the rest of the team during that round.

Another aspect to take into account is the availability of different resources. This escape room can be completed with either standalone-VR headset, smartphone-powered VR headsets, tethered VR headsets, or none of the previous options.

For a standalone VR headset experience, depending on the number of headsets available, the classroom will have to be divided into the same number of groups to make sure that there is at least one headset per group. Then, the essential workings of the escape room will be respected if there is only one headset, which means that there will be a cursed one and non-cursed students that will try to cooperate to release the cursed one while also figuring out individual questions. The VR environment could be further modified to be similar to the exact same proportions and items that are present in the classroom to be taken as an initial reference. This means that the VR simulation will be based upon the *Upside-Down*, which is an alternative version of reality where everything is reversed, as seen in *Stranger Things*. An illustrative image of the concept can be seen in Figure 24:

Figure 184. The Upside-Down world (Source: Netflix, 2015).

If possible, an *Upside-Down* version of the actual classroom of the student should be used, as seen in *Stranger Things*, which would increase the immersion degree of the student. A standalone VR headset offers the possibility of having extra input from the student, making the necessity of a Bluetooth handheld controller not mandatory. The student will be able to use the controllers that are included with each headset which will allow him to interact with elements that could be present on the VR table or the wall of the simulation, for instance, as seen in Figure 25. If all students in the same group could use a standalone VR headset, then the datasheets will have to be digitalised and incorporated into the student VR simulation, with a minimum of two students per group with a different version of the datasheets in their VR simulations. This will force students to interact with their surroundings and communicate the information that they see with the other students from their group to complete the escape room.

Figure 195. Finger-tracking controllers (Source: The Verge, 2019).

For a tethered VR headset experience, the number of adaptations will be almost identical to the ones developed for standalone VR headsets, with the main difference that tethered VR headsets will require either a computer and external sensors to work, alongside cable management. However, the options provided by tethered VR headsets are almost unlimited, as they depend on the variations and simulations that the teacher can elaborate on. For example, perhaps one task demands that the student has to go to the entrance of the school to gather extra clues, which could be done in a VR simulation without the student moving from his seat in the classroom. Another instance would be to have the surrounding walls fall off in the VR simulation after a series of rounds, revealing more information to solve the tasks and, thus, another depth of layer to the VR experience.

For a smartphone-powered VR headset experience, the escape room could be done in two distinct ways. The first option would be to have the cursed one with a smartphone-powered VR headset while the rest of the students have the datasheets as physical copies, as developed in section 3.3. If there are no headsets, then the smartphone could be used as an AR headset, as long as there is a smartphone VR visor. The cursed one could see the questions and any related materials in the form of AR 3D elements by scanning a QR code containing the information pertinent to that round in particular. In other words, a student could have a folder similar to the datasheet folders, but this would be a cursed one folder. The student could read the question pertinent to that round via scanning the QR code associated to the round being played and start interacting with the rest of their group

in order to solve this. Another option would be for the student that becomes the cursed one to use a smartphone-powered VR headset while the rest of the group use QR codes to bring up a digitalised, 3d version of the datasheet from that round in particular.

If no VR headsets nor AR visors are available, the escape room can be done by using a cursed one printed datasheet. However, in doing so, the cursed one will not be able to know if he answered the question successfully as there will not be any direct feedback for the submission of an answer.

In regards to the level of difficulty of the tasks involved in the escape room, these will have to be a reflection of the contents developed for the year level of the students attempting the scape room, as developed by the *Order 15th January* (BOJA, 2021) for the academic levels of 4th CSE, 1st PCSE and 2nd PCSE. This will result in an experience adapted to what students have learnt in their ESL lessons during their academic year.

On a similar note, the parameters of the escape room can also be modified by the teacher to make them easier or harder. Some of the parameters that can be altered will be the duration of the curse, with an increase in time resulting in an easier experience for the students as they will have more time to resolve the tasks required for each round. On the contrary, if the time limit is reduced, the task will be harder, forcing students to focus and cooperate if they want to successfully complete it. Also, the number of times that the cursed one attempts to introduce an answer could be a factor to be changed. For example, a maximum limit of attempts to be saved could be introduced, or a penalization for the group score based on the number of attempts could also be introduced. Another aspect that could be altered is how the cursed one is saved. Instead of only answering one question, perhaps once the timer is closer to running out, clues could pop out nearby within the VR simulation so the cursed one can have an easier time when communicating with the rest of the team to try to search for the solution. Similarly, the cursed one could, for example, follow up with a new question after the first one is successfully completed. As a consequence, the duration of the rounds would be prolonged, having two questions to solve to liberate the cursed one.

4. Results

It is time now to address the outcomes of the escape room as well as the use VR & AR elements in the ESL classroom.

First of all, the key competences for the area of English must be addressed. Key competences, as developed by the *Order ECD 65/2015*, are defined by Rychen and Salganik (2003) as "*the ability to respond to complex demands and to carry out diverse tasks in an appropriate manner*." Thus, key competences can be understood as a set of abilities that are not inherent to a subject in particular, however, they can be taught through a subject. In the case of English, the competences that could be developed and an example has been gathered into the following table:

Table 2

Key Competences Definitions and Examples

KEY COMPETENCE	DETAILS	EXAMPLES
Competence in Linguistic Communication (CLC)	It consists of the use of a correct communicative action within a particular social context, interacting with the participants orally and/or through texts in different formats.	As we are teaching a language, the vast majority of the activities we will do will involve CLC. An example could be a practice of an activity involving orally asking for a date.

