

GAMES

+ *in Schools* ▶

Using educational games in the classroom:

guidelines for successful
learning outcomes

A handbook for teachers



EUROPE'S
VIDEO GAMES
INDUSTRY



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1. Introduction

1.1. Purpose of this handbook

This handbook is intended for teachers interested in using video games in their lessons. It provides the necessary information to understand their educational benefits and learn how to use them as educational and motivational resources. After reading the handbook, you should be able to make informed decisions on the choice and use of video games in the classroom and obtain all the benefits digital games can offer. This handbook is a practical guide aimed at providing you with theoretical and practical information. It is not only an introduction to the educational use of video games, but also provides references to useful resources such as articles, websites, and books, where you can find additional information.

1.2. What this handbook offers

This handbook aims to provide practical information for people who are considering using video games as a class resource to teach, motivate and engage pupils. This includes: (1) understanding the benefits of using games for teaching, (2) knowing how games are used inside and outside the classroom to support teaching and learning, and (3) understanding the theoretical basis for integrating games in teaching practices.

1.3. Scope and target of this handbook

This handbook is initially written with teachers in mind; however, it can also be useful to other audiences, who want to understand how games can be used pedagogically.

1.4. Learning objectives

After reading this handbook, you should be able to:

- Understand the benefits and opportunities, but also challenges related to game-based learning.
- Be aware of successful uses of video games as a learning resource and understand how game-based elements can enhance both teaching and learning.
- Know a number of video games (and their expected learning benefits) that you can use as a learning resource in the classroom.
- Understand the differences between digital game genres, their learning purposes and discover ways to implement different games in your own classroom.
- Understand the requirements for successful educational games and learn how to assess whether a digital game is suitable for the classroom.
- Understand digital game ratings and standards.
- Know how to organise the classroom for a play session.
- Understand how to run a debriefing session after playing the game.
- Understand challenges related to online safety and approaches to overcome them, and learn how to promote and apply healthy and safe gaming habits.

- Understand how to maximise the knowledge transfer so that information acquired in the game can be reused at a later stage by pupils.
- Understand how to use video games as a starting point to discuss sensitive issues with students, and how to approach the topic of online safety with parents.
- Understand the educational benefit of game jams and learn how to use them to promote learning.
- Reflect on ways of promoting learning and motivation for pupils of different ages and skill levels through games.





2. Why use educational games?

2.1. Introduction

Video games are increasingly starting to become more and more accepted, beyond their entertaining features. They are now used as an art form and as a medium to teach, to influence, or to inform. Video games have also given rise to e-sports, which have become an increasingly popular and lucrative form of sport and entertainment.

2.2. Change in the perception of video games

Despite their increased recognition as a valid educational tool and resource by teachers, video games have often been associated with many stereotypes and alleged to have negative effects on gamers' physical and mental health. Several studies have shown that digital games played beyond a reasonable length of time, like any other activity, can have negative effects on players - and this was illustrated by the recent World Health Organisation's classification of ***gaming disorder***¹. However, gaming disorder is thought to affect only a small proportion of players.² At the same time, many studies have consistently shown that if good gaming habits are followed (e.g. time, frequency, environment, moderator for online games, etc.), playing games can be considered a safe and fulfilling activity and that gaming can bring many health benefits to players (Granic et al., 2014; Hernández-Jiménez et al., 2019; Pallavicini & Pepe, 2020).

While games are typically associated with entertainment, the improvements in gaming technologies have also been harnessed for educational and training purposes through the creation of applications, often referred to as ***Serious Games***. These have been used to raise awareness about specific topics, or to train staff often working in dangerous or life-threatening situations including the army, hospitals, oil rigs, or fires. They have also been employed in situations, where realistic simulations offer a safer and more-cost-effective way of training staff.

Beyond the technological advancements offered by gaming technologies such as game engines, several companies and educational institutions have tried to gamify some of their content. This aims not only to increase knowledge or skills on the part of the trainees, but also to promote engagement and motivation, as learners' engagement may significantly impact their progress. For example, Moodle, a Learning Management System (LMS) used in education and the industry, includes mini games that can be configured to support learning material and engage learners.

Many educators have understood that video games can play an important part in education or training and have been using immersive environments and gaming technologies in order to reach their students, to harness their creativity, and to encourage them to learn by doing. This shift in teaching practices has been supported by improvements in gaming technologies and the availability of applications that make it easier to introduce, amongst other things, programming concepts to novices.

1 <https://www.who.int/features/qa/gaming-disorder/en/>

2 <https://www.who.int/news-room/q-a-detail/gaming-disorder#:~:text=Gaming%20disorder%20is%20defined%20in,the%20extent%20that%20gaming%20takes>

This shift has also been supported by gaming companies who have started to provide teachers with tools to integrate popular gaming technologies into their classrooms, making it possible for students to either play the game or modify it through programming. This has been the case for games such as **Minecraft**, where players can modify the game content through programming. This effectively empowers the players to become makers and not just consumers of digital technologies.

Several educators have also started to use game development to introduce coding to students with no prior programming background. This has been done using software such as **GameMaker** or **Scratch**, whereby students can discover programming concepts by dragging and dropping code blocks.

It is now easier and less expensive to develop video games, thanks to game engines, games middleware³ (i.e. a software, integrated into a game engine), and **Mods** (i.e. modified versions of existing games), which make it possible for users with little or no programming experience to develop games. As a result, instructors wishing to create (or to help their students to create) an educational video game can focus on its educational features rather than the underlying technology. For example, **Scratch**, a free and user-friendly software, is now used by many teachers to create digital games, which suit their class plan, or to improve pupils' programming skills. Game technology is also widely used to provide training in a motivating, yet realistic environment for a wide range of trainees including surgeons, soldiers, and fire fighters. For example, virtual environments such as **Second Life**⁴ have been used to teach biology to students or to train firefighters. The immersive features of **Second Life** have been linked

to **Moodle**, a Learning Management System (LMS), to produce **Sloodle**: a virtual environment where participants can navigate, explore and attend virtual classrooms. It facilitates communication and collaboration regardless of the geographical constraints between learners and teachers.

2.3. The benefits of video games

Video games entail several implicit educational benefits. They can develop cognitive, spatial, and motor skills and can help improve Information and Communications Technology (ICT) skills. They can be used to teach facts (e.g., knowledge, recall, rote learning, or memorisation), principles (e.g. cause and effect relationships), and complex problem solving to increase creativity or to provide practical examples of concepts and rules that would be difficult to illustrate in the real world otherwise. They can also be particularly useful to perform experiments that could be dangerous in real life such as the use of hazardous chemicals.

In addition, such games also have the advantage of personalising their content to the player, to make the experience more relevant to the skills and needs of the player. This is an important feature that can be found in different aspects of video games, such as the difficulty levels (e.g., static or dynamic), the user interface, the type of feedback (e.g., text, audio, etc.), or the appearance of the avatar used in the game. This makes it possible for the players to personalise their experience, be challenged at the right level of difficulty, and receive relevant feedback

3 https://en.wikipedia.org/wiki/List_of_game_middleware

4 Second Life is available at: <http://www.secondlife.com>

on their progress. Such levels of personalisation can contribute to sustained engagement, a sense of progress, and overall, improvements in terms of learning outcome and behaviour towards the topic.

Despite their instructive features, not all video games are built with learning objectives in mind; however, they usually possess intrinsic learning qualities that can challenge learners' cognitive abilities. These games are based on the premise that players need to learn, to memorise, to collaborate, to problem-solve, to explore or to obtain additional information if they want to progress further in the game. Playing means learning, and one of the main advantages of digital games is their ability to let players learn in a challenging environment, where they can make mistakes without real consequences or shame, and be motivated to *learn by doing*. These types of environments may be particularly suited to more pragmatic pupils, who might prefer to go through the process of experimenting, rather than regurgitating information. Such an experience could help them understand better some concepts they might otherwise perceive as complicated or boring.

Video games promote genuine collaboration between users, and are, to some extent, similar to collaborative learning environments or collaborative working environments (e.g. Computer Supported Collaborative Working environments), where participants share information and learn from each other. Multiplayer video games develop both competition and collaboration by motivating players to join teams (or guilds) and to compete against other teams. For example, in MMORPGs (Massive Multiplayer Online Role-Playing Games), players can create teams, share information through text and voice, learn by observing (and communicating with) other players, and improve their skills and knowledge.

Video games can also have an emotional impact on players (Kovess-Masfety et al., 2016; Pallavicini, F., & Pepe, 2020; Pallavicini et al., 2018). They can increase players' self-esteem, provided that proper monitoring is applied, and enable them to engage in social activities. Playing can have a calming effect on participants in the same way as in other entertaining activities (e.g. watching films) – inducing a wide range of emotions, but in a safe and controlled environment. Emotions experienced during play can vary between joy, empathy, anger, frustration, or triumph. This succession of emotions keeps the players immersed. Furthermore, studies have shown that emotions can help the memorisation process (Tyng et al., 2017), especially if the emotional content or the tone of the material to be learned matches the emotions of the learner. Because they induce different emotions in players, digital games might help them to remember facts more vividly thereby supporting the cognitive process. These types of games can also increase players' self-confidence. This is achieved by keeping success within their reach (e.g. *winnability*), by making sure that the learning curve is suitable to their skills, and by providing timely feedback on their progress.

In addition to video games, gamification can also be used in the classroom whereby game elements, such as badges, leader boards, or points, are used in a non-game context.

2.4. From CBT (Computer-Based Training) to educational games

Since the emergence of the first CBT system, computer technologies have evolved significantly, and so have learning theories. This has impacted on teaching practices as many computer games, and more specifically

educational games, include subtle mechanisms that make it possible to support learning, in an environment that is both motivating and engaging. Many popular games now promote constructivist approaches and they support learners' creativity and needs to explore and to make sense of their learning experience. For example, MMORPGs intrinsically manage to support collaborative learning activities in an environment that is both visually appealing and engaging. They create virtual communities with participants who communicate and collaborate. Several MMORPGs have leveraged these features to help language acquisition or 21st century skills. This is because, in these environments, collaborations and communication are intrinsically needed to succeed and to progress further in the game.

The design of educational systems has been greatly influenced by trends in educational psychology and instructional design. For instance, the first CBT systems were based on a number of questions and predefined answers allowing for little interaction with the user. Subsequent systems have included more flexibility by incorporating tutoring systems that added the ability to monitor learners' progress and to adapt pedagogical strategies dynamically. Although these systems were effective, their development costs were sometimes perceived as prohibitive, partly because they were based on advanced Artificial Intelligence (AI). Later on, the use of simulations matched the need for learners to experiment with their mistakes through a constructivist approach to learning, an approach that prioritizes *learning by doing*. Many learning environments are based on virtual reality and built with collaboration in mind. They allow participants

to learn from their experience but also to learn from their peers. MMORPGs or virtual communities such as *There*,⁵ *Second Life*⁶, or *Fortnite*⁷, inherently include these aspects. Because collaborative learning occurs naturally in these environments, they have been considered to support innovative teaching methodologies.

2.5. Video games and the cognitive process

Educational theories and Instructional Design can help create learning resources and ensure that learners achieve the learning objectives. Such theories have been used to design school curricula and training programmes. Amongst existing learning theories, different approaches can be applied to ensure successful learning outcomes. Most educational theories fall into one of the following categories: *cognitivist*, *behaviourist*, and *constructivist*. In *behaviourist* approaches, subjects are not directly responsible for their learning activities; instead, they are conditioned to react to a stimulus. In *cognitivist* theories, subjects possess an *internal map* (e.g. knowledge), which external events will require them to update. In these approaches, the emphasis is on the underlying cognitive process. Several well-known theories have been established under the *cognitivist* movement, such as transfer effect, whereby learning can be affected by previous knowledge. Finally, in *constructivist* theories, subjects learn by interacting with their environment and peers. This involves a process of trial and error and requires

5 *There* is an online virtual environment where the user can take part in social activities. It is available at: <http://www.there.com>

6 <https://secondlife.com/>

7 <https://www.epicgames.com/fortnite/>

learners to interpret their past and present experiences to update their knowledge.

Because they were initially designed for entertainment, video games are not all based on Instructional Design theories. However, some of them intrinsically implement well-known pedagogical concepts. For example, well-designed games usually include a high intensity of interaction, specific goals, a continuous feeling of being challenged, and a sense of engagement. All these concepts have been associated with successful learning environments. To some extent, all digital games feature **behaviourist**, **cognitivist**, and **constructivist** approaches. However, whereas early educational software placed an emphasis on the first two theories, more recent digital games, due to their more complex, open-ended and collaborative nature, have encouraged a **constructivist** approach to learning. In digital games, players can elaborate on new theories and hypotheses, test them, and update their knowledge and skills accordingly. Video games, which include a 3D environment, advanced AI and realistic physics engines, offer a simulation-like environment that reacts to players' actions in a highly realistic manner.

In terms of cognition and learning process, digital games can be analysed through well-known models such as Carroll's minimalist theory, Vygotsky's Zone of Proximal Development (ZPD), or Kolb's basic learning model. For example, Kolb's basic learning model illustrates the process of **accretion** whereby students modify their internal map (or knowledge) based on the information and feedback obtained from their previous actions. They successively go through active experiments, concrete experiences, reflective observations, abstract conceptualisations and back to active experiments. To some extent, the succession of learning events experienced in video games can be compared to Kolb's learning cycle: the players experience something discordant or a failure (i.e. failure

to win); they subsequently need to reflect and identify the cause of the failure. Following this analysis, they formulate hypotheses on the cause(s) of the failure, plan actions that might help them to overcome the problem and then test and assess their hypotheses. Likewise, according to Vygotsky's Zone of Proximal Development (ZPD), learners should be assisted with scaffoldings and progressively be made more and more independent. As they improve their skills and confidence, less and less help is needed or provided. Learners' independence and meta-cognitive skills are improved gradually. This concept can also be found in games that offer an easy learning curve and that are usually forgiving in the first levels, so that players can progressively familiarise themselves with the game's mechanics and become proficient. However, players need to learn new skills to succeed, and to some extent, take responsibility for learning. This ability of video games to engage players and motivate them to learn and collaborate in order to succeed, is by far the most interesting feature that could help instructors to make learning a more engaging and motivating activity.

2.6. Video games and motivation

One of the foremost qualities of video games is their capacity to motivate, engage, and immerse players. They include a rich variety of auditory, tactile, visual, and intellectual stimuli that make them both enjoyable and, to some extent addictive. While engagement can often be behavioural, emotional, and cognitive, it is usually the result of motivation. In other words, while pupils may be motivated to use games as a resource, the process of learning through games is a process that will typically require them to be engaged both cognitively, emotionally, and for them to take responsibility for their learning and

choices (Pesare et al, 2016). In this context, both motivation and engagement need to be sustained. It is believed that games can achieve this, as they can motivate learners and engage them, hence helping them to increase their interest in learning, change their behaviours, and ultimately influence the learning outcomes. During play, users are immersed in a state of flow - a state in which they can forget about their surroundings and become totally engaged and focused on the task in hand. In this state, provided that they possess sufficient skills, players will strive to achieve their goal, regardless of the challenges encountered. Players' motivation can be triggered or hindered by many different factors such as the game play, the graphics, the interface, or the game genre. Players' behaviour in video games often depends on their personality and aspirations. Therefore, the relevance of the reward offered in the game might differ across players. Whereas some players value exploration, others might prefer highly complex scenarios, which require more strategic skills. Some of them will enjoy very simple games with a linear scenario, which necessitates little time to play and succeed. Cultural backgrounds and gender might also influence the motivation to play games. The concept of personalising a game is important so that the player's experience is customised to their need and background, and so that it adapts accordingly to address areas that may need more work. Most importantly, however, it keeps the player challenged and motivated.

2.7. Successful applications of video games

Video games have already been used for training, educational or therapeutic purposes. Some of the most common uses of *serious games* are listed in the next sections.

2.7.1. Serious games

Serious games can be used to train fire-fighters (e.g. *XVR simulation*⁸), healthcare staff (e.g. *Geratrix*⁹), or to recruit and train soldiers. For example, *America's Army*¹⁰ has been used both to recruit soldiers and as a training resource by the US government. It is now available as a commercial digital game, which has become quite successful.

2.7.2. Fitness, mental and physical health

The technology available for 3D-based video games has made it possible to create highly realistic environments and simulations. This remarkable level of detail has been used to cure post-traumatic stress or phobias (Rizzo and Shilling, 2017). When they are immersed in a safe but realistic environment, patients can learn to cope with their fears while feeling in control. Video games have also been used to help patients before surgery and reduce their apprehension. *Motion-based devices* have been employed and assessed for their potential to improve health and fitness and there is evidence that fitness video games can motivate players to follow an active lifestyle (Zurita-Ortega et al., 2018). In addition, video games can be (and have been) used to support mental health. For example, commercial games have been employed to prevent and treat depression through exergames with the Wii Fit console, or by using

8 <https://www.xvrsim.com/en/>

9 <https://seriousgaming.nl/portfolio/game-projects/clinical-reasoning/>

10 <http://www.americasarmy.com>

mini games and puzzles with narratives. Some of these games are based on Cognitive Behavioural Therapy (CBT) approaches (Fleming et al, 2017).

2.7.3. Learning by creating video games

Video games can also be used to empower learners by requiring them to create their own digital games using a programming language or a game engine (e.g., *Scratch*, *Unity*, *Godot* or *Game Maker Studio*). By designing and creating their own game, students become designers and 'makers'; they create the game that they would like to play and, in the process, acquire valuable skills (e.g., communication, planning, programming or media production) and good knowledge of the theme of the game (e.g., pollution, recycling, biology, physics, etc.). This approach can be especially relevant for teachers who would like to co-design learning and engage their pupils in developing games collaboratively.

2.7.4. Mobile development and augmented reality

Using augmented reality, it is possible to obtain relevant information on one's surroundings through a digital device (e.g. a mobile device or a helmet). Due to their popularity, handheld devices have been used for games that support healthcare education (Zhu et al., 2014), including therapeutic education for children with diabetes (Calle-Bustos, et al., 2017), and for location-based learning activities. Several of these games either help users to understand a specific

condition or to improve their well-being. For example, the game *MyoBeatz*¹¹ was released in 2018 as a rhythm mobile game for neuromuscular prosthesis training to help amputated patients to progressively improve control over their future arm prostheses. *Alpha Beta Cancer*¹² includes several mini games that together help demystify the topic of cancer to young patients.

2.7.5. Raising awareness

Games can help to add an emotional dimension to learning, to raise awareness on (and to help discuss) taboo or challenging topics such as pollution, environmental threats, sexual health, or bullying. For example, in the digital game *Global Conflicts: Latin America*¹³, the player impersonates a journalist who conducts an investigation to uncover the causes and consequences of industrial pollution in South America. Likewise, in the digital game *Darfur is Dying*¹⁴, players impersonate refugees in Darfur camps. Through their journey, players get to develop an understanding of genocides.

2.7.6. Internet safety

Several games have been created to promote internet safety, to help children understand the potential risks using the Internet entails, and to teach them simple, yet effective steps to ensure that they are safe online. For example, *Interland*¹⁵, a game developed by Google, teaches players about the importance of being careful about the information they share online. *Safe Online Surfing*¹⁶, a game

11 <http://www.gamesforchange.org/game/myobeatz/>

12 <https://www.mukutu.com.br/>

13 <https://www.seriousgames.net/portfolios/global-conflicts-game/>

14 <http://www.gamesforchange.org/game/darfur-is-dying/>

15 https://beinternetawesome.withgoogle.com/en_us/interland/

16 <https://sos.fbi.gov/en/>

developed by the US FBI, also uses an online game format to help children understand a variety of issues surrounding internet safety. Similarly, *The Case of the Cyber Criminal*¹⁷ is a game in the form of an interactive multiple choice quiz, where players answer questions related to internet safety, with each correct answer bringing them one step closer to the goal of preventing a spy commit cybercrime.

2.7.7. Curricular topics

Some video games have been used to support the teaching of curricular topics such as languages, mathematics, geography, history, or science. These include games with intrinsic learning content but designed for entertainment, or games that were designed with learning in mind initially. The following sections describe some of the games designed to support the teaching of these topics.

2.7.8. Language learning

Several games have been developed and used to promote language skills, including listening, reading, speaking and writing, for both first and second language acquisition. Research has shown that commercial games

such as *World of Warcraft*, used over relatively long periods of time, may have a positive impact on second language development, especially when gaming is done outside of school or paired with focus sessions (Reinders, 2017). Online and multiplayer games, when used for language acquisition, offer many opportunities to interact, communicate, and collaborate using players' second language. This contrasts with several games designed with learning in mind, which may only focus on the language to learn, rather than on a social context where learning occurs more spontaneously. Some of the commercial games used for language learning that have been scientifically proven to provide positive outcomes include: *Tibia*, *Ragnarok*, *The Sims* or *Club Penguin*. Findings from assessment on the potential of these games for language learning and their educational value (e.g. Savonitti and Mattar, 2018), show that many of them support engagement and provide a safe environment to experiment and learn. Moreover, they not only motivate learners to research a topic further, but also create communities where players are motivated to belong to groups and hence improve their language skills through communication.

Table 1: Commercial games used for language learning

NAME	GENRE	URL
Tibia	RPG	https://www.mobygames.com/game/windows/tibia
Ragnarok online	MMORPG	https://www.mobygames.com/game/ragnark-online
The Sims	Life simulation	https://www.ea.com/games/the-sims

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https://www.consumer.ftc.gov/sites/default/files/games/off-site/ogol/_cyber-criminal.html

2.7.9. Mathematics

Many video games have been released to teach mathematics, some as standalone applications and others as part of a class set-up, whereby teachers can monitor the progress of their students and motivate them to compete against each other. For example, with *MangaHigh*, an online platform that features games to learn mathematics, teachers can follow the progress of their students, avail of analytics, identify areas where students need more support, or promote competition amongst students through leaderboards. Studies have shown that using video games can be effective in teaching mathematics (Tokac et al, 2019), although it is agreed that many studies on the impact of games on mathematic skills usually need

to include more information on several factors, including: teacher training, alignment with the curriculum, frequency of use, and the type of skills promoted in the game. Games such as *Dimension M* (Bai et al, 2012), *Brain Age 2* (Gelman, 2010), *MySims* (Hawkins, 2008), *Vmath Live* (King, 2011), *Sims 2 - Open For Business* (Panoutsopoulos and Sampson, 2012), or the *Lure of the Labyrinth* (Starkey, 2013), have been used and assessed for their educational benefits. Several of these games were proven to increase mathematical knowledge acquisition and keep students motivated to learn, in addition to developing a more positive attitude towards their teachers. This is also true for bespoke games created to support the teaching of mathematics (Masek et al, 2017).

Table 2: Commercial games used for mathematics

NAME	GENRE	URL
Dimension M	FPS	https://www.dimensionu.com/dimu/home/home.aspx
Brain Age 2	Puzzle	https://www.amazon.co.uk/Brain-Age-Training-Minutes-Nintendo/dp/B000T6Z73U
MySim	Simulation	https://www.mobygames.com/game/mysims
VMathLive		https://www.vmathlive.com/login
The Sims 2 Open for Business	Simulation	https://www.mobygames.com/game/sims-2
Lure of the Labyrinth	RPG	https://labyrinth.thinkport.org/www/

2.7.10. Learning about geography, history and science

Video games have been used in primary and secondary schools to support the teaching of (and interest in) science, history, or geography. For example, the game *Civilization* has been used to teach history and makes it possible for

the players to learn about strategic planning, agriculture or engineering, and the relationship between these areas.

2.8. Learning coding through the creation or modding of games

2.8.1. Benefits of learning through the creation of games

In recent years, an increasing number of schools have started to use game development to introduce programming to their students and promote 21st century skills such as learning and innovation, digital literacy, and career and life skills. The goal is often to use programming as a means to build an artefact or a game that consists of a combination of multimedia assets (e.g., audio, video, or images) and a logic that controls how the user interacts with these assets. Games are usually a great resource to reach these goals because they can motivate students to learn new skills (e.g. programming), while using their creativity to build an artefact. In this approach, learning occurs individually or through peer-learning.

The creation of games can help students develop a wide range of skills, as each necessary step in this process involves specific types and levels of understanding.

In the early stages, students may need to collaborate to investigate the topic, collate information, make sense of it, and organise it in a way that can be used for the creation of the game.

When this information has been collected and when the students start to develop a deep understanding of the topic, they will begin to design their game, to build the narratives, and use their creativity to define how the game mechanics can help the players learn, while being entertained.

Finally, the students will start to code their game and leverage their collaborative and problem-solving skills to implement, code, debug, test, and publish their game. Different skills can be required at every stage of the game creation process. This is a dynamic process whereby students may need to leverage different skills, depending on the task at hand.

There are many tools available to facilitate the learning of programming through game creation and most of them are free. The next sections include a non-exhaustive list of some of the tools that can be used to teach coding through the creation of games.

2.8.2. Using Scratch

Scratch¹⁸ is a free software used across school levels to create interactive stories, animations, and games and is often used to introduce programming. Users can combine programming blocks which once put together, create instructions that mirror code (e.g. loops or conditional statements). **Scratch** requires minimal installation or computer resources and can run via a web browser. It is available as an app and includes a significant community of users. In addition, **Scratch junior** is an app based on **Scratch** that makes it possible for young children (between the ages 5-7) to learn how to code. **Scratch** is designed for children aged from 8 to 16; however, people of all ages should be able to use it too. For more information on **Scratch**, you can visit <http://www.scratch.mit.edu>. To see examples of how **Scratch** is used in education, please visit: <https://sip.scratch.mit.edu/>.

2.8.3. Using Game Maker Studio

Game Maker Studio¹⁹ is a premium game engine that makes it possible to create video games using drag and

18 <https://scratch.mit.edu/>

19 <https://www.yoyogames.com/gamemaker>

drop features or code with the *Game Maker Language* (i.e. GML). This software is only free for a limited time, but it does offer interesting features to create 2D games. For more information on *Game Maker Studio*, you can visit <http://www.yoyogames.com>. To see examples of how *Game Maker Studio* is used in education, please visit: <https://www.yoyogames.com/blog/219/gamemaker-in-education>.

2.8.4. Using Minecraft

*Minecraft*²⁰ is a popular 3D game, in which players are provided with tools to modify the game through code (e.g. using JavaScript or blocks of code). Through programming, players can create and share their own artefacts with their friends. *Minecraft* has been recognised as a significant tool to support a wide range of skills such as coding, problem-solving, communication, or critical thinking. *Minecraft Classic*²¹ (the 2009 version of *Minecraft*) is freely available. An education version of Minecraft, specifically designed for classroom use, called *Minecraft Edu* is also available. It includes added features such as collaboration between students, non-player characters for instructors to guide students through the game, or a classroom mode. *Minecraft* is rated suitable for children aged 7+ or 12+, depending on the version used. For more information on *Minecraft Edu*, you can visit <http://www.education.minecraft.net>. To see examples of how Minecraft is used in education, please visit: <https://education.minecraft.net/how-it-works/in-the-classroom/>.

2.8.5. Using Unity

*Unity*²² is a free game engine that makes it possible to create 2D and 3D games using C#. It is being used mostly in third-level education because it does not require users to code, unless a plug-in is purchased to allow drag-and-drop features. Despite this, *Unity* can be a great introduction to 3D environment creation (e.g. indoors and outdoors) with no coding involved. This software can be computer-intensive and may require computers with relatively high specifications. For more information on *Unity*, you can visit <http://www.unity3d.com>. To see examples of how *Unity* is used in education, please visit: <https://learn.unity.com/educators>.