Mathematical Competence and Basic Competences in Science and Technology (MSTC)	This competence works upon the improvement of daily life mathematical reasoning, to be able to use a particular knowledge to explain what happens in our surroundings, and the technology competence focuses on being able to apply said knowledge to meet our needs.	The use of many digital apps, such as Google VR for Everyone, or QR codes in the classroom. An example would be a student scanning a QR code, seeing the desired information but having to locate the particular information the student is after.
Digital Competence (DC)	It involves the safe use of ICT to gather, analyse, construct and to exchange information.	The use of tasks to enhance DC will be essential. Using a smartphone as an AR visor, or using a VR headset could be an example of this.
Learning to Learn (LL)	Learning to Learn means being able to acquire, process and incorporate new knowledge and skills, as well as being able to use them properly depending on the social context the speaker is interacting in.	The escape room designed in this paper contains several rounds, each round having 2 different questions. The first half of the results can be compared to the second to determine if students were able to successfully assimilate the functioning of the escape room and incorporated it to their skills.
Social and Civic Competences (SCC)	This competence focuses on the ability to actively participate in society, from a	A debate would be an excellent way to enhance our students' mastery of SCC. An example of this would be a

	democratic and constructive approach.	group debate after finishing the escape room in order not only to gather feedback from the students, but to foster interaction between students on a bigger scale than group-based communication.
Initiative and Entrepreneurship (IE)	The focus for this competence is to be able to put ideas into action and transform them into a reality, as well as the ability to plan, assume risks and be creative.	This idea can be carried out as a project. In it, students could be asked to design their own escape room for English students. A certain array of topics and general ideas could be provided if needed.
Cultural Awareness and Expression (CAE) 	It comprises the skill of being able to appreciate the importance of expressing oneself through music, fine arts and literature.	Since any VR simulation could be designed, creating one using elements from Andalusia, for example, could be feasible. For example, a VR simulation in which students have to give directions in English to tourists in their city.

Note. Adapted from *Order ECD 65/2015*.

On a similar note, the stage goals and area goals related to the subject of English in Andalusia for the levels of 4th CSE, 1st PCSE, and 2nd PCSE will be improved upon the put into practice of the developed escape room. Stage goals are the objectives shared between all subjects of a particular level, without taking into account the area they belong to. Stage goals, as developed by the *Royal Decree 1105/2014*, will help students to develop skills that will allow them:

Table 3

Stage Goals

a)	To assume their duties with responsibility, know and exercise their rights while respecting others, practise tolerance, cooperation and solidarity among people and groups, practise dialogue strengthening human rights and equal treatment and opportunities between men and women as common values of a plural society and prepare them to take part in democratic citizenship.
b)	To develop and consolidate habits of discipline, study and work both individua and in a group, as a necessary condition to carry out learning tasks effectively a as a means of personal development.
c)	To value and respect gender differences and equal rights and opportunities among them. Reject stereotypes leading to discrimination between men and women as well as any other act of violence against women.
d)	To strengthen affective capacities in all areas of their personality and in their relations with others. Reject violence, prejudice of any type, sexist behaviour and solve conflicts in a peaceful manner.
e)	To develop basic skills in the use of information sources to acquire new knowledge with a critical approach. Acquire basic training in the field of technology, especially in Information and Communication Technologies (ICT).
f)	To perceive scientific knowledge as an integrated knowledge which is structured into different disciplines and know and apply methods to identify problems in different fields of knowledge and experience.
g)	To develop an enterprising spirit and self-confidence, participation, critical awareness, personal initiative and the capacity to learn, plan, take decisions and assume responsibilities.

h)	To understand and produce correctly complex texts and messages in oral and written form in Spanish or any of the other co-official languages, starting to get acquainted with knowing, studying and reading literature.
i)	To understand and express themselves appropriately in one or more foreign languages.
j)	To know, value and respect the basic characteristics of their own culture and history and that of others, together with their artistic and cultural heritage.
k)	To know and accept the functioning of their own body and that of others and respect the differences; look after their body and develop healthy habits; take part in Physical Education and sports to contribute to their personal and social development; know and value the human dimension of sexuality in all its diversity; be critically aware of social habits related to health and consumption; care for living beings and the environment and contribute to their conservation and enhancement.
l)	To appreciate artistic creation and understand the language of different art forms, using various means of expression and representation.

Note. Adapted from Royal Decree 1105/2014.

In the case of Andalusia, we have these stage goals expanded in *Decree 110/2016 and Decree 111/2016, Chapter 6*. Article 3 with the following two additions:

a) To delve into the knowledge and value of Andalusian as a linguistic modality in all its forms.

b) To delve into the knowledge and value of the specific elements of Andalusian history and culture, its physical features and other specifications in our community to be respected as our own heritage and inside the Spanish and universal sphere

Area goals, on the contrary, are those concerning a subject in particular. Every subject with have shared stage goals but its own area goals. In the case of English, the area goals to take into account, as developed by *Order 15th January 2021*, are:

1. To listen and understand specific information from oral texts in varied communicative situations.

2. To express and interact orally in daily situations in a suitable and understandable way

3. To read and understand different texts according to the students' needs and capacities to extract general and specific information

4. To read in different formats as a source of enjoyment.

5. To write different simple texts with different goals about different issues with cohesion and coherence.

6. To use correctly the basic phonetic, lexical, syntactic-discursive and functional resources in real communication.

7. To develop autonomous learning, discipline, study and work habits.

8. To develop teamwork, avoid discrimination due to gender or any other personal or social condition.

9. To use learning strategies, including ICT to present orally/written.

10. To value and appreciate the foreign language as a means of communication, cooperation and understanding between people.

11. To appreciate the foreign language as a means to reach knowledge and artistic expression.

12. To show a positive attitude of self-esteem and confidence in our own abilities, using language creatively.

13. To know and appreciate the basic elements of the Andalusian culture.

14. To recognise the relevance of tourism and culture in Andalusia and develop the sense of entrepreneurship through the use of the foreign language.

There is a clear body of evidence showing that the use of VR and AR, alongside an escape room, can improve many of the goals above exposed. Area goals one to four, as well as area goals eight, nine, ten, eleven, and twelve, are directly covered if developing an escape room using VR & AR as previously stated. Area goal nine, which says to use learning strategies, including ICT to make oral and written presentations, will be a direct call for an activity such as *The Curse of Vecna*.

After having examined how key competences and area goals can be improved as a result of putting into practice an escape room alongside VR and AR ICT, it is time to move on to the learning standards that could be improved based on the execution of the escape room. Learning standards are the referents that describe what students should be familiarised with and know how to do to demonstrate that he has successfully acquired the required learning goals of that stage in particular. Learning standards are divided into four blocks: block 1, or comprehension of oral texts; block 2, or production of oral texts; block 3, or comprehension of written texts, and block 4, or production of written texts. Since these are different based on the year level of the student, they will have to be checked and adapted. In doing so, the results of the escape room will include those related to the learning standards and their acquisition by students.

Due to the nature of the intervention proposal developed in this document, a theoretical exercise, the option to measure the increase in motivation and performance degrees as a result of putting the escape room into practice will not be available. However, it could be stated that there is a considerable amount of evidence to support the claim (Vidergor, 2021; Dimeo et al., 2022). An improvement in motivation, performance, interest and participation should be some of the factors that could be measured as a result of the escape room.

To summarize what has been developed so far, setting up an escape room using VR & AR might seem like a daunting task at first, and certainly requires a considerable amount of preparation in order to be put into practice. Several factors will have to be supervised and taken into account to develop a successful experience for students, including economic resources, typology of the escape room in particular and such, to illustrate a few. However, there will be a variety of positive results due to this. Both area and stage goals will be improved as a result, as well as key competences and learning standards related to the subject of English. In other words, students will achieve what they

are supposed to during their academic year, and will do so in an innovative, significative and effective way by using ICT in an up-to-date course of action.

Once the range of results that can happen due to the execution of the escape room, it is time to move on to one of the final sections of this essay, dealing with the present limitations in the implementation of a VR and/or AR escape room as well as the future possibilities offered by the technology.

5. Current Limitations

Even when considering the advantages offered by the use of VR & AR ICT in the ESL classroom, as of the moment of the elaboration of this document, there is a series of limitations that must be taken into account by the teacher.

Firstly, the cost of the actual VR headsets could made them not available for certain budgets. Standalone VR headsets are one of the most optimal choices for the execution of the escape room due to their technical characteristics, developed in section 2.3.2. However, due to the majority of standalone VR headsets being discontinued, and those related to video console gaming systems not being a real option to elaborate content as of now, the catalogue of standalone VR headsets remains poor in terms of choice. Oculus/Meta Quest 2 has excellent technical specifications and characteristics, battery life and allows for the development of content without any mandatory external computing device but itself.

Secondly, both tethered VR headsets and AR visors are found in a similar position to standalone VR headsets in terms of budget restrictions. Tethered VR headsets usually have the highest computing specs of all of the VR headsets available at the moment. As a consequence, their price tag is considerably higher than other types of VR headsets, as well as requiring a computer with high specs. This is due to the necessity of having high-end gear that can compute the necessary amount of data fast enough for the headset. There is a higher variety of options to choose from when it comes to tethered VR headsets, as seen in Table 1. However, due to the necessity of having a nearby computer, to manage cables so they are not a risk for any student, and to be able to set up sensors for each headset, these remain a poor choice to develop VR content in a reduced space with a considerable number of participants.

Thirdly, smartphone VR headsets currently offer a considerable amount of versatility in regards to the cost of the product and the options it offers to the user. However, the variety of smartphone-powered VR headsets in the market is considerable It will become essential to research the desired unit based on the type of content that will be developed. Similarly, Smartphone VR headsets usually only include the visor and nothing else. In order for the student to be able to input information, an external unit is required, as previously stated. Some options were explored before in terms of controllers; however, these will have to be properly researched so that they adapt to the type of content developed through VR and AR. On a similar note, the smartphone to be used will also be of critical importance, as it will be the unit doing the computing for the whole VR/AR environment. Additionally, not every student possesses a smartphone with an internet connection capable of using VR technology. Authorization from parents and the agreement of the school board also become of critical importance when using smartphones within the classroom. While the specs required from a smartphone to compute VR content are not very high, tables will be an option when smartphones are not.

Fourthly, the size of the classroom and the number of students could also become a limitation for the correct development of an escape room using VR/AR-based ICT. High schools have different classroom dimensions, which in turn means that a single VR simulation can not be applied to every classroom. The VR simulation needs to be adapted to the size it will be developed in. To be certain that the environment is safe for our students when participating in the escape room proposed in this paper becomes not only essential but mandatory. To solve this limitation, different options have been offered in this essay, including options where students do not move from their seats during rounds as well as more complete options that include their surroundings as part of the VR simulation. On a similar note, the characteristics of the students that integrate each group could become a limitation. In order for groups to properly function, it is best if all of their components share a similar communicative competence in the use of ESL. This will result in more homogeneous groups in which a particular student will not become the leader, with the consequence of having the rest of the students from that group following the leader, resulting in a lower individual performance degree.

Fifthly, developing a VR environment becomes a daunting task with a considerable amount of work by the teacher. The elaboration of certain mechanics, such as the cursed

one codes as developed in section 3.4 of this document, could pose problematic due to the amount of knowledge required in other areas such as programming or designing. AR software, however, tend to be significantly easier, as a whole simulation does not need to have as much data as including 3d models into an actual camera. Nonetheless, VR and AR environments have not yet made a breakthrough into education, which means that it is possible for many students not to be familiarised with them at all. This would result in a higher time used for pre-tasks and instruction, as well as a higher training and formation time for the teacher that wishes to adopt VR/AR methodologies into their teaching. However, there is a variety of software that can be used to lessen the workload required to elaborate a VR environment or AR content, as previously developed in sections 2.3.1, 2.3.2, and 2.3.3.