2.8.6. Using Godot

*Godot*²³ is a lightweight open source game engine that enables players to create both 2D and 3D games using C++, C# and GDScript (a language similar to Python). Because this game engine uses a language similar to Python, it can be a great choice for beginners. *Godot* is a good alternative to *Unity* when using computers with limited processing capacity. For more information on *Godot*, you can visit <http://www.godotengine.org>. To see the resources available for *Godot*, please visit: https://docs.godotengine.org/en/3.0/getting_started/step_by_step/resources.html

2.8.7. List of game engines and mods

The following table lists some of the game engines that can be used to support the teaching of programming through game creation.

20 <https://education.minecraft.net/>

21 <https://education.minecraft.net/>

22 <http://www.unity3d.com>

23 <https://godotengine.org/>

Table 3: Game engines to support programming skills

NAME	DRAG AND DROP FEATURE	PROGRAMMING LANGUAGE
Game Maker	No	C#
Godot	No	C++, C#, GodotScript (i.e., Python)
Minecraft	Yes	JavaScript
Unity	No	C#
Scratch	Yes	n/a

2.9. Organizing Game Jams and their benefits.

2.9.1. What is a game jam?

A game jam is a contest, where different teams or individuals compete to create the best game based on a given topic or theme. This competition usually takes place over one or several days, typically between 27 and 72 hours. The participants can either be located in the same building, or remotely (e.g. for a global game jam).

Game jams have become very popular amongst educators, students, and aspiring indie game developers because of their ability to bring together groups of game enthusiasts from different backgrounds. They effectively consist of multi-disciplinary teams with coders, graphic designers, or 3D modelers, whose members share the common purpose of creating an interactive and entertaining game.

2.9.2. How are game jams used to promote knowledge and collaboration?

Several studies published on game jams point to their potential, in many cases, to create a strong sense of camaraderie amongst participants, promote technical skills, support participants' confidence, (Miller et al., 2019; Fowler et al., 2013) and help them assess their skills.

2.9.3. Taking part in a game jam

If you are interested in game jams to motivate your students and promote coding through game creation, then you can either organise your own game jam, or encourage your students to take part in one. In this case, you may attend the **Global Game Jam**²⁴, a worldwide game jam for participants of all skills and levels. Other game jams are also available throughout the year and are listed on the site **IndiegameJams**²⁵.

24 <https://globalgamejam.org/>

25 <http://www.indiegamejams.com/>



2.9.4. *Organizing a game jam*

Organising your own game jam is a great way to engage your students and others at your school in the topic of game design. You can find more guidance, resources, and ideas for hosting a game jam on the website of the Global Game Jam: <https://ggjnext.org/the-jam/>.

Further resources on organising game jams can also be found in Table 10 of Section 6.5.



3. Choosing the appropriate game

Digital games can be delivered through various formats and different platforms. The following sections will help you, as a teacher, to understand the different game genres, their key features, and their associated educational benefits.

3.1. Taxonomy of Video Games and Associated Benefits

Before choosing a game, it is important to understand the different game genres available and be able to identify them. There are many taxonomies and classifications available to categorise video games, all from different angles and perspectives; three worthy classifications include Poole (2000), Herz (1997) and Crawford (1984). These include the following categories: action (shoot'em ups and racing), fighting (beat'em ups), sports, puzzles, adventure or platform (or role-playing) games, simulation (or god games), and strategy. This being said, new and or hybrid genres are released every year, thus stretching (or blurring) the boundary between these categories.

The following list, based on the two first classifications, Poole (2000) and Herz (1997), categorises and describes different game genres in alphabetical order.

- **Adventure games:** In these video games, the gameplay is based on story telling. Players navigate through a complex world, collect objects and overcome challenges until they reach the final goal. This game genre, initially based on text, has

evolved to include 2D (e.g. *King's Quest*) and 3D graphics (e.g. *EverQuest*²⁶).

- **Fighting games (or beat'em ups):** In these games, the player impersonates a character that needs to fight and defeat opponents in order to succeed.
- **Mazes:** In these games, players have to navigate through a maze and are chased by enemies they need to avoid. These games usually offer a view from above and require strategy, forward planning skills, and reflexes. *Pacman* is one of the most successful maze games. An educational version of Pacman called *PacWriter*²⁷ has been created to improve typing skills.
- **Platformers:** In these games, players move through an environment where they need to progress to platforms (hence the name). *Mario* was one of the most popular platformer games of its generation. *Platformers* are usually based on hand-eye coordination, and educational versions of these games have been developed to teach geography (e.g. *Mario is Missing*²⁸), reading (e.g. *Mario's Early Years: Fun with Letters*) or typing skills (e.g. *Mario Teaches Typing*).
- **Puzzles:** In these games, players need to solve a puzzle to progress. The gameplay usually occurs within a static screen. *Tetris* is one of the most popular puzzle games of all times. Puzzle games are essentially based on strategy. Some educational versions of puzzle games have been

26 <https://www.everquest.com/home>

27 <http://www.caiman.us/scripts/fw/f2998.html>

28 https://www.retrogames.cz/play_597-SNES.php?language=EN

developed to teach mathematics (e.g. *PrimeTime Adventure*²⁹ or *Rocky's Boots*³⁰). Educational versions of existing board games or TV game shows have also been released and they include the possibility to edit the questions.

- **Racing Games:** In these games, players take part in a race: driving a car, a motorbike, a spaceship, etc.
- **RPG (Role Playing Games):** In these games, players impersonate a fictional character. This character has several features that can evolve through play, such as health, or strength. *The Witcher* or *Skyrim* are popular RPG examples. **MMORPG (Massive Multiple Online Role-Playing Games)** are a variation of RPGs, in which a large number of players interact in an online virtual world. These video games are a valuable basis for collaborative and exploratory activities.
- **Shooters (or shoot 'em-ups):** In these games, players need to solve a conflict by shooting their opponents. These games can be based on either 2D or 3D technologies. 2D shooters can be static or scrolling. In static 2D shooters, the battlefield is restricted to the size of the screen; whereas in scrolling 2D shooters, only part of the battlefield is displayed, and the screen scrolls horizontally or vertically. **Shooter** games usually place an emphasis on reflexes and coordination, rather than strategy. 3D versions of shooters can include First-

Person Shooters (FPS). In these games, players see the world through the eyes of the character they are impersonating (i.e. a first-person view) and need to eliminate enemies to progress further. These games can be played individually or collectively. They generally include violent content. However, if the game is played within a team, these games can promote collaboration. Mods of these games have been created for educational purposes. For example, *DimensionU*³¹ is an FPS developed to help and encourage the learning of mathematics. Video games based on this genre, such as *Re-Mission*³², have been used to introduce information related to cancer treatment.

- **Simulation Games:** in these games, real world settings and activities are simulated. Some popular games in this genre include *Flight Simulator* or *Roller Coaster Tycoon*.
- **Sport Games:** These games simulate popular sports such as soccer, golf, or basketball. They are available in 2D or 3D and require coordination and strategy, especially if the player has to manage a team. **Bat and ball games** can also belong to this category - in such games, players use a bat to hit a ball. One of the first digital games based on this principle was *Pong*³³. Since then, many variations have flourished including *Breakout*, a game in which players need to hit a ball that travels across the screen and hits and destroys bricks.

29 <http://prime-time-math-adventure.taylor-clark-software.qarchive.org/>

30 <http://www.warrenrobinett.com/rockysboots/>

31 <http://www.dimensionu.com/>

32 <http://www.re-mission.net/>

33 <http://www.pong-story.com/atpong2.htm>

Some educational games have been based on this genre, including *10 Finger BreakOut*³⁴, a game that teaches typing skills.

- **Strategy Games:** These games are essentially based on strategy. The players control both the economic and military aspects of an army or population and they need to make fast, strategic decisions. In a study by Jenkins and Squire (2003), it was shown how *Civilization III*, a popular strategy game, could be used in schools to help pupils understand geography and history.

Many games can be used in the classroom, some of them are built for the sole purpose of learning, while others are built for entertainment but include structures that can support a wide range of skills and knowledge. In addition, as many teachers use educational websites and Learning Management Systems, many of these have started to include games or gamified activities.

3.1.1. Educational websites

Several educational websites use games as part of the learning experience. The following list collates some of the most popular learning sites:

- **Moodle:** Moodle is currently the most popular Learning Management System (LMS) in schools, enabling teachers to install game activities plugins to their modules to create educational games based on snakes and ladders, quizzes, the hangman game, or crosswords. For more information about Moodle, please visit this page: https://moodle.org/plugins/mod_game.

- **The Khan Academy:** The Khan Academy is one of the most popular free online resource dedicated to and used by K-12 students. It includes mini games to learn about maths, science, engineering, arts and humanities crosswords. For more information about the Khan Academy, please visit this page: <https://khanacademy.org/>
- **MangaHigh:** MangaHigh is a game-based learning site with mini-games to learn about maths, with the ability to monitor students' progress. In the UK, all games in MangaHigh are tied to the UK National Curriculum. It is one of the only game-based learning sites that is free for students, that offers monitoring for parents and teachers, and that is tied to the curriculum. For more information about the MangaHigh, please visit this page: <http://www.mangahigh.com/>

3.1.2. Free Video Games that can be used in the classroom

As a teacher, it might be very challenging to find a game that can be used to support learning activities; as a result, this section lists games that can be used in the classroom, along with their potential benefits, and genre (based on the previous taxonomy).

All the games listed in this section are available for free and can be played either in a browser or with mobile digital devices such as phones or tablets.

- The games included in this list were shortlisted from a recent publication from Schrier (2019), one of the rare publications, which assesses and lists a wide range of video games that can be used for

the classroom; for the purpose of this guide, the games were shortlisted based on the following: The games are free to access.

- The games are accessible online (i.e. web-based), on mobile devices or on desktops.
- As much as possible, the games have been assessed scientifically to determine their impact on learning, motivation and/or emotions.

- The games are suitable at primary and secondary levels.

Please note that this list is not exhaustive, as many other games are published on a daily basis. Where possible, a reference to academic publications, evaluating the impact of this game, has also been provided. The full reference is available at the end of this publication.

Table 4: Free Games with educational benefits

NAME	BENEFITS/TOPIC
Alien Rescue	Problem solving and scientific inquiry
Antura & the Letters	Language learning
Ayiti: The Cost of Life	Geography and economics
BREAKAWAY	Social studies
The Evolution of Trust	Psychology, sociology and history
Food Fight	Biology
Fortnite	Collaboration skills
Game Over Gopher	Mathematics
Honeymoon	Health, psychology
Mission: Admission	Preparation for college and university
Monster Mash: A Bomb Game	Team building, memory
Night of the Living Debt	Finance and economics
The Oregon Trail	History, language and mathematics
Paint-a-Long	Mathematics

NAME	BENEFITS/TOPIC
Playground Physics	Physics
Quandary	English and geography

3.1.3. Commercial Video Games that can be used in the classroom

This section lists commercial games that can be used in the classroom, along with their potential benefits, and genre (based on the previous taxonomy).

Not all games listed were built with education in mind, but nevertheless they include features that can help develop a wide range of skills and knowledge.

While most of the games are premium, some are available for free.

Similarly to the free video games listed above, the premium games on this list were shortlisted from Schrier's

(2019) recent publication on video games that can be used for the classroom. For the purpose of this guide, premium games were shortlisted based on the following:

- These games were commercial games (built primarily for entertainment).
- As much as possible, the games have been used in experiments to determine their impact on learning, motivation and/or emotions.

Please note that this list is not exhaustive, as many other games are published daily. In addition, please note that before using these games, you should always check their suitability for your students.

Table 5 – Commercial games with educational benefits

NAME	BENEFITS/TOPICS	GENRE	RELATED PUBLICATIONS
1979 Revolution. Black Friday	History, Politics	Adventure	
A Closed World	Inclusion, Sexuality & Gender	Role Playing (RPG)	
A Normal Lost Phone	Inclusion, Sexuality & Gender	Adventure, Puzzle	
Animal Crossing	Geography, Biology, Organisation, Time Management, DT.	Simulation/Education	

NAME	BENEFITS/TOPICS	GENRE	RELATED PUBLICATIONS
Assassin's Creed Discovery Tour Ancient Egypt Ancient Greece	History	Adventure	
Bury Me, My Love	Ethics, Migration & Flight	Adventure, Simulation	
Caesar III	History	Strategy	
Change	Ethics, Inclusion, Sex & Gender	Adventure, Role Playing (RPG), Simulation	
Civilization	History, Geography, Economics and Sociology	Strategy (Turn-based)	Webb (2013)
Cloud Chasers – Journey of Hope	Ethics, Migration & Flight, Politics	Adventure	
Crazy Machines 3	Physics	Puzzle, Simulation Strategy	
Democracy 3	Politics	Strategy	
Der Die Das Rockets	Language (German)	Action	
ECO	Climate & Environment, Politics, Economics	Adventure, Simulation	
Fable III	Ethics, Social studies, English	Role Playing (RPG)	Schrier (2015)
Fake It To Make It	Media Literacy	Simulation	
Fallout Shelter	Economy and Sociology	Simulation/Strategy	
Fate of the World	Climate & Environment	Simulation	
Food Force (United Nations)	Economy, Management	Simulation	
Foldit	Biology	Puzzle	
Fortnite	Collaboration skills	Shoot'em up	
Imagine Earth	Climate & Environment, Politics	Strategy	

NAME	BENEFITS/TOPICS	GENRE	RELATED PUBLICATIONS
Just Dance	Computer Science (Algorithms), PE	Rhythm, Musical	
Keep Cool	Climate & Environment	Strategy	
Kerbal Space Program	Physics	Simulation	
Kingdom Hearts 3	English Language	Role Playing (RPG)	
Ludwig	Ethics, Climate & Environment, Physics	Adventure, Simulation	
Mario Maker	Computer Science, Problem Solving, Spatial Awareness, Math	Platform	
Minecraft	Critical thinking	Simulation/Strategy	
Minetest	Various Subjects	Simulation/Strategy	
Monkey Swag	Math (Geometry)	Adventure, Puzzle	
NBA 2K14	Economics, Management, critical thinking and historical awareness		
Nintendo LABO	DT, Problem Solving, Computer Science (Algorithms), Music	Puzzle, Action, Platform	
No Male Heroes	Inclusion, Gender & Diversity	Role Playing	
Orwell	Ethics, Literature, Politics, Data Security	Adventure, Simulation	
Papers, Please	Ethics, Migration & Flight, Politics	Adventure, Simulation	
Path Out	Migration & Flight	Adventure	
Pokémon Go	Critical thinking, citizenship, Geography	Adventure (exploration)	Gong et al (2017)