6. Projection of AR & VR ICT

Once the limitations that this essay has found have been addressed, an overview of the possibilities that the use of VR and AR offers is recommended. Since this is a field which is partially based on the options offered by the technological aspects of VR/AR ICT, the technology used evolves and adapts with a considerable speed. It is the role of the teacher to be up to date with the latest trends if the most updated methodologies and options want to be included within the teaching practice of the teacher.

One of the most interesting news related to AR and VR technology took place by the hands of Meta., previously known as Facebook, a popular conglomerate specialising in technology and social media. Meta acquired the company Oculus VR, a company focused in VR technology, in 2015. Since then, Meta has released a considerable amount of VR and AR headsets with many different specs and characteristics available. The current Oculus/Meta Quest 2 is a revision of the first prototype of standalone VR visors.

A relevant announcement was made by the online blog *The Information* (O'Regan, Olson, 2022) in June announcing 4 different upcoming AR/VR headsets to be released from 2022 until 2024. In it, Michael Abrash, Meta's Chief Scientist, explains that they are aiming at creating a VR/AR headset that could pass the Alan Turing test and can fit in a regular VR/AR headset. Abrash would say:

> In 1950, Alan Turing conceived the Turing Test in 1950 to evaluate whether a computer could pass as a human. The visual Turing test, which is a phrase that we've adopted, along with a number of other academic researchers, is a way to evaluate whether what's displayed in VR can be distinguished from the real world.

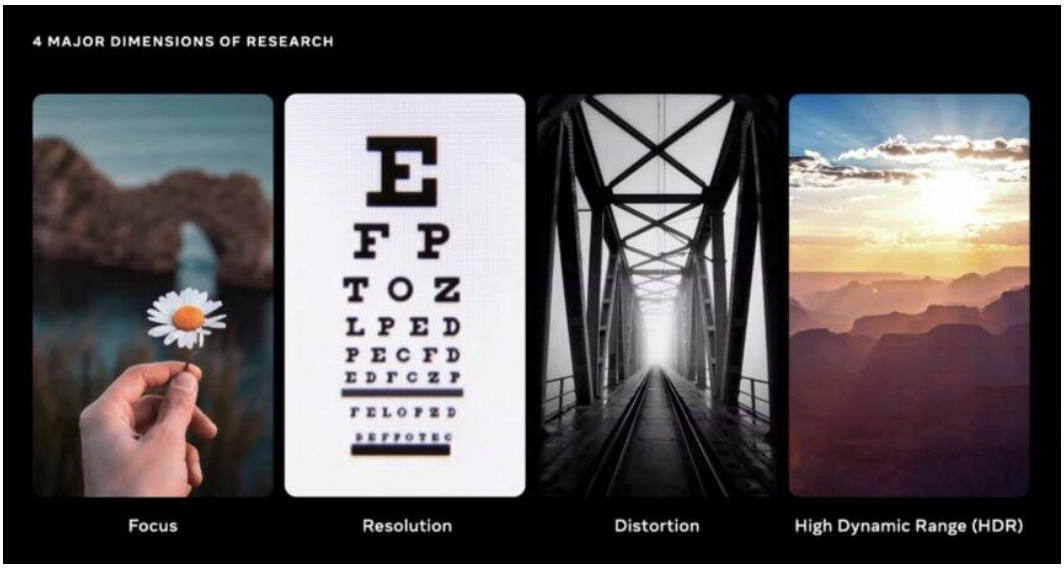

Figure 206. 4 Major dimensions of research (Source: Meta, 2022a).

To achieve realism, Abrash pointed out the four aspects of focus for his research team, being these focus, resolution, distortion, and high dynamic range. This is illustrated in Figure 26. The first prototype presented was named *Butterscotch*, consisting of an VR focused on a very high retinal resolution, directly related to the quality of the image seen through the visor. As seen in the video, Butterscotch allows for the user to be able to read the smallest letters on an eye chart, opening a whole new array of possibilities for the ESL teacher. This visor will have a more advanced technology than the technology currently present in computer screens. The second VR visor is focused on an improvement in focal depth. As Mark Zuckerberg, Meta's CEO, points out during the video, monitors have a set distance for focusing on items and only allow for one place to be focused on. This headset allows the user to be able to focus on any item at any distance. Zuckerberg moves on to the third headset, *Starburst*, which highlights High Dynamic Resolution, HDR. When comparing the levels of brightness found in reality to those offered by current HDR monitors, Zuckerberg states that the level of brightness in real life could be located up to 100% higher than the brightness found in said HDR monitors. This is also the case with colours, which result in the need for higher specs if the user wants to achieve a very realistic simulation of reality using VR and AR technology. *Starburst* is the only upcoming HDR VR headset so far, with none in existence as of the time of the elaboration of this essay. The video presentation ends up with the introduction of a very light VR/AR headset that incorporates all of the technology previously stated, which highlights how much VR/AR technology can still advance.

According to *Virtual Reality In Education Global Market Report 2022*, the current landscape looks promising for the growth of the presence of VR/AR in education. One of the first facts about the global presence of VR/AR in the education market is expected to rise from $6.37 billion in 2021 to $8.66 billion in 2022 as a response to markets stabilizing after the COVID-19 worldwide pandemic of 2020. According to the report, there is an estimation within this field of reaching $32.94 billion in 2026. This data is measured by the number of VR/AR hardware and software sold to educational entities. Another interesting aspect shared by the report links the higher penetration of internet in society to the further development of AR applications. This is directly linked with the surge in the upcoming 5G mobile technology, which will allow for an even faster data transfer rate than actual smartphone 4G connections.

7. Conclusions

In this essay, an exhaustive compendium of how to successfully integrate VR and AR ICT into the ESL classrooms via an escape room has been developed. An overview about the current state of the presence of VR/AR ICT within ESL classroom was offered, alongside an explanation as to why it is important to integrate said ICT. This was followed by an overview of the past and current situation of ICT in Spain, including an analysis of how this data has evolved over the years. Then, the statement of the general and specific objectives of the essay were highlighted, followed by an analysis of the theoretical framework related to VR, AR, and the differences to be found between the two. Escape rooms, ICT, hardware and software followed afterwards, with an exhaustive analysis of the typology of technology to be found. After said aspects were examined, the development of the intervention proposal took place. Context, associated pre-tasks, the layout of the classroom, resources, activities, assessment and possible adaptations are the areas that had been covered previously in this essay concerning the intervention proposal developed in it. The next section covered the information related to the possible outcomes of the intervention proposal, followed by the current limitations present when performing the escape room, alongside possible solutions. Finally, the projection of AR & VR ICT took place, examining what can be expect to be found in this field in the future.

As previously developed in section 1.3.a, it could be stated that, while the intervention proposal has been of a theoretical nature, the main objective of this intervention proposal could be considered valid, based on the evidence provided in this essay. To illustrate how the use of VR, AR and escape rooms can boost performance and motivation have been some of the aspects dealt with on different sections of this document, with many authors supporting the claim as well as a intervention proposal dealing with the issue at hand.

Similarly, most of the specific objectives previously seen in section 1.3.b have been successfully met. The first specific objective of the document, dealing with the definition of VR and AR, including their use within education in general and English classrooms in particular, has been achieved. The second chapter of this document includes an exhaustive definition of both VR and AR, including concepts such as MR. Similarly, the origins, characteristics and actual presence of escape rooms has been explored in the same chapter. At the same time, the second specific objective, dealing with an exploration of the theoretical framework related to VR, AR, escape rooms and associated hardware and software, has been achieved in the second chapter. Different sections dealing with the aspects illustrated have been elaborated and explored, taking into account a variety of characteristics. The third specific objective, the review of the use of escape rooms in the English classroom, has also been explored in the second chapter. While this specific aspect has not yield that many results, it is far from being a completely unexplored topic. The fourth and last specific objective developed in this document, the elaboration of an intervention proposal of an escape room using VR and AR ICT in the English room, has been explored in chapter three, including future projections and limitations in later chapters.

Based on the evidence provided in this essay, it could be stated that VR and AR can be currently integrated into the teaching practice of not just ESL teachers, but teachers of a variety of subjects and levels. The possibilities that VR and AR offer are only limited by the options that the technology currently presents, as well as mentioning the initial difficulty in setting up a VR or AR environment. However, once this initial barrier has been passed, the results that using this innovative methodology can yield are enormous. From teaching vocabulary, grammar, interaction with natives, and a variety of other cultural aspects, VR and AR technology offer an almost unlimited array of possibilities only interrupted by the imagination of the developer. It would not be surprising if VR and AR ICT become the teaching standard in the future due to the huge benefits they can offer to both teachers and students.