NAME	BENEFITS/TOPICS	GENRE	RELATED PUBLICATIONS
Portal	Physics, Geometry, problem- solving, spatial analysis	Shoot'em up (FPS)	
Portal 2	Physics, Geometry, problem- solving, spatial analysis	Shoot'em up (FPS)	
Rabbids Coding	Basics of programming		
Railroad Tycoon II	Collaboration, strategy, Business administration, economy	Simulation/Strategy	
SimCity 4	Urban studies (planning and development)	Simulation/Strategy	Gaber (2007)
Legend of Zelda: Breath of the Wild	Organization, time management	Adventure	de Castell et al (2017)
The Sims 3	Language, communication, Media studies	Simulation	Lacas et al (2017)
The Sims 4	Language, communication, Media studies	Simulation	
The Unstoppables	Inclusion, Gender & Diversity	Adventure	
This War of Mine	Ethics, Migration & Flight, Politics	Simulation	
Through the Darkest of Times	Ethics, History, War & Political Conflict	Adventure, Strategy, Simulation	
Tricky Tower	Physics, Geometry, problem- solving, spatial analysis	Strategy, 4 players	
Valiant Hearts: The Great War	History, War & Politics, Storytelling	Adventure, Puzzle	
World of Warcraft	Accounting	Role Playing (MMORPG)	Buchko (2013)

3.2. Understanding Video Games' Technical Requirements

It was often difficult for teachers to find software that was suited to their students' computer lab or home computers because of the high computer technical specifications required by some games, such as processor speed, graphic card, or screen resolution. These specifications could sometimes prevent the use of such games in schools where computers were not up to date.

However, while computer specifications may vary across schools, there is an increasing number of games that are available on browsers and mobile devices, which, as a result, put less emphasis on the computer specifications. Games available on the Internet based on HTML/CSS, Flash³⁵ or Java³⁶ may impose fewer constraints, other than the installation of plug-ins (which are often installed by default on the computer).

In addition, games that can be played inside a browser usually offer a very intuitive interface and require less processing power, which will probably lead to a more enjoyable experience for the pupils, who can use an application that is responsive and easy-to-use.

Many of these games are generally available in the form of mini games, with challenges that can be solved quickly. They also use relatively simple interaction techniques and are therefore suitable for people with no or little experience of video games.

Before choosing a game for the classroom, you should check the specifications of the available computers and try to answer the following questions:

- Which operating system is required for the game?
- How much RAM (Random Access Memory) is recommended for the game to function properly?
- How much hard drive space is needed to install the game?
- Does the game need to be played over a network or an Internet connection?
- What type of input device is needed to interact with the game (joystick, keyboard or mouse)?
- Are there mechanisms to support internet safety if/when applicable? (for more information on internet safety, please see the appendix on Internet Safety Standards).

Answering all these questions will help you to assess if the digital game you wish to use is suitable for the school's computers. Failing to take these features into consideration at an early stage could result in a frustrating experience for the pupils (e.g. lack of responsiveness or inability to progress in the game). The type of input used in the game should be assessed based on pupils' age and skills. For instance, answering questions by selecting the correct option with the mouse might be more suitable than typing the solution because the latter (typing) may require a higher level of proficiency in spelling. The specifications of pupils' devices outside school (e.g., desktop, laptop, tablet, or mobile phone) should also be considered. Enabling pupils to play the game at home in their spare time will help them become more familiar with the interface and improve their skills. In this case, you will need to make sure that

35 <http://ww.adobe.com/flash/>

36 <http://www.java.sun.com/>

the technology required for the digital game is available on most computers used by pupils at home, and also possibly on mobile devices (e.g., iOS or Android versions).

3.3. Understanding Digital Game Rating and Standards

Beyond practical considerations, you should determine if the content of the digital game is suitable for the pupils

in terms of age and content. This choice can be guided by the existing rating standard. For example, PEGI³⁷ (Pan European Game Information) is the European digital game rating system, supported by most game publishers and developers in Europe. This rating system helps to ensure that the content of a game is suitable for the targeted audience. It includes two types of information: an age label (i.e., 3, 7, 12, 16, 18) and a content descriptor (i.e., violence, bad language, fear, gambling, sex, drugs, in-game purchase and discrimination). It is a voluntary system used in 38 countries, but only enforced in some. The age labels are described in the next table.

Table 6: PEGI age labels



Content suitable for all age groups. The game should not contain any sounds or pictures that are likely to frighten young children. A very mild form of violence (in a comical context or a childlike setting) is acceptable. No bad language should be heard.



Content may include scenes or sounds that may frighten young audiences, and very mild forms of violence (implied, non-detailed, or non-realistic violence), if any.



Content may include slightly more graphic violence towards fantasy characters or non-realistic violence towards human-like characters, sexual innuendo or posturing, and some mild bad language, if any.



Content may include violence that is similar to violence found in real life; more extreme bad language may be featured along with the use of tobacco, alcohol and illegal drugs depictions.



Content with possible gross violence, motiveless killing, or violence towards defenceless characters, glamorisation of the use of illegal drugs and explicit sexual activities may be featured. Gambling as it is carried out in real life in casinos or gambling halls can also be present.

The meaning of the different content descriptors used in the PEGI rating system is explained in the next table.

37 <http://www.pegi.info>

Table 7: PEGI content descriptors



Violence : In games rated PEGI 7 this can only be non-realistic or non-detailed violence. Games rated PEGI 12 can include violence in a fantasy environment or non-realistic violence towards human-like characters, whereas games rated PEGI 16 or 18 have increasingly more realistic-looking violence.



Bad Language: This descriptor can be found on games with a PEGI 12 (mild swearing), PEGI 16 (e.g. sexual expletives or blasphemy) or PEGI 18 rating (e.g. sexual expletives or blasphemy).



Fear: Might contain pictures or sounds frightening for young children at PEGI 7 level or on PEGI 12 games with horrific sounds or horror effects (but without any violent content).



Sex: This descriptor can accompany a PEGI 12 if the game includes sexual posturing or innuendo, a PEGI 16 if there is erotic nudity or sexual intercourse without visible genitals or a PEGI 18 if there is explicit sexual activity in the game. Depictions of nudity in a non-sexual content do not require a specific age rating



Drugs: The game refers to or depicts the use of illegal drugs, alcohol or tobacco. Games with this content descriptor are always PEGI 16 or PEGI 18.



Discrimination: The game contains depictions of ethnic, religious, nationalistic or other stereotypes likely to encourage hatred. This content is always restricted to a PEGI 18 rating (and likely to infringe national criminal laws).



Gambling: The game contains elements that encourage or teach gambling. These simulations of gambling refer to games of chance that are normally carried out in casinos or gambling halls. Games with this sort of content are PEGI 18.



In-game purchases:³⁸ There are in-game purchases within the game (also for physical releases of video games).

More information on PEGI is available on the PEGI's official website³⁹ which makes it possible to find a game according to its publisher, and the year it was released. More details can be found also on the PEGI App⁴⁰, which allows players and parents to quickly access a game's rating (and why it has been rated this way) through their mobile phones.

3.4. What to Look for in a Digital Game: Testing the Game

Once you have found a suitable game to support your lessons, you should play-test the game to check if the content is appropriate for the pupils and suitable for the topic taught. You should also complete training tutorials for this game and read relevant material beforehand.

When assessing a video game, please consider the following:

Technical considerations:

- **User interface:** The interface should be clear, intuitive, and easy to use. Some children might stop enjoying the digital game if they find it is difficult to perform common tasks, such as navigating through the menus or moving the main character.
- **Saving and loading the game:** The game should enable players to save the current level and to resume the game at a later stage. This will be

particularly useful if the computer rooms are only available for short periods of time.

- **Audio:** If the game features audio, and although most devices provide an option to mute audio, a mute button for the background music or for sound effects should be available.
- **Customization:** You should check if it is possible to customise the game (e.g., character, colour, scenario, or level of difficulty). Customisation makes the gaming experience more personal and keeps players challenged (e.g. by level of difficulty).
- **Monitoring:** The ability to monitor students' progress and identify areas that need more work can be very useful to teachers, and this option is provided in several educational games.

Contextual considerations:

- **Age group:** The activities and type of skills required for the game should be suitable for the targeted age group.
- **Cultural considerations:** The game should promote cultural awareness and help develop an understanding of societal stereotypes, rather than perpetuate or reinforce them (e.g. those linked to gender or minorities).
- **Language:** The level of the language used should be adequate for the age group.

39 <http://www.pegi.info/>

40 <https://pegi.info/app>

- **Time:** You need to estimate the time, required to complete challenges, to ensure that pupils will have enough time to finish the game levels and benefit from their educational features. Completion time will vary across games. Whereas mini games are usually designed to be completed relatively quickly, adventure games or RPGs might require several hours or days to be completed. For the latter, it is good practice to plan the playing session over a week or more, so that pupils can learn at their own pace and become familiar with the mechanics of the game. In addition, games can also be used after school as homework.
 - **Accounting for people with disabilities:** You should check if the digital game accommodates people with disabilities (see next chapter for more information on digital games designed for this audience).
 - **Network games & internet safety:** If the game is played over the Internet and involves interaction between participants (e.g. text or chat), great care should be taken to keep children safe. This means preventing bullying and use mechanisms to detect and condemn such behaviours, but also educating children and parents on simple Internet safety measures that will make them safer. It is very important for children to know about Internet safety to be and feel safe while playing video games, and to know that they can report suspicious or unacceptable behaviour if these are encountered.
- Pedagogical considerations:
- **Learning curve:** The game should use an easy learning curve, allowing players to make mistakes at the start.
 - **Educational content:** The game content should illustrate the topics taught. Even if the content is not closely related to the curriculum, it should provide a clear and simplified representation of some of the concepts taught.
 - **Clear objectives: while the objectives in the game need to be clear,** teachers also need to ensure that the objectives of the game are stated clearly, so that children know exactly what they are required to do. Frustrating situations can arise from vague instructions. In this case, children might feel stuck, because they do not know how to progress further in the game. This being said, some intrinsically open-ended games (e.g. Minecraft) may include few or no objectives, because the idea is for the players to create their own objectives, hence encouraging them to harness their creativity and take ownership of their learning. So, if the goal is to encourage players' creativity and meta-cognitive skills, and if the objectives of the game are not set or clear, the teacher may need to ensure that the students know they are expected to create their own objectives and use their creativity accordingly. In all cases, clarifying what the pupils are supposed to do is important.
 - **Clear progression:** Teachers should check if the progression of the player is displayed at all times in the form of a score or a progression bar. This will help children have a positive attitude towards their performance and will show them that their actions do impact their progress. This should motivate players to take responsibility for their learning activities.

- **Feedback:** Feedback provided to players should be gentle. Verbal guidance or hints can help maintain their focus.
- **Opportunities for collaboration and group work:** It is good to use video games that enable players to take part in collaborative activities.
- **Assessment and follow-up:** A software that tracks pupils' progress enables teachers to analyse areas that are misunderstood by the pupils and where more work is required. Not all software includes this feature, but some applications are SCORM-compliant (Sharable Content Object Reference Model) and can be integrated into a Learning Management System (LMS). A Learning Management System will make it possible for teachers to follow the progress of their pupils and to identify areas where more attention and work is required.
- **Opportunities for creativity:** You should check whether the material included in the digital game can encourage pupils' creativity by enabling them to make and share items that they have created.
- **Help:** A Help section should be available and include comprehensive information. If possible, you should print it and have it ready for pupils before they start playing the digital game.

41 <http://www.portinteractivecenter.org/lifeisgame/>

42 <https://cordis.europa.eu/project/rcn/85309/factsheet/en>

43 Audio games are digital games that can be played based only on audio cues

44 <http://www.audiogames.net/>

45 <http://www.audiogames.net/listgames.php>

3.5. Taking Account of Children with Disabilities

Video games have been used to help people with disabilities, including intellectual disabilities (ID), to improve their skills and to provide a medium that caters for different learning styles and needs. While some mainstream games can be used for people with ID, other have been designed specifically to cater for their needs.

3.5.1. Games for people with intellectual disabilities

There are several games available for people with intellectual disabilities, many of which are geared towards, people with ID, Autism Spectrum Disorder (ASD), or Asperger syndrome in order to improve their social and cognitive skills.

For example, *LifeisGame*⁴¹ is a game about emotions, designed to help people with emotional impairment to recognise and respond to emotions conveyed by the face. *Playmancer*⁴² is a therapeutic video game designed to help players control emotions and impulsive behaviours and studies have shown that this game can help users to develop coping mechanisms (Fernandes-Aranda et al., 2012).

3.5.2. Games for Visually Impaired People

Both mainstream video games and audio games⁴³ can accommodate visually impaired players. The website AudioGames.net⁴⁴ provides information on audio and blind-accessible games⁴⁵. Some of the digital educational

games suitable for people with impaired vision include *Terraformers*⁴⁶, or *Azabat Educational Games*⁴⁷. When using mainstream video games, you need to check whether buttons can be read aloud and if other information can be delivered through audio cues. To facilitate reading onscreen information in the digital game, screen readers and screen magnifiers can be used and might be suitable for text-based games. Although several video games have been developed for people with visual impairments, more work is needed in this field, especially for educational games.

3.5.3. Games for People with an Auditory Disability

To make auditory information available to people with an auditory disability, open and *closed captioning* is sometimes available in video games. This enables people to see the meaning of auditory information such as voice or sound effects. Other commercial digital games make extensive use of text for dialogues, feedback or tutorials, and may therefore also be suitable for people with an auditory impairment.

3.5.4. Games for People with a Learning Disability

Although players with a mild disability will be able to play most mainstream video games, some of these games may not be suited to specific disabilities. For example, people with dyscalculia⁴⁸ might find it problematic to play games that involve basic mathematics (e.g. counting). Likewise, people with dyslexia may have difficulties playing digital games where the information is delivered essentially

through text. People with ADD/ADHD⁴⁹ might find it difficult to play games with no immediate feedback or games that require prolonged periods of play. You should therefore test the game and identify issues that might arise depending on pupils' learning disabilities. Some video games have been specifically designed to help particular learning disabilities and might be used in the classroom and studies have shown that that serious games can improve a wide range of skills (e.g., practical, cognitive, or social) for people with intellectual disabilities (Tsikinas and Xinogalos, 2019). Involving people with disabilities on the design of educational games can also significantly increase their engagement in and knowledge of the topic (Bossavit and Parsons, 2018).

3.5.5. Games for People with a Physical Disability

For people with physical disabilities, digital games can be made accessible by choosing a dedicated controller, thanks to mechanisms provided in the game itself, or through the operating system. For example, *slow-motion gameplay* enables players (including those with a physical disability) to go slower through parts of the game, where the action is intense. It is also important for players to be able to customise the controls and use external controllers. *One-switch* video games are suitable for players with severe physical disability because they only require one or two buttons.⁵⁰

46 <http://www.terraformers.nu/>

47 <http://www.azabat.co.uk/games1ed.html>

48 People who have difficulties in handling everyday maths functions

49 Attention Deficit [Hyperactivity] Disorder

50 Several *one-switch* digital games can be found on <http://www.oneswitch.org.uk>



4. Conducting a play session

4.1. Organising a play session

4.1.1. How to Organise the Class and the Classroom?

Once you have tested the game and decided to use it as an educational resource, you will need to identify the scenario that you think would be most beneficial to support your students. Several key points should be considered:

Technical and contextual points:

- If the digital game uses sound and if the activities are not of a collaborative nature, you should ensure that pupils use headphones.
- Depending on the type of game and on the learning objectives, you may need to create groups. This will be very effective in engaging children in discussions or collaborative activities.
- Take breaks: it is good practice to encourage children to take regular five minutes breaks (for example, every 45 minutes).
- Make sure that the light in the room is sufficient and adequate. This can avoid occurrences of epilepsy seizures for pupils with photosensitivity.

Pedagogical points:

Before the lesson:

- Give a list of factual information that pupils need to gather while playing.
- Identify learning objectives.

- Identify what part of the game (or levels) might best support the learning objectives.
- Print the list of objectives and help section (or booklet) of the game to give to the students.

During the lesson:

- Begin by explaining the objectives of the session.
- Demo the game and explain how common tasks are performed (e.g. accessing help, navigating through menus, or moving the character).

4.1.2. Promoting Good, Safe and Healthy Gaming Habits

Like any other form of activity, video games should be used wisely and appropriately. Therefore, parents and pupils should be informed of good gaming habits to ensure that games do not negatively affect children's physical and mental health.

Teachers and parents need to **regulate the amount of time** during which children play. There are many parental control tools available online, which can help parents (and players) regulate the amount of time spent playing the game. For example, ISFE's Responsible Gameplay Hub Page⁵¹ provides tips for parents on how to promote responsible game play at home. Children might also be asked to set the length of the play session themselves. Some may find it hard to stop playing, but this could be due to the fact that they are trying to avoid boredom. It is good practice to encourage children to play different types of game genres to challenge them in different ways. For

51 <https://www.isfe.eu/responsible-gameplay/>

example, children might alternate between action games, strategy games and puzzles.

While exergames and augmented-reality games can promote exercise and encourage children to be outdoors, children should also be encouraged to **exercise regularly (i.e. without screens)**, to decrease screen time, and to spend time away from digital devices. In addition, it is important to communicate with them and take the time to listen to their success in the adventure they have undertaken. By playing alongside their children, parents are also able to better understand video games and are able to make better judgments on their educating effect. They should also be made aware of potential issues and risks such as bullying and Internet safety and be informed who to contact to report these behaviours. Further information on these topics, as well as other recommendations on protecting privacy and online safety can be found in the Responsible Gameplay section.⁵²

Finally, **information should be provided** to your teacher colleagues, parents, and course-board members: on the pedagogical process, the preparation, and the learning objectives of game-based-learning. This information should be given before and while using the game.

4.2. Evaluating and Strengthening Pupils' Knowledge through a Debriefing Session

4.2.1. General Considerations to Conduct a Debriefing Session

Video games can promote many different cognitive skills. However, some of the aptitudes needed to make a connection between the game and the curriculum, such as reflection, observation, prediction, or theory-building, are not always built into the digital game. It is therefore necessary to include a debriefing session through which pupils will have an opportunity to reflect on the content of the game, and to share and discuss the knowledge that they have acquired.

The debriefing session can also be used to ask children to explain how they feel about the digital game and to describe their achievements or frustrations. Debriefing sessions are a way to make a connection between the game and the learning outcomes. During a debriefing session, you should encourage pupils to relate to their experience and to discuss what they have learned while playing. You might ask students to compare the different methods or techniques presented in the digital game or describe the different solutions they have tried and identify the ones that have worked for them. If the game is used to discuss sensitive issues, the characters of the story can be used as a starting point for the discussion. Pupils might be asked to comment on the behaviour of some characters, the consequences of their acts and possible actions to solve the issues. After running the debriefing session, you should summarise the different points brought forward in the discussion and the learning objectives of the session. You should also ask pupils to summarise what they have learned from the digital game. This will help to formalise

and memorise the introduced concepts and ideas. The issues, raised during the debriefing session, can then be mentioned and discussed during formal classes.

The strategy for the debriefing session is summarised below:

- Review learning objectives.
- Ask pupils to answer questions stated at the start of the session.
- Ask pupils to relate to their experience.
- Initiate discussions.
- Make the link between the game experience and the learning objectives.
- Summarise findings.
- During formal classes, refer to the findings made while playing the game.

4.2.2. General Understanding of the Game

After playing a digital game, pupils should have a good understanding of its goals and objectives. They should also understand the purpose of the game and the challenges it raises. Asking the following questions to pupils will help you to assess their general understanding of the game:

- Where and when does the scene take place?
- What is the goal of the game?
- Who is the main character?

- What are the main challenges faced by the main character?
- What do you need to do to be successful in this game?
- What items do you use to help you pursue your quest?
- What prevents you from achieving your goal? (e.g., characters, events, etc.)
- What are the main issues raised by the game?
- Who are the main protagonists?

4.2.3. General Understanding of the Issues Raised by the Game

When you have ensured that pupils have understood the general goals of the game, it is time to check they also understand the underlying ideas or topics, introduced by the game, so that a link can be established between the game itself and the topic taught. For this purpose, the following questions may be appropriate:

- What is the main topic of the game?
- Do the events that take place in the game remind you of something you know, or something you have heard of from your friends, your family or on TV?
- Why do you think this topic is important?
- What did you learn from this game?

4.2.4. Understanding of the Game Mechanics

While pupils might understand the game's goals, it is particularly important that they understand key principles in the digital game that mirror real life concepts. To assess this, you might ask them to explain key actions in the game and their consequences. For example, if you have chosen to use the game *Global Conflicts: Latin America* to explain industrial pollution in South America, you could ask the following questions:

- What are the causes of pollution in South America?
- What are the effects of industrial pollution on people living near maquiladoras?
- What would happen if all maquiladoras were closed-down?

4.2.5. Factual Information

Before starting the game, you should give a list of factual information that pupils need to gather while playing. After the game, they will need to show that they have remembered important locations, names, or dates from it.

4.3. Checklist

While the previous sections provide a step-by-step list of how to plan and organise a teaching session based on the use of games, the following checklist might be useful to ensure that key actions, required to ensure learning and motivation on the part of the pupils have been covered:

- Check the technical specifications of your computer.
- Check that the games are appropriate for the pupils (e.g., age, content, help, difficulty levels, audio, etc.).
- Check the room and the computers.
- Encourage peer-learning when applicable.
- Explain the goals and objectives of the session and demonstrate how to play the game.
- Promote safety and healthy habits.
- Encourage pupils to relate to their gaming experience through questions and discussions when applicable.
- Contextualise the gaming experience and the game content and make links with the learning objectives through questions and discussions.



5. Frequently Asked Questions

Is there any evidence that video games can help learning?

Yes. Several reports have shown that video games can be used effectively in schools to improve both learning and motivation on the part of the students (e.g., Abdul Jabbar & Felicia, 2015; Hainey et al, 2016; Clark et al, 2016).

Can video games replace teachers?

No. Video games cannot replace teachers. However, they can considerably help to involve and motivate children. Some children might find certain topics very difficult to understand until they experience them through play, and games can provide them with this opportunity. In this regard, digital games do not replace traditional classes but instead provide an additional way to reach children and to enable them to understand topics that they might otherwise find too complicated. They also make it possible to use a student-centred learning experience.

Are video games bad for pupils' health?

If children are taught healthy and safe habits, if a balance is maintained between play and other activities, and if the chosen games are age-appropriate, digital games can be a fulfilling activity with little or no risk.

How can I make sure that the digital game I have chosen is appropriate for my pupils?

You need to check the game's ratings and play the game yourself to assess whether it is appropriate in terms of structure and content.

How can I make sure children will learn from the game?

Not all games are built with educational objectives in mind. However, some can be effective to teach or to introduce basic concepts. The most important part is the debriefing session, because it makes it possible to establish a connection between the game's content and the learning objectives.

Our computers are very old. What are our options?

You might want to try Java or Flash-based games, or even HTML games. These games are lightweight and not so processor-intensive.

We have a very low budget for digital games. How can we obtain good-value educational games?

Whereas COTS (Commercial-Off-The-Shelf) games can be expensive, many other video games with educational benefits can be used for free. Alternatively, video games can be rented.

How can I know whether children will enjoy the game?

It is very difficult to know exactly what game children will like. However, a good starting point is to read the reviews provided in online forums and magazines.



6. Resources for Teachers

6.1. Lesson Plans using Games

In 2019 the Interactive Software Federation of Europe sponsored a Massive Open Online Course (MOOC) about Games in Schools on the European Schoolnet Academy. The course featured engaging video content created by Ollie Bray, Director of Play at the Lego Education Foundation, as well as a large number of activities which included discussion, reflection, and production of educational materials by the course participants. While the course primarily focused on the use of video games, it also explored associated themes linked for example to the use of AR, VR, geocaching, coding, playful learning, etc.

The course remains accessible for browsing here: www.europeanschoolnetacademy.eu/courses/course-v1:GiS+GamesCourse+2019/about

As part of this course, participants produced course work in the form of lesson plans incorporating ideas, pedagogical strategies and tools shared on the course. This work was first peer assessed by other course participants and subsequently reviewed by an editorial board made up of a group of experienced and innovative teachers from across Europe. Based on the reviews of this editorial board a number of lesson plans which were produced by participants as part of the course were selected for publication as part of the course website.

The lesson plans can be accessed here: www.europeanschoolnetacademy.eu/courses/course-v1:GiS+GamesCourse+2019/eb9537aa5109467aa041f71360ee185a/

Five of these lesson plans have also been included directly in this Handbook and can be viewed below. The members of the editorial board were: Anita Streich, Cristina

Nicolaita, Glykeria Gkouvatso, Massimo Bidotti, Reyhan Gunes.

The five lesson plans presented below were selected due to the variety of approaches they cover. They were created using the Learning Designer tool and are available in a digital format that can be easily adapted for own purposes via the available links. All 5 lesson plans are also available in [Annex I](#). The lesson plans have been designed by the teachers with their own classes in mind. Accordingly, any reuse requires adjusting of the lesson plans to the context and conditions in which they are intended to be used.

LESSON PLAN 1: DIGITAL STORYTELLING WITH MINECRAFT

<https://v.gd/RoZo2d>

Secondary level

Subject(s): Cross-curricular

Description: The lesson is an attempt to make known to students the story of Mohammad Aljaleel, The cat man of Aleppo. His story touched the hearts of millions when his sanctuary featured in a BBC video in 2016. He had to leave the city when it fell to Syrian government forces, but he went back - in an area nearby - and helped children as well as animals. The students will attempt to recreate Alaa's story as a game in Minecraft and try to figure out ways to create a digital version of Ernesto's Sanctuary, the shelter he built for cats in the middle of a war crisis. The general aim of the lesson is to make students sensitive to social and controversial issues such as the implications of war, refugees, animals and children as victims of war, solidarity, volunteering, and the power of social media in the 21st century. The lesson also aims to familiarize students with the Minecraft digital environment and make them practice their English language skills for narrating a story (reading and writing) as well as their ICT skills.

Author: Sofronia Maravelaki

LESSON PLAN 2: CELEBRATING THE 500TH ANNIVERSARY OF THE WORLD'S FIRST CIRCUMNAVIGATION (1519-1522) – A CROSS-CURRICULAR LEARNING DESIGN

<https://v.gd/xW4wT5>

Secondary level

Subject(s): Cross-curricular

Description: Students develop a cross-curricular project, designed in collaboration with teachers and other students about our knowledge of the World: the Seas, the Earth and the Skies, concerning the topic “The world around us/ the world seen by Magellan/ Del Cano”. The subjects involved are: Portuguese Language; English Foreign Language, Spanish Foreign Language, Biology, History, Geography, Maths, Physics and Citizenship Education.

Author: Candida Pombo

LESSON PLAN 3: HOUSE AND FURNITURE IN ENGLISH

<https://v.gd/goNnQs>

Primary level

Subject(s): Languages

Description: The lesson is designed for a 4th grade, English as a Foreign Language class. The students will learn key English vocabulary for parts of a house and some furniture.

Author: Cristiana Lopes

LESSON PLAN 4: KUNG PAO CHICKEN RECIPE

<https://v.gd/m4tKnz>

Primary/Secondary level

Subject(s): Languages

Description: The recipe of the Kung Pao Chicken is within the game called “World Cuisine”. This game will help the students to have fun and learn at the same time.

The students will be able to use the vocabulary about ingredients and instructions to write a recipe.

Author: Güniz Çalışkan Kılıç

LESSON PLAN 5: MINECRAFT VILLAGE

<https://v.gd/HI5vV0>

Secondary level

Subject(s): Cross-curricular

Description: To teach students the importance of collaboration and division of labor by taking advantage of group experiences on digital gaming. The course will be taught in 2 stages. Phase 1 is the uncoordinated phase in which individual actions are carried out, and the second phase is the planned implementation phase where the division of labor and cooperation are emphasized.

Author: Barış Ertuğrul

6.2. Further Reading on the Use of Educational Games

6.2.1. Books on the Benefits of Educational Games

- Bogost, I. (2011). *How to Do Things with Videogames* (University of Minnesota Press).

How to do Things with Videogames explores the intersection between games and popular culture. Computer games are used in a number of different ways in today’s world, from documenting historical and cultural events to educating both children and adults. In a series of 20 short essays, Ian Bogost illustrates the influence of games on modern culture and argues that they have become so

important that they can be regarded as a medium of their own.

- Gee, J., P. (2008). *What Digital Games Have to Teach Us About Learning and Literacy* (Palgrave Macmillan).

This book analyses new and popular computer games such as World of WarCraft and Half Life 2 against theories of cognitive development. James Paul Gee illustrates the numerous benefits of digital games by looking at the effect they have on major cognitive activities – how individuals develop a sense of identity, how we grasp meaning, how we perceive the world. In this book, you will learn how video games can be designed to encourage deep learning and the development of critical thinking skills: they can even have a positive impact on an individual's self-esteem. Designed for teachers, educators and instructional designers, Gee's book provides further tips on how to integrate digital games within the classroom.

- Prensky, M. (2006). *Don't Bother Me Mom – I'm Learning!* (Paragon House Publishers).

In *Don't Bother me Mom – I'm Learning*, Marc Prensky – an educational software development – rejects the notion that video games are harmful to children. Instead, he argues that games can teach a variety of skills, including problem-solving, language, strategic thinking, and multi-tasking; and that they can foster the development of 21st century skills from an early age. The book addresses the most common parental concerns related to games, and offers recommendations for especially beneficial games, as well as useful websites for parents.

- Steinkuehler, C. (2012). *Games, Learning, and Society: Learning and Meaning in the Digital Age* (Cambridge University Press).

This book is a collection of essays from the most influential thinkers, designers, and writers in the field of games and learning, covering game design, culture, and the pedagogical function of games. It focuses on the use of digital games in formal and informal learning environments and provides a good comparative overview of games designed for different purposes.

6.2.2. Reports on the Use of Educational Games

• Games in Schools

- Kearney, C., Van den Berghe, W., Wastiau, P. (2009). *How are digital games used in schools? Final report*, (European Schoolnet)

The Games in Schools report gives an overview of the use of electronic games as potential teaching tools in the classroom. More than 500 teachers and 30+ policymakers and experts were interviewed between April 2008 and March 2009. The aim of the consultation was to evaluate what benefits electronic games can bring to classroom teaching, and what kind of cooperation can be envisioned between the educational systems and the games industry. The report provides excellent background information on trends and developments related to the use of electronic games in teaching and presents the state-of-play in the area on a European level. In the report, you can also find case studies of successful practices and recommendations for teachers and experts.

Final report available at:

www.europeanschoolnetacademy.eu/courses/course-v1:GiS+GamesCourse+2019/eb9537aa5109467aa041f71360ee185a/

- **Games and simulations in higher education**

- Vlachopoulos, D., Makri, A. *The effect of games and simulations on higher education: a systematic literature review*. Int J Educ Technol High Educ 14, 22 (2017). <https://doi.org/10.1186/s41239-017-0062-1>
- Open Access article available at: <https://educationaltechnologyjournal.springeropen.com/articles/10.1186/s41239-017-0062-1>

This article focuses on the impact of games and simulations when it comes to achieving specific learning objectives. The article shows the positive impact games and simulations have on learning goals and identifies three learning outcomes of integrating games into the learning process: cognitive, behavioural, and affective. The article collates further resources and evidence on the efficient use of games and simulations for pedagogical purposes that could be useful for teachers and academics in higher education.

- **Use of Serious Games**

- Zhonggen, Y. (2019). *A Meta-Analysis of Use of Serious Games in Education over a Decade*. International Journal of Computer Games Technology Volume 2019. <https://doi.org/10.1155/2019/4797032>

- Open Access article available at: <https://www.hindawi.com/journals/ijcgt/2019/4797032/>

This study focuses on the effectiveness of serious games in education – their advantages, as well as drawbacks. It presents an overview of the literature on the topic, published in the last decade, explores attitudes towards the use of serious games in educational contexts, and analyses new developments and approaches in the area.

6.3. Web Portals for Educational Games

Table 8: Non-exhaustive list of educational games

TITLE	AUTHOR	TOPIC	TARGET AUDIENCE	OVERVIEW	URL
Ramo Games	Ramo Games Inc	Maths Geography Language	Children aged 6-13	A comprehensive database of educational games for children of all ages, including parents and teachers. The games are organised in categories and range from basic colouring and addition games to subject-based ones (geography, history, chemistry, etc).	http://www.ramogames.com/
Cool math for kids	Coolmath.com LLC	Maths	Children under 12	A website collating educational games, quizzes, and lessons, that aim to teach math to children in a fun way.	http://CoolMath4kids.com
Arcademics		Maths, geography	Children aged 6-13	A platform for students and teachers with HTML5 video games of educational content. Teachers can enrol their students, assign games to them and adapt content according to specific needs.	http://www.arcademicskillbuilders.com/
Learning games for kids	Learning games for kids	Maths, science, typing	Children in primary school	A platform with many educational games and songs that help build skills in math, language, science, social studies, geography. Games range from math addition to flash cards and language puzzles.	http://www.learninggamesforkids.com/

TITLE	AUTHOR	TOPIC	TARGET AUDIENCE	OVERVIEW	URL
Vocabulary Blog	Vkidz	Vocabulary	Children of all ages and adults	An educational website with free vocabulary learning games (word search, crossword puzzle, hangman online), specifically designed to build vocabulary and phonetic skills.	http://www.vocabulary.co.il/
Spelling City	LearningCity	Vocabulary	Children of all ages, teachers, parents	A platform (free and paid version) with online spelling and language games, videos, as well as a dedicated section with teaching resources for educators, and information for parents.	http://www.SpellingCity.com/
Brain POP	FWD Media Inc	Language, maths, and science.	Children of all ages, teachers, parents	A platform with digital games, online tools, and interactive assessments for teachers which foster digital citizenship skills in children; and a separate section with educational content for both parents and children.	http://www.BrainPOP.com
GameQuarium	Diana Dell, GameQuarium	Language, science, and maths.	Children in primary school, teachers	A portal for online educational games and learning activities, with a fun underwater theme for children. Its purpose is to provide interactive, instructional online resources for teachers, parents, and students. The portal fosters technological understanding and helps teachers integrate technology resources into curricula.	http://www.gamequarium.com/

TITLE	AUTHOR	TOPIC	TARGET AUDIENCE	OVERVIEW	URL
Fun Brain	Funbrain Holdings LLC	Maths and science.	Children aged 3-14	A platform with online games, books, comics, and videos that develop skills in math, reading, problem-solving and literacy.	http://www.funbrain.com/
iGames	National Geographic Kids	Geography and biology	Children aged 3-14	A website with animal-themed games and videos designed to teach children biology and geography. The portal offers a fun way for children to learn about keeping the environment clean.	http://kids.nationalgeographic.com/Games/
The problem Site	The Problem Site	Vocabulary, maths, and arts.	Children of all ages (kindergarten to high school)	A directory of games, puzzles and printable worksheets and educational recommendations. Teachers can give assignments to their students and monitor progress through reports.	http://www.theproblemsite.com/
Prongo.com	Dr. Prongo.com Inc	Maths	Children of all ages (kindergarten to high school)	The website's purpose is to provide educational games where kids can interact and learn maths in a challenging online environment. Content includes quizzes, fun facts, links and other resources for all ages.	http://www.prongo.com/games/
Kids Games	UpToTen.com	Kids Games	Children up until the age of 10	The platform has two sections – for children and parents. Its purpose is to enable children to have fun, learn, play, listen to music, read stories and interact with each other in a safe, online environment.	http://www.kidsgames.org/

TITLE	AUTHOR	TOPIC	TARGET AUDIENCE	OVERVIEW	URL
Sheppard Software	Brad Sheppard Jr and Jasmine Chapgar	Maths, geography, nutrition, and more	Children of all ages, including adults	A rich, educational website with hundreds of games for kids, as well as activities for people from all ages interested in online learning. Its purpose is to foster skills in a range of areas, from geography and science to maths, language, and health.	http://www.sheppardsoftware.com/web_games_menu.htm

6.4. Internet Safety

Table 9: Sites on Internet Safety

NAME	AUTHOR	CONTENT/PURPOSE	TARGET GROUP	URL
Better Internet for Kids	European Schoolnet/ European Commission	A set of resources to help discover the online world safely	Teachers, parents, children, young people	https://www.betterinternetforkids.eu/web/portal/resources/gallery
NSPCC UK	National society for the prevention of cruelty for children	A set of resources to help parents understand how to keep children safe online, and how to talk about online safety with their children.	Parents and teachers	https://www.nspcc.org.uk/preventing-abuse/keeping-children-safe/online-safety/
E-safety for Schools	NSPCC Learning	Policies, procedures for e-safety, resources and online safety trainings	Educators, parents, wider school administration staff	https://learning.nspcc.org.uk/research-resources/schools/e-safety-for-schools/

NAME	AUTHOR	CONTENT/PURPOSE	TARGET GROUP	URL
ISFE Responsible Gameplay	ISFE	A set of tips and guidance for parents and educators on how to promote a safe and responsible gameplay	Parents, educators, players	https://www.isfe.eu/responsible-gameplay/

6.5. Game Jams

Table 10: Resources for organising Game Jams

NAME	AUTHOR	CONTENT/PURPOSE	URL
Isntap.org	Legal Services National Technology Assistance Project	Tips and recommendations for teachers on how to organise your game jam	https://www.isntap.org/sites/isntap.org/files/How to Create and Host Game Jams and Hackathons.pdf
Game Jam Guide	Carnegie Mellon University ETC Press	Lesson plans and ideas for educators to implement game jams and stimulate empathy and design thinking	http://press.etc.cmu.edu/index.php/product/game-jam-guide/
The Game Jam Survival Guide	NSPCC Learning	A step-by-step guide on how to organize a game jam	https://www.amazon.com/Game-Jam-Survival-Guide-ebook/dp/B007R0NTF4/ref=sr_1_1?keywords=game+jam&qid=1574695179&s=books&sr=1-1



7. Glossary of terms

ADD	Attention Deficit Disorder
ADHD	Attention Deficit and Hyperactivity Disorder
AI	Artificial Intelligence
CBT	Computer Based Training
GBL	Game Based Learning
FPS	First Person Shooter
LMS	Learning Management System
MOD	Modified version of a Digital game
MMORPG	Massive Multiplayer Online Role Playing Games
RAM	Random Access Memory
RPG	Role Playing Game
RTS	Real Time Strategy Game
SCORM	Sharable Content Object Reference Model



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9. Annex I - Lesson Plans using Games

Lesson Plan 1: Digital storytelling with Minecraft

CONTEXT

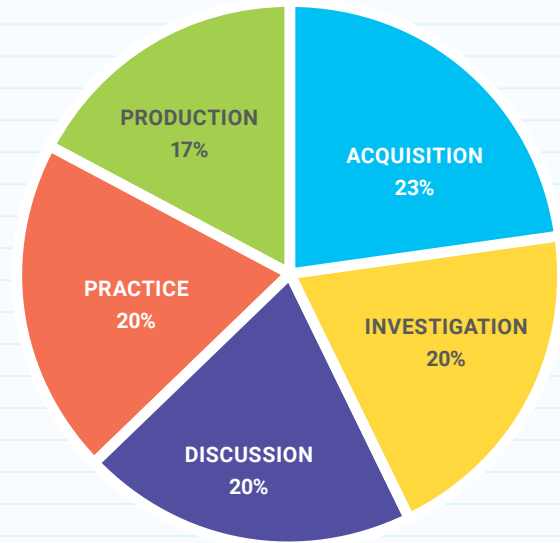
Topic: Narrating a true story

Designed learning time: 2 hours and 30 minutes

Size of class: 20 students

Mode of delivery: Classroom-based

Description: This lesson is an attempt to make students familiar with the story of Mohammad Aljaleel, the ‘Cat Man of Aleppo’. His story touched the hearts of millions when his sanctuary was featured in a BBC video in 2016. He had to leave the city when it fell to Syrian government forces, but he went back - in an area nearby – to help both children and animals. To play the game, students have to recreate Aljaleel’s story as a game in *Minecraft* and try to figure out ways to create a digital version of Ernesto’s Sanctuary, the shelter that he built for cats in the middle of a war crisis. The general aim of the lesson is to raise students’ awareness of social and controversial issues, such as the implications of war, refugees, animals, and children as victims of war, solidarity, volunteering, and the power of social media in the 21st century. The lesson also aims to familiarise students with the *Minecraft* digital environment and make them practice their English language skills to narrate a story (reading and writing), as well as their ICT skills.







AIMS

- Brainstorm and generate ideas and opinions
- Sum up and categorise information in a table
- Build a story as a game inside Minecraft Education Edition tools
- Play games
- Evaluate games
- Gain Digital Badges for recognition of achievement
- Communicate
- Collaborate
- Create, Produce
- Publish
- Evaluate

TEACHING-LEARNING ACTIVITIES (TLA)

MODULE 1: INTRODUCTION TO THE STORY OF THE CAT MAN OF ALEPPO.





This lesson is designed to help students brainstorm and generate ideas and opinions, sum up and categorise information in a table.

 *Read Watch Listen: 10 minutes*
 *20 students*
 *Tutor is available*
 *Face to face*





Students watch a video about the Cat Man of Aleppo, a man from Aleppo, who set up a shelter for cats in the middle of a war crisis. Aleppo is a city in Syria, serving as the capital of the Aleppo Governorate, the most populous Syrian governorate. With an official population of 4.6 million in 2010, Aleppo was the largest Syrian city before the Syrian Civil War.

LINKED RESOURCES

BBC - Return of the cat man of Aleppo
Mohammad Aljaleel

 *Discuss: 10 minutes*
 *20 students*
 *Tutor is available*
 *Face to face*

Students discuss the videos they watched and brainstorm ideas on the ways and means this man used in order to build the shelter, achieve funding, and provide medical care for the cats.

 *Investigate: 30 minutes*
 *4 students*
 *Tutor is available*
 *Face to face*

Students form groups of four in front of a PC or laptop and access a website which presents the story of Mohammad Aljaleel and his charity work with cats up until this day. They read the information on the website and try to verify the answers to the questions from the previous brainstorming activity. After reading the information on the website, students have to fill in a table with information from the web page and ideas of their own. The table includes sections such as: time, place, people, funding, services, etc.

LINKED RESOURCES

House of Cats Ernesto

OUTCOMES

Knowledge:

- Find out / Discover
- Identify
- Select
- List

Comprehension:

- Describe reasons for
- Summarise
- Classify





TLA LINKED RESOURCES

BBC-The cat man of Aleppo
Mohammad Aljaleel

MODULE 2: BUILDING THE STORY OF THE CAT MAN OF ALEPPO AND ERNESTO'S SANCTUARY AS A GAME INSIDE MINECRAFT.

This lesson is designed to provide an opportunity to combine world building with storytelling while using many of the Minecraft Education Edition tools.





Credits: The module on Minecraft is inspired by: <https://education.minecraft.net/lessons/fairytale/>, a sample lesson plan in <https://education.minecraft.net/class-resources/language-arts-subject-kit/>, submitted by Steve Isaacs. It was adapted to fit the aims and objectives of this lesson and helps to navigate the Minecraft world of Language Arts.

 *Read Watch Listen: 25 minutes*
 *20 students*
 *Tutor is available*
 *Face to face*

The teacher provides a short demonstration of the use of the world builder and narrative tools in ***Minecraft: Education Edition***. Narrative tools, which can be used include: find and place in inventory; slate, poster, board, sign, NPC. Etc. The teacher also provides a short demo of placing and using these tools to develop story within ***Minecraft***.

LINKED RESOURCES

Minecraft Education Edition

 *Produce: 25 minutes*
 *4 students*
 *Tutor is available*
 *Face to face*

The purpose here is for students to form groups and recreate the story of Cat Man in Minecraft. Students also build the world of Ernesto's Sanctuary and incorporate the narrative. As an extension activity, students can add elements using ***redstone*** and other tools to create a more interactive experience for the reader.

LINKED RESOURCES

[Minecraft Education Edition](#)

OUTCOMES

Application

- Construct
- Assemble
- Use

Analysis

- Analyse
- Break down
- List component parts of
- Predict
- Relate
- Select
- Subdivide

Synthesis





- Combine
- Compile
- Compose
- Conclude
- Derive
- Design

TLA LINKED RESOURCES

Minecraft Education: <https://education.minecraft.net/>

MODULE 3: PLAY, EVALUATION AND DIGITAL BADGES.

This lesson is designed to provide the students with an opportunity to present and play their story in Minecraft, peer-evaluate it, and earn digital badges in recognition of achievement.





-  *Practice: 30 minutes*
-  *4 students*
-  *Tutor is available*
-  *Face to face*

Students publish their completed work to be shared with a global audience at: <https://education.minecraft.net/community/connect-with-others/>.

This way each team can find online the other team's game and play their version of the story. The game can be played in the school computer lab (or at home to save teaching time at school). Once students have played the game, each team evaluates the version of the story they played, according to the criteria identified in the next activity.

LINKED RESOURCES

Minecraft-Communities

-  *Discuss: 20 minutes*
-  *4 students*
-  *Tutor is available*
-  *Face to face*

The teacher creates a digital credentials rubric using Credly's intuitive Credential Dashboard to provide students with an achievement recognition system. Students can use the following set of criteria to evaluate the work of their classmates:

OBJECTIVES AND PERFORMANCE INDICATORS

- Students have successfully recreated the story of the Cat Man of Aleppo inside Minecraft.
- Students demonstrate an understanding of digital storytelling, guiding the viewer throughout the complete story experience.
- Students demonstrate an understanding of the narrative tools used in Minecraft Education edition (slate, poster, board, signs, NPCs).
- Students demonstrate an understanding of the world builder tools including fill and clone tools and build Ernesto's Sanctuary inside Minecraft this way.
- Students collaborate on the creation of their project and share responsibilities with other group members.
- Students utilise redstone and other elements in the game to combine coding and engineering skills with storytelling.

PERFORMANCE EXPECTATIONS

All students will submit a completed story as a .mcworld file. Expectations include the following:

- The story is complete, and the player can travel through its entire length.
- Directions for the player are clear – they should know where to go and what the objectives are to prevent them from getting lost in the world.
- A variety of narrative / storytelling tools should be used throughout including: slate, poster, board, sign, NPCs.
- Students should use the fill and/or clone tool to make building more efficient and add interactive elements utilising redstone.
- After the evaluation, students can present and share the digital badges they have earned.

LINKED RESOURCES

Credly: <https://info.credly.com/>

OUTCOMES

Evaluation:

- Criticise
- Defend
- Evaluate
- Give arguments for and against
- Give feedback
- Judge
- Reflect
- Support

TLA LINKED RESOURCES

Minecraft-Communities: <https://education.minecraft.net/community/connect-with-others/>

Credly: <https://info.credly.com/>

Lesson Plan 2: Celebrating the 500th Anniversary of the World's first Circumnavigation (1519-1522) – a cross-curricular learning design

CONTEXT

Topic: The world around us - the world seen by Magellan/ Del Cano

Designed learning time: 6 hours and 20 minutes

Size of class: 30

Mode of delivery: Classroom-based

Description: Students develop a cross-curricular project, designed in collaboration with teachers and other students, about our knowledge of the world: the seas, the Earth and the skies, on the topic: 'The world around us/ the world seen by Magellan/ Del Cano'.

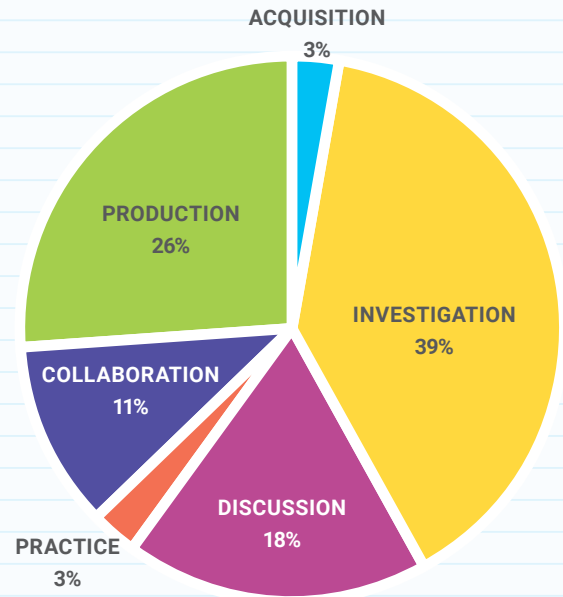
The subjects involved are: Portuguese language, English Foreign Language, Spanish Foreign Language, Biology, History, Geography, Math, Physics, and Citizenship Education.

AIMS

Students are expected to learn in a creative and immersive way, through the use of a range of digital games, and should be provided with a high degree of freedom and responsibility on their learning path. Collaboration through ICT is essential, and they must build substantive knowledge on the subject, as well as develop problem-solving skills.





OUTCOMES

A cross-curricular project-work to be presented to the school community about the relevance of the first circumnavigation trip. Badges are awarded.







TEACHING-LEARNING ACTIVITIES

DISCOVERING MAGELLAN'S/ DEL CANO 'S WORLD

-  Discuss: 10 minutes
-  30 students
-  Tutor is available
-  Face to face

The teacher presents the project objectives, curriculum links, schedule and reinforces the focus on creativity and students' freedom to learn. Teachers and students together design and negotiate the assessment criteria.





-  Read Watch Listen: 10 minutes
-  30 students
-  Tutor is available
-  Face to face

In plenum, the students listen to and watch a video by NASA about the 500th Anniversary of Humanity's First Circumnavigation of Earth, by Games Garvin.

https://www.youtube.com/watch?v=35lh2_muP_w





LINKED RESOURCES

[Video about the 500th Anniversary of Humanity's First Circumnavigation of Earth.](#)

-  Practice: 10 minutes
-  1 student
-  Tutor is available
-  Face to face





After watching the video, students start playing *Microsoft Flight Simulator X*, to explore the areas of the world navigated by Magellan / Del Cano. The "Flying

Simulation" becomes the starting point for the project-work.





-  Investigate: 30 minutes
-  5 students
-  Tutor is available
-  Face to face

Students are divided in groups and asked to carry out research. Going 500 years back in time, students are asked to replace their planes from the simulator with ships, considering the huge achievement of the Earth's circumnavigation. Based on their research, students suggest which areas of the world they would like to focus on within this project. Then, the two groups start working on their respective projects.

PLAYING /STUDYING ABOUT MAGELLAN'S/ DEL CANO 'S WORLD

-  Investigate: 40 minutes
-  5 students
-  Tutor is available
-  Face to face

In Maths and Physics lessons, students study the sky, cartography, astronomy, and the stars, starting with the game/ app *Universe Sandbox* and /or *Flight Simulator X*.


-  Investigate: 40 minutes
-  5 students
-  Tutor is available
-  Face to face


In History classes, students research and write about the time of the discoveries, portraying the world's history around 1500. They identify the most important issues of Magellan's/ Del Cano's voyage, through Google

Cardboard Design Lab and they take/ share notes about them.

 Investigate: 40 minutes


 5 students


 Tutor is available


 Face to face

In Portuguese classes, students read about and analyse the main characters, namely Magellan and write about his physical and psychological description and his biography. Students can use *Debojaan*, an immersive game, which helps them develop writing.


 Collaborate: 40 minutes


 5 students


 Tutor is available


 Face to face

In Biology lessons, students learn and debate about the oceans, their richness, as well as the current environmental threats we face through the Game “*Stop disasters*”.


 Produce: 40 minutes

 5 students

 Tutor is available

 Face to face

In English and Spanish (as a second language) classes, students are expected to produce podcasts about the trip undertaken in the game in the two languages. Students can first train with the help of *Bravolol*, in order to practice their speaking competences and language skills.

 Discuss: 40 minutes


 5 students

 Tutor is available

 Face to face

Students, studying Citizenship Education and Ethics read and discuss about the so-called “natives”: their ways of living, cultural and ethnic differences, and habits. Moreover, they reflect on the issues society faced at the time, as well as on the evolution of human rights throughout the centuries.

APPLYING KNOWLEDGE ON MAGELLAN’S/ DEL CANO ‘S WORLD


 Discuss: 20 minutes


 30 students

 Tutor is available

 Face to face

Debate throughout the activity is carried out via the tool *Tricider* and the results of each groupwork are shared on different *Padlets*. In the end, just before the final task, the work of all groups is collated together in an ActiveTextbook: an interactive PDF shared with everyone in the community.

 Produce: 1 hour

 30 students

 Tutor is available

 Face to face

Through geocaching and utilising a mobile phone, students and teachers collectively organise and participate in a treasure hunt (the first circumnavigation trip) where they have the opportunity to put in practice all the knowledge gained so far. In this trip, the ‘sailors’ (students) land in specific places of the world, characterised by different species, different foods, cultures and people.

Lesson Plan 3: House and Furniture in English

CONTEXT

Topic: House and Furniture

Designed learning time: 1 hour and 10 minutes

Size of class: 12

Mode of delivery: Classroom-based

Description: This is the first lesson on this topic. Students will learn the main parts of a house and some furniture in English. The lesson is designed for children in 4th grade, who study English as a Foreign Language.

AIMS

- To introduce children to the topic 'house and furniture' in a fun and engaging way.
- To engage children in cooperative tasks.
- To encourage children to research for words they need in English.
- To encourage children to be creative.
- To use games in the classroom.

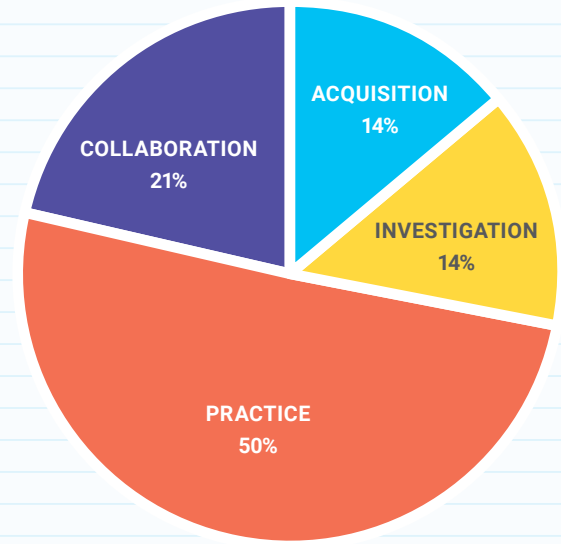
OUTCOMES

Knowledge: Identifying vocabulary in English

Psychomotor skills: Movement and speed are required in the treasure hunt





Comprehension: Using *Duolingo* dictionary

Application: Designing a house



TEACHING-LEARNING ACTIVITIES

SUDOKU GAME (EASY LEVEL)

-  Investigate: 10 minutes
-  3 students
-  Tutor is available
-  Face to face

Children like being surprised. Teacher explains that the lesson has to be 'unlocked' and for that, students must solve a **Sudoku** puzzle in groups of three. They also need to pay attention to time. Each group receives a badge stating their position (1st, 2nd, 3rd, or 4th). This determines the order for the treasure hunt activity.





LINKED RESOURCES

[Sudoku for Children 4x4](#)

NOTES

This is a settler activity, important on a primary level, to start the class.





HOUSE - GEOCACHING OR TREASURE HUNT GAME

-  Read Watch Listen: 5 Minutes
-  12 students
-  Tutor is available
-  Face to face





At the end of the puzzle, the teacher shows a picture of a house with the word 'HOUSE' below. This is the topic of the lesson. Since this is the first lesson on the topic, children may not know any words yet.

LINKED RESOURCES

[House Flashcard PT_EN](#)

-  Collaborate: 15 minutes
-  3 students
-  Tutor is available
-  Face to face

The teacher explains that some items of a toy house were previously hidden somewhere in the playground. Students have to search for them using the coordinates provided and find them, divided in groups of 3. If geocaching is too difficult, the exercise can be done without it. The teacher can then prepare a treasure map. Each group leaves the classroom in the order established in the **Sudoku** game, according to the badge each group received.


-  Practice: 10 minutes
-  12 students
-  Tutor is available
-  Face to face


After the treasure hunt, the class comes together again. Each group shows what they have found, and the objects are sorted in categories (also with the help of flashcards): kitchen, bathroom, bedroom, living room and dining room. Each group receives 10 points for each item it found. The teacher can then check if the words for the parts of the house were understood correctly.


NOTES

You need to hide small pieces of toy furniture in the playground and mark their location.

ROOMS IN A HOUSE - PLAYING SIMS

 Practice: 25 minutes

 3 students

 Tutor is available

 Face to face


Each group plays The Sims, but the children are only allowed to 'buy' the number of objects according to the points they got in the previous task. Students use the *Duolingo* dictionary option to learn the word for each furniture item in English. The teacher supports the groups and tries to assess their use of words.

LINKED RESOURCES

[The Sims Freeplay](#)

[Duolingo dictionary](#)

 Read Watch Listen: 5 Minutes

 12 students

 Tutor is available

 Face to face

The teacher tells each group to save their project. The house they are building can be completed in the following lessons. This game can then be used to learn more words about daily routines and emotions.

NOTES

The teacher can use any version of the game available.

Each child is invited to create a painting for their houses at home, using the QuiverVision template. Next lesson, they will be surprised to see their painting as augmented reality.

TLA LINKED RESOURCES

[Quiver](#)

Lesson Plan 4: Kung Pao Chicken Recipe

CONTEXT

Topic: Kung Pao Chicken Recipe

Designed learning time: 2 hours and 5 minutes

Size of class: 36

Mode of delivery: Classroom-based

Description: The recipe of the Kung Pao Chicken is within the game called *World Cuisine*. This game will help the students to have fun and learn at the same time.

AIMS

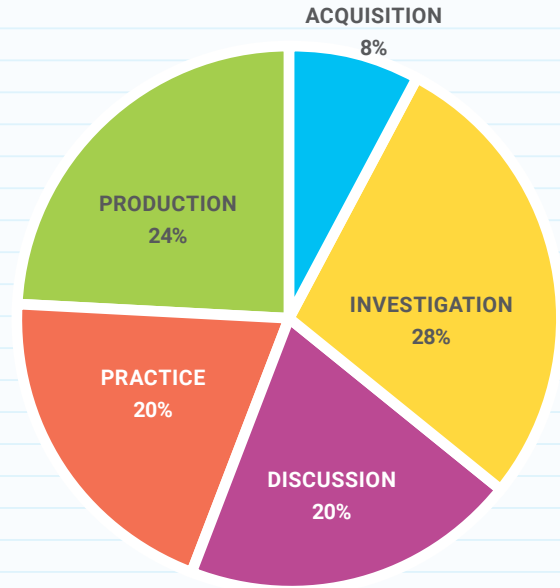
Students will be able to use the vocabulary about ingredients and instructions to write a recipe.

OUTCOMES

Knowledge: Students will be able to list what they already know, and what they want to know about this meal.

Comprehension: Students will be able to summarise the ingredients and instructions to make this meal.





Application: Students will be able to make use of the vocabulary of ingredients and instruction to make another recipe of their preference. They will apply what they have learned to develop another recipe.



TEACHING-LEARNING ACTIVITIES

PREPARATION AND TASK 1 FILLING IN THE FIRST TO PARTS OF A KWL CHART





URL: https://en.wikipedia.org/wiki/KWL_table

 *Read Watch Listen: 10 Minutes*
 36 students
 *Tutor is available*
 *Face to face*

The teacher will write the name of the application on the board. The students will download the application called “Cooking Academy 2 World Cuisine”. While they are downloading the application the teacher will make groups of six. The students are going to explore the game in their groups.

LINKED RESOURCES





[World Cuisine](#)

 *Discuss: 15 minutes*
 6 students
 *Tutor is available*
 *Face to face*

The teacher will hand out the KWL chart and ask the students to fill in the first two parts (What we know, What we want to know) of the chart which is about the Chinese meal called Kung Pao Chicken. The students will write the name of their group on the worksheet and do the task in their group.

LINKED RESOURCES

[KWL chart](#)





 *Investigate: 15 minutes*
 6 students
 *Tutor is available*
 *Face to face*

After filling in the handout, students will be given enough time to reach the 3rd level of the game. They will be motivated to investigate the game, as they will be given a further question from the KWL chart – to explain ‘what they have learned’.





NOTES

Since not all students have mobile phones, there should be at least 1 or 2 phones per each group.

TASK 2: THE STUDENTS WILL BE ABLE TO SUMMARIZE THE INGREDIENTS AND INSTRUCTIONS TO MAKE THIS MEAL.

 *Investigate: 10 minutes*
 6 students
 *Tutor is not available*
 *Face to face*

In this task, the students are divided in groups and compete to get the highest number of points. While they play the game, they are going to encounter some words they have learned before , as well as some new ones. They will also be able to read about the origins of the meal at the beginning of the game.





 *Practice: 5 minutes*
 6 students
 *Tutor is available*
 *Face to face*

The teacher gives the second handout to the students. The students have to write a list of all the vocabulary





related to the instructions and the ingredients, which they remember from the game.

LINKED RESOURCES

[Instructions, Ingredients](#)

-  *Discuss: 10 minutes*
-  *6 students*
-  *Tutor is available*
-  *Face to face*





One leader from each group is designated to read out what the group wrote on the paper to the rest of the class. The students can use the discussion to add or remove words from their lists.

-  *Investigate: 10 minutes*
-  *36 students*
-  *Tutor is available*
-  *Face to face*

The teacher is going to stick the flashcards on the board and the students are going to check their work one more time.

LINKED RESOURCES

[Flashcards](#)
[Steps of Kung Pao chicken](#)

-  *Produce: 10 minutes*
-  *1 student*
-  *Tutor is available*
-  *Face to face*

Students write a simple recipe by using any of the ingredients mentioned before, applying what they have learned to develop another recipe. They can then stick their recipes on the board while leaving for the break.





Curious students will be able to read all the recipes collated together.

NOTES

Naturally, some students will be quicker to understand the game, and others slower. The faster students can be given an opportunity to improve their scores so they will not get bored. If there is time left, the teacher can ask them to match the pictures to the steps.

TASK 3: THE STUDENTS WILL BE ABLE TO USE GOOGLE DRIVE IN ORDER TO FINISH THE KWL CHART.





TASK 4 THE STUDENTS WILL BE ABLE TO FILL IN A CHART OF INGREDIENTS AND INSTRUCTIONS FOR ONE OF THE NEXT LEVELS OF THE GAME ON THEIR OWN.

-  *Produce: 20 minutes*
-  *6 students*
-  *Tutor is not available*
-  *Face to face*

In this task, the students have to fill in the last part of KWL chart on google drive. They are going to arrange the 'What they have learned' part through their Google Drive account.

LINKED RESOURCES

[How to use google drive](#)

-  *Practice: 20*
-  *1 student*
-  *Tutor is not available*
-  *Face to face*

The students are given an opportunity to make their own recipes, including pictures of the game which clearly shows the ingredients and instructions. Students are free to choose the recipe they want to create. Once finished, all recipes can be shared on the class bulletin boards.

NOTES

If the students do not know how to use Google Drive the teacher can give them the handout attached. All students, who complete Task 4 within a week will be rewarded with a badge. After this step, students will subconsciously pay attention to the ingredients and instructions of the meal without having to fill in a chart.

Lesson Plan 5: Minecraft Village

CONTEXT

Topic: Importance of Cooperation and Division of Labor

Designed learning time: 2 hours

Size of class: 15

Description: To teach students the importance of collaboration and division of labor by taking advantage of group experiences on digital gaming. The course will be taught in 2 stages. Phase 1 is the uncoordinated phase in which individual actions are carried out, and the second phase is the planned implementation phase where the division of labor and cooperation are emphasized.

Mode of delivery: Blended

AIMS

Improving students' collaboration and division of labor skills

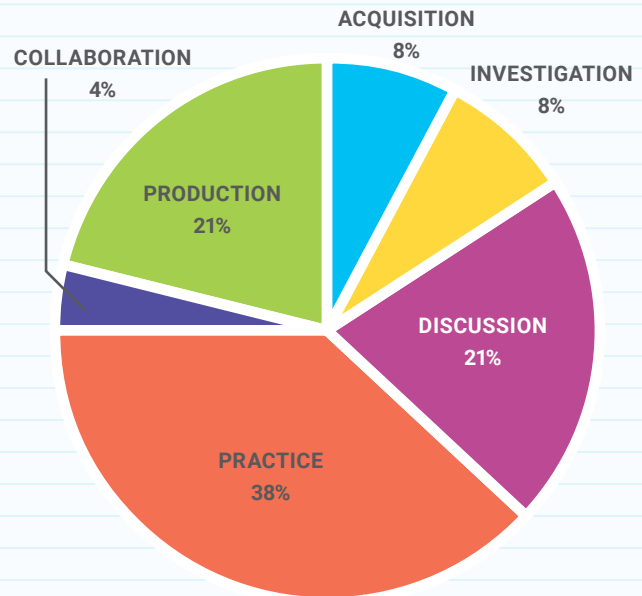
OUTCOMES

Define (Knowledge):

Identify causes of (Comprehension):





Evaluate (Evaluation):

Show awareness of (Affective learning outcomes):



TEACHING-LEARNING ACTIVITIES





PART 1 UNPLANNED WORK IN MINECRAFT

-  *Read Watch Listen: 5 minutes*
-  *15 students*
-  *Tutor is available*
-  *Online*

Students are shown a previously prepared minecraft village and they are asked to create the same village. However, they will not be able to communicate with each other. They are told that they should decide what to do and where. However, each of the students will have done part of the example village, but it is not clear who will do what. Students have 20 minutes to build the village.

LINKED RESOURCES





[Minecraft](#)

-  *Practice: 25 minutes*
-  *15 students*
-  *Tutor is available*
-  *Online*

All students are allowed to log into the set minecraft server and are allowed to play on it for 20 minutes.

LINKED RESOURCES





[Minecraft](#)

-  *Discuss: 10 minutes*
-  *15 students*
-  *Tutor is available*
-  *Face to face*

After the game, the students and the students are asked to identify and evaluate the differences between the

desired village structure and the village they create. In addition, students are asked to explain the problems they encounter during the formation of the village while they play the game and they are asked to explain and evaluate them.





PART 2 PLANNED WORK IN MINECRAFT

-  *Read Watch Listen: 5 minutes*
-  *15 students*
-  *Tutor is available*
-  *Online*





The students are shown a similar minecraft village, which is prepared beforehand, and they are asked to form the village again, but this time they will select a leader from among them and will be divided into groups and assigned a task to each group. The students are informed that they will determine the leaders and the groups themselves and that they will make the task part again with their own decisions. In this part, students will be in contact with each other. The students are then given time to choose the leader, to separate the groups and to split the task.

LINKED RESOURCES

[Minecraft](#)

-  *Collaborate: 5 minutes*
-  *15 students*
-  *Tutor is available*
-  *Face to face*





At this stage, the students should negotiate among themselves, choose a leader, identify the working groups and perform the task division. With small orientations, it is ensured that students make this preparation within the given time.

-  Practice: 20 minutes
-  15 students
-  Tutor is available
-  Online

Students are allowed to play Minecraft and try to create the requested village.





LINKED RESOURCES

[Minecraft](#)




-  Discuss: 10 minutes
-  15 students
-  Tutor is available
-  Face to face


At the end of the period, all students leave the game. The students are asked to emphasize the differences between the two villages and evaluate their play experiences this time. They are then asked to make a comparison between their previous game experience and their last games. Finally, the teacher emphasizes the importance and benefits of cooperation and division of labor.

PART 3 CONSOLIDATION

-  Investigate: 10 minutes
-  15 students
-  Tutor is available
-  Face to face

The students are asked to discuss how they can work together to form another village and to make a division of tasks for this village.





-  Produce: 25 minutes
-  15 students
-  Tutor is available

-  Online

Students are allowed to play games to build the village they planned. In this section, students play again.

LINKED RESOURCES

[Minecraft](#)

-  Discuss: 5 minutes
-  15 students
-  Tutor is available
-  Face to face

Students are asked to evaluate their village and their experiences.

GAMES

+ in Schools ◀

This handbook has been written in the framework of the project Games in Schools 2019-2020, which explores the opportunities and challenges offered by integrating games into teaching and learning.

This handbook is intended for teachers interested in using video games in their lessons. It provides the necessary background to understand their educational benefits and to learn how to use them as educational and motivational resources at school. This edition also features a selection of lesson plans developed by educators participating in the project learning course and curated by a Teacher Editorial Board.

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