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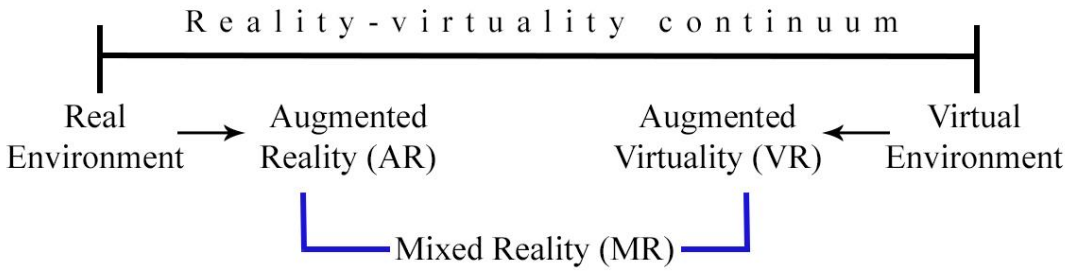
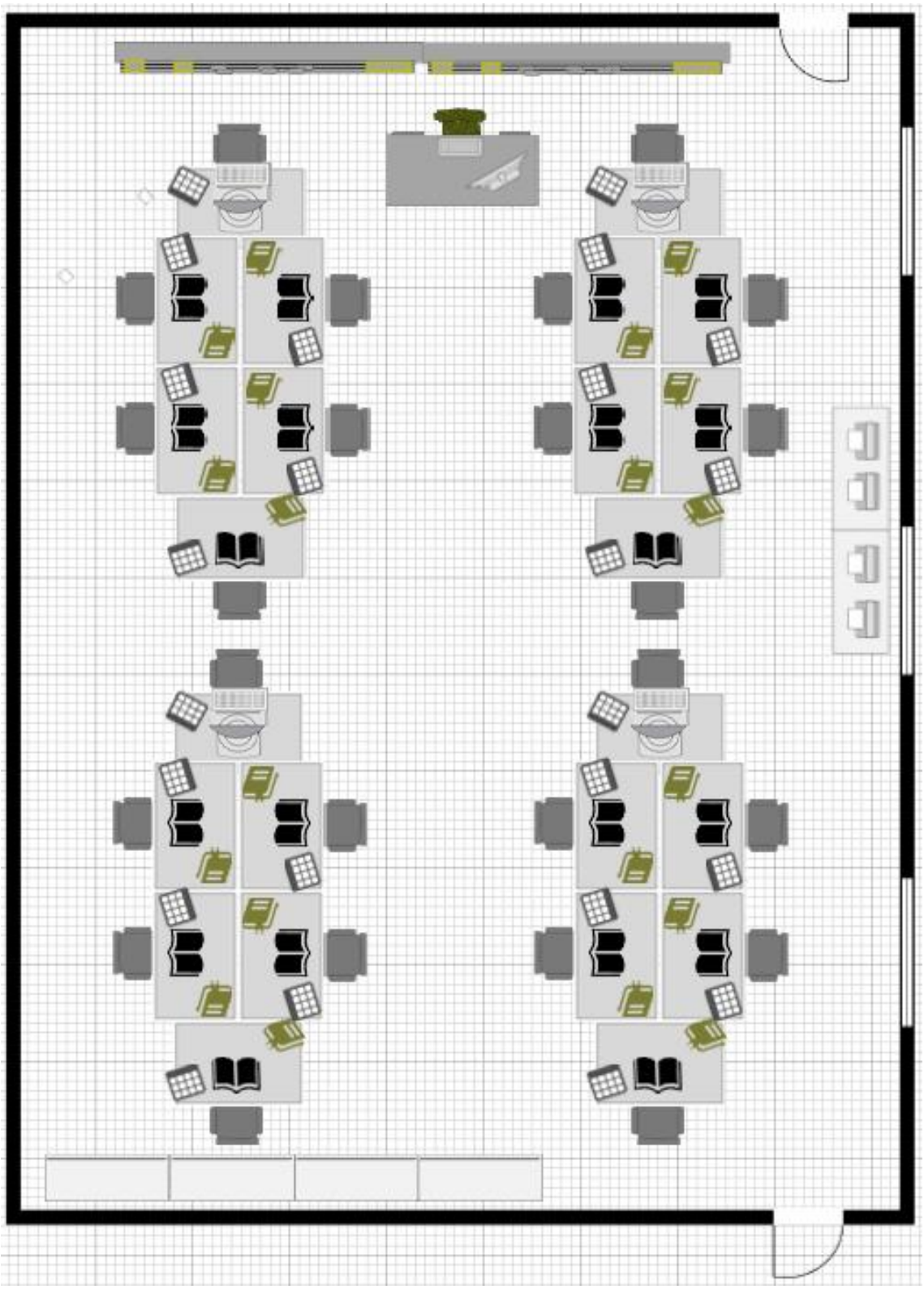
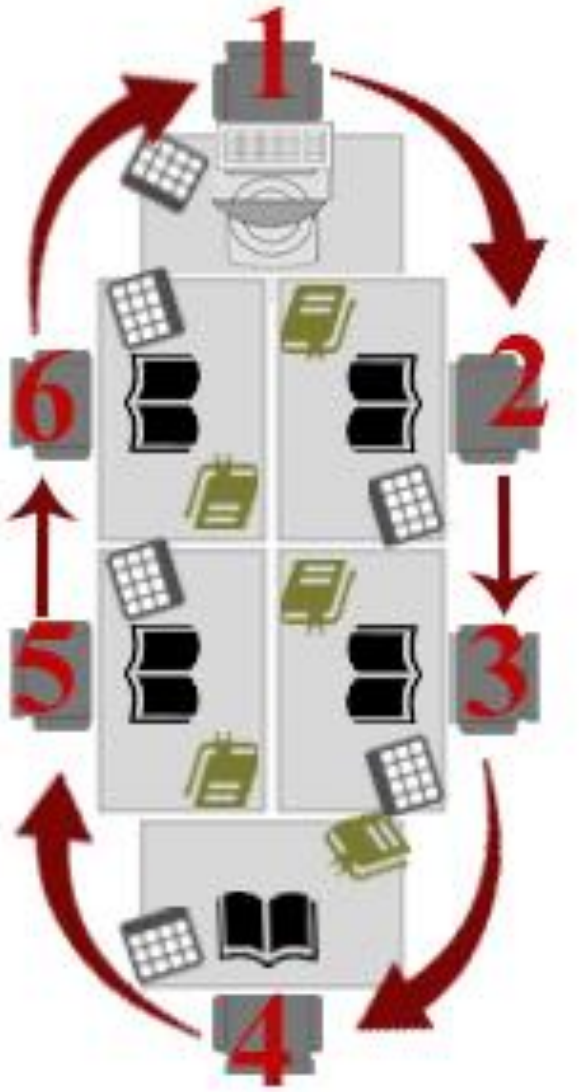
Appendix 1


Reality-virtuality continuum
Real Environment
Augmented Reality (AR)
Augmented Virtuality (VR)
Virtual Environment
Mixed Reality (MR)

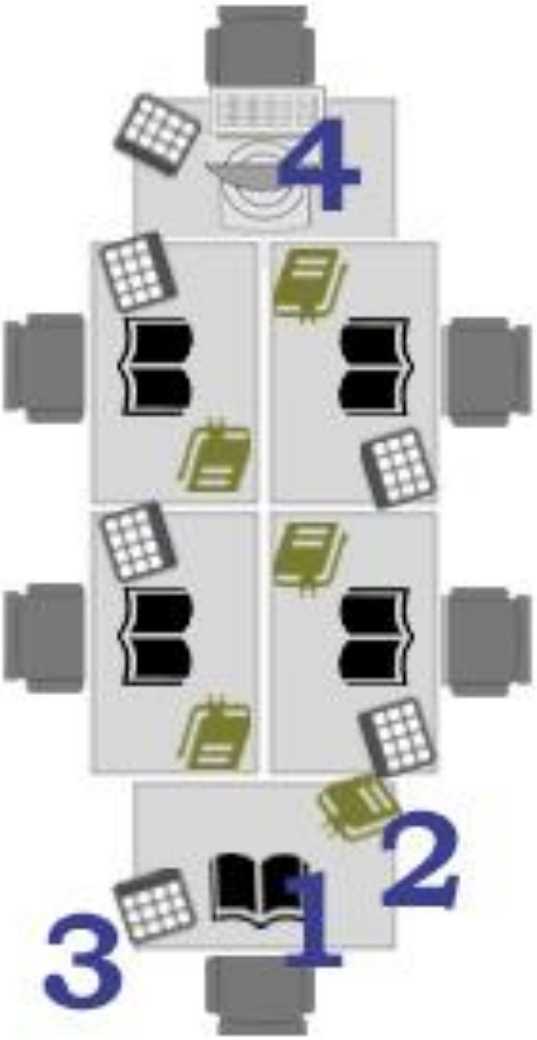
Appendix 2



Appendix 3



Appendix 4



Appendix 5


4:45
In which year did I
became imprisoned within
the Upside Down world?
_ _ _ _

Appendix 6

CLUE: A-01

New tabletop club
Hellfire club is the latest addition to the ever-growing list of Hawkins High School. If you are a fand of D&D, you can't miss this one.

Awards for our students
The upcoming Hawkins Awards will be held on Friday 27th at 16:00. If you want to participate, join us on the courtyard next Friday!

The Hawkins Tigers win
The Hawkins Tigers won on a thrilling match agains the Shinra busters by a 4-1 match. Jason Carver and the team did it again.

MARCH /1986

HAWKINS HERALD

Vecna was a human being who has been transformed by The Upside Down in 1979 in an unknown manner. He retains the psychic abilities that Henry Creel once possessed; the ability to reach into the minds of others, as well as the power of telekinesis.

When connected to tendrils in The Upside Down, Vecna is able to see into the minds of people living in Hawkins. His victims are, so far, teenagers with vulnerable minds. His choice of victims appears to be random, but it is likely that they are chosen primarily due to one trait shared among them all; they reject and hide from a part of themselves (Chrissy; Bulimia, Fred; Murder, Patrick; Alcoholism, Max; Losing Billy), which is a habit that Henry Creel despised about human beings.

The mistery of Vecna

Vecna is able to see into the minds of people living in Hawkins

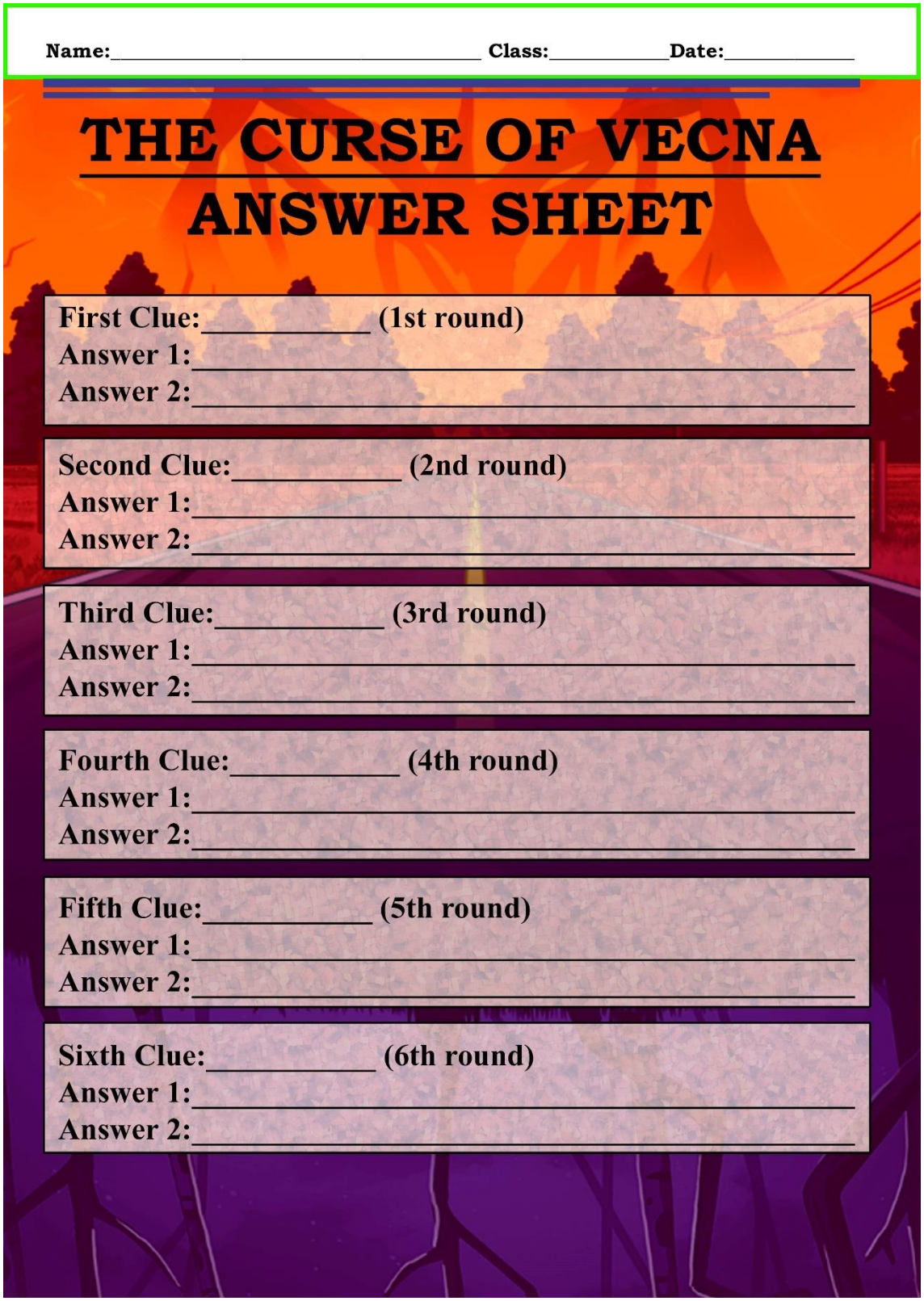
Henry Creel was motivated by a nihilistic, misanthropic and egocentric philosophy; he desired to reshape the world to his own design, considering humanity a species of corrupted and power hungry parasites who have no regard of the world and the other living being. As a consequence, he don't have mercy or empaty for other humans, and find himself gratified by hurting, torturing and tormenting people, massa-

In general, he is sadistic, cruel and viscid with every human that he encounter, at the point that he is ready to do everything possible to eradicate all of humanity and re-create the world. However, his sadistic and predatorial nature go beyond every of his convicions: he torture and torment emotionally unstable teenagers, making them revive their traumas and obscure past, all for his own enjoyment, before slowly cursing them and forcing them to accept his will.

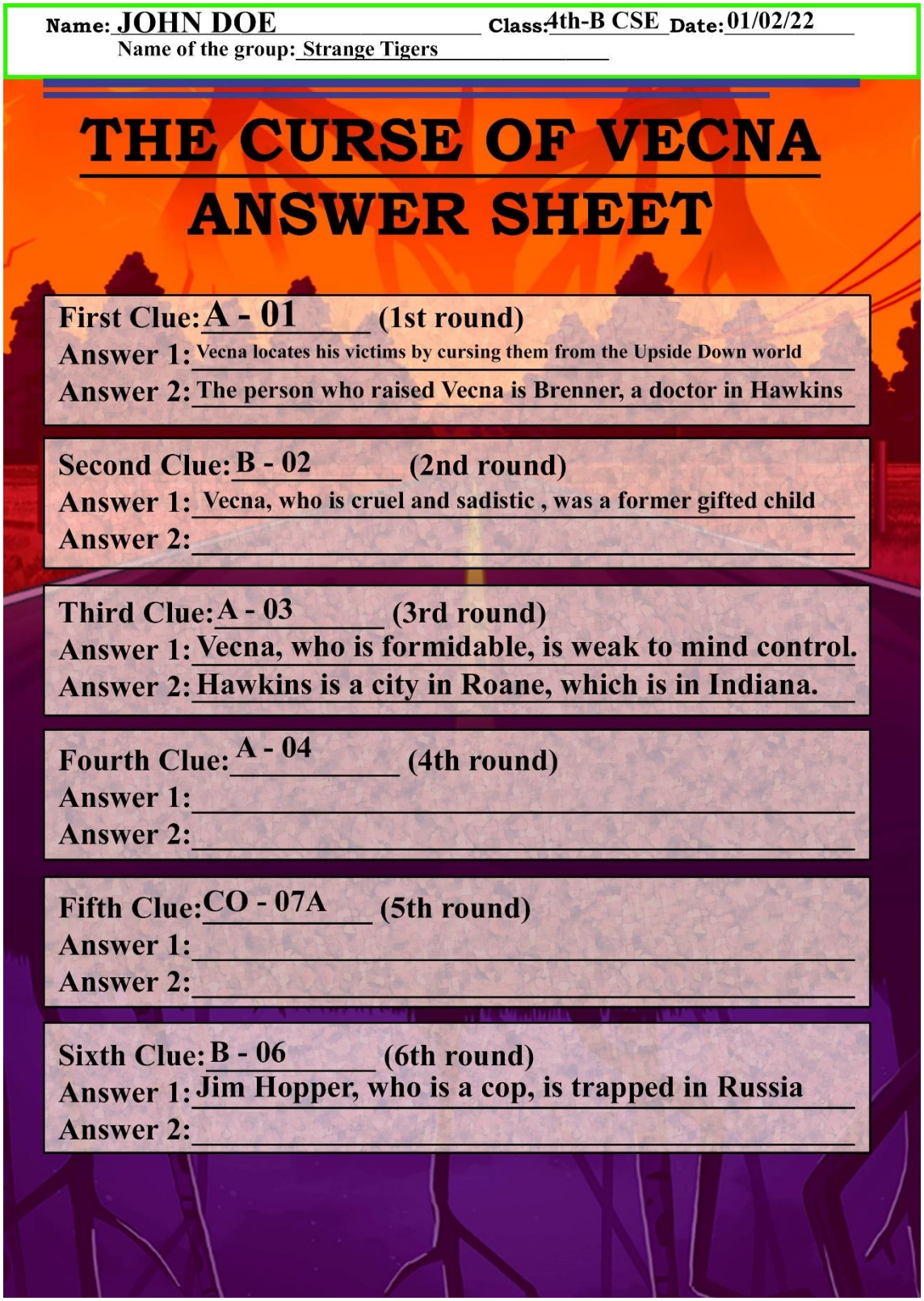
Question 1: How does Vecna locate his victims?

Question 2: What is the name of the person who raised Vecna?

Appendix 7


Name:_____ Class:_____Date:_____
THE CURSE OF VECNA
ANSWER SHEET
First Clue:_____ (1st round)
Answer 1:_____
Answer 2:_____
Second Clue:_____ (2nd round)
Answer 1:_____
Answer 2:_____
Third Clue:_____ (3rd round)
Answer 1:_____
Answer 2:_____
Fourth Clue:_____ (4th round)
Answer 1:_____
Answer 2:_____
Fifth Clue:_____ (5th round)
Answer 1:_____
Answer 2:_____
Sixth Clue:_____ (6th round)
Answer 1:_____
Answer 2:_____

Appendix 8


Name: JOHN DOE Class: 4th-B CSE Date: 01/02/22
Name of the group: Strange Tigers
THE CURSE OF VECNA
ANSWER SHEET
First Clue: A - 01 (1st round)
Answer 1: Vecna locates his victims by cursing them from the Upside Down world
Answer 2: The person who raised Vecna is Brenner, a doctor in Hawkins
Second Clue: B - 02 (2nd round)
Answer 1: Vecna, who is cruel and sadistic , was a former gifted child
Answer 2:
Third Clue: A - 03 (3rd round)
Answer 1: Vecna, who is formidable, is weak to mind control.
Answer 2: Hawkins is a city in Roane, which is in Indiana.
Fourth Clue: A - 04 (4th round)
Answer 1:
Answer 2:
Fifth Clue: CO - 07A (5th round)
Answer 1:
Answer 2:
Sixth Clue: B - 06 (6th round)
Answer 1: Jim Hopper, who is a cop, is trapped in Russia
Answer 2: