Examples of Games for Learning in Erasmus+

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Abstract. This article focuses on the review of specific examples of European educational projects, within the framework of Erasmus+, that use educational games or platforms as the main axis of action. It is assumed that games are a great tool to engage students in the teaching-learning process and the fact of being able to observe projects that have been considered good practice in this field can contribute not only to the use of resources developed, but also to inspire the realization of new projects in this line of work. In this publication, one or two example projects are reviewed for different educational sectors (school, vocational education and training, and youth), in total five projects. Most of them are projects that have been selected and analysed within the framework of the research "Methodological guide for the successful use of digital technologies in education: Improving learning through European educational projects". They have worked on the development of iOS or Android games and all have the label of good practice. As their main result they have proven to be useful for the educational community in general and especially for teachers because all of them have helped to solve a need in education.

Keywords: Education · Technology · European projects · Interactive learning environments · Games

1 Introduction

Education is the pillar of social and economic development and requires that it adapt to the needs imposed by the labour market. Technology has been spreading more and more and is a fundamental part of everyday work and social life. Students have multiple tools at their fingertips, either with widely extended mobile phones (smartphones), or with access to the Internet with different types of devices, which force educational systems to be redirected so that they not only contribute to transmitting knowledge but also use attractive and competitive methodologies with these emerging technologies available to everyone [1]. For this reason, the use of games in education is a great tool to reach students and engage them in the teaching-learning processes.

Digitization offers great opportunities for education. On the one hand, the exploitation of data that is collected from the day to day of the schools can help to improve the teaching process and a better student learning [2]. Likewise, it can contribute to providing key information for administration decision-making. The relationship between technology and education actors has been difficult, moving from enthusiasm to scepticism [3]. However, it is important to have in mind the potential of digital technology (learning analytics [4], smart technologies based on artificial intelligence (AI) [5, 6], robotics [7] and others) to transform education in the same way that society is changing. There are good reasons to think that smart technologies will make our educational systems more equitable, efficient, and cost-effective. On the other hand, we must not lose sight of some relevant aspects to consider to obtain these benefits [8].

One notable aspect of gaming as a tool and activity is its ability to elicit positive emotions, thereby promoting long-term health and quality of life. It can also help increase attention, thinking efficiency, and problem solving. In the same way, it allows to reduce fear, anxiety, stress, and improves self-esteem, especially when an increase in mastery of the technique is perceived. In this sense, the game can be considered a beneficial activity transferable to different contexts of life. There are several examples, as the case of using a Kahoot tool with Zamora teaching students, which has proven to be an appropriate and useful tool to increase the motivation, involvement and active participation of students and has encouraged their incorporation into the teaching strategy, with other gamification and innovation proposals [9]. Another example is the use of a Digital Escape Room in Higher Education [10].

The aim has been to improve the quality of university teaching by offering students new resources based on a process of research-action by the teaching team. Not only has the introduction of mobile devices in the classroom been successfully achieved under a gamified methodology, but teachers have taken advantage of this process as an opportunity for learning and professional development. Considering gamification as the use of mechanisms, aesthetics and the use of thought, to attract people, incite action, promote learning and solve problems [11].

Teachers are a key piece of the efficiency of any educational model, because, by determining a learning environment based on their experience and creativity, they can ensure that students achieve specific professional skills, especially those teachers who have changed the paradigm of self-centred practices and have focused on the student, in addition to making use of educational strategies that support the teaching-learning process. The motivation of the students, through the recognition of the computational thinking skills that they possess, the offer of study options considering their individuality in the learning process of the basic programming skills in a gamification and appropriate learning environment, allows reducing the percentage of university dropouts without sacrificing the level of educational quality [12].

Mobile learning has the potential to improve efficiency in education and expand educational opportunities to communities in remote areas. Nevertheless, there are many challenges to be faced when trying to introduce and implement m-learning. One of the is the infrastructure, that it is often underdeveloped in rural communities, with a lack of access to the ICT knowledge. Hence, before implementing m-learning programs, it must be established the right infrastructure with ICT services expanded [13], and

applied innovative policies [14] with well-designed curriculum and content. This should be accompanied by teacher training and recognition. It is true that the benefits of m-learning are increasing, but it should be followed with a better understanding of the impact and role of ICT in education. It is vital to raise awareness among national and local policy makers as well as rural communities to know the benefits that m-learning can bring and, more importantly, to address inequality in access to ICTs and education [15, 16].

The potential of games in education is high, although it is very important to understand the nature of childhood as a first step for education to meet these objectives. It is worth looking at the intersection between physical well-being and digital technologies, exploring the role of play as well as its possible risks in learning. It is not possible to ignore the pressures of modern life in which the "search for perfection" is pressing in the physical, cognitive, and academic spheres. Educational systems have the mission of empowering children to make informed decisions that help them take care of their own health and well-being, using technology in an agile way, but with protection against possible collateral damage [17].

For all this, knowing projects that use games developed and tested in the classroom can be very useful to inspire the design of new projects. Hence, this article explores examples of Erasmus+ projects in this field, compiled on the Erasmus+ results platform (E + PRP - https://bit.ly/3sZMYXt). In the case of this article, it focuses on ongoing research projects with a specific group of projects related to electronic learning [18, 19].

The following sections include five project examples of different educational fields (school, vocational education and training, and youth) and conclusions.

2 Examples of Erasmus+ Projects

This section explores five Erasmus+ educational projects that have developed an Android or iOS game. Those projects are part of the sample chosen for the research "Methodological guide for the successful use of digital technologies in education: Improving learning through European educational projects" [19].

The review of projects follows the guide for systematic reviews of research projects has been used as a basis [20, 21]. The stages could be seen in Fig. 1.
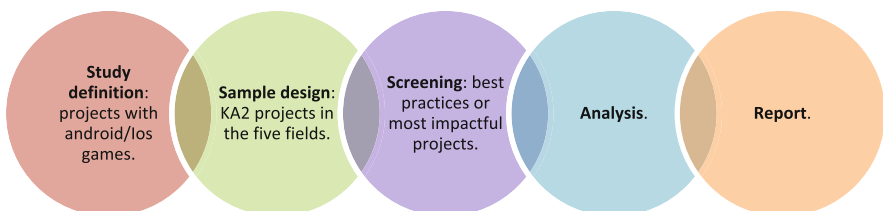

Fig. 1. Phases for the review.

The starting point is the database used for the previously cited research [19]. This database was established by selecting projects related to eLearning or ICT from different

educational sectors in actions KA1 and KA2 that have been classified as good practice. After analyzing the information collected from the projects, those who met the requirements were contacted to collect more information through a questionnaire. One hundred eighty-seven beneficiaries completed the questionnaire.

Different analyses have been carried out and those projects in which there were educational centers involved, with students and/or teachers, and had turned out to be sustainable over time, beyond the funding period, participated in an interview. The interview was intended to collect more information on the reasons for the success of those projects.

The last stage of the research involves conducting focus groups to exchange ideas on what makes projects successful.

As a result of all this process, a doctoral thesis will be written and published in 2023.

In the following sections only some of the outstanding projects that have developed games for education are shown (Table 1), especially those that have proved to be useful over time.

Table 1. Selection of projects (GP: Good Practice; SS: Success Story).

Field	Project	URL	GP	SS
School	2017-1-PT01-KA201-035847: Education in Mathematics in Game-based Immersive Contexts	https://bit.ly/398 D2nZ	Yes	No
	2017-1-DE03-KA219-035459: Fun And Curriculum oriented Exercises for: Information Technology	ttps://bit.ly/3NT HtSp	Yes	No
Vocational Education and Training	2016-1-BE02-KA202-017345: Strengthening capacities for caregivers to choose a valid lifting technique at daily practice	ttps://bit.ly/3Nj 64A1	Yes	No
	2016-1-DE02-KA202-003273: Fit for E-Commerce	ttps://bit.ly/3x6 3MgQ	Yes	No
Youth	2014-2-RO01-KA205-013607: The suitcase, the map and the voyage of a youth worker	ttps://bit.ly/3Mj VQ1c	Yes	Yes

2.1 School Field

This educational field is where there are more projects, which is why two projects have been chosen: one in which there is a mixture of institutions (KA201) and another that is only school centres (KA219). Both projects were selected in the sample for the research indicated above that has completed the questionnaire, conducted the interview and have participated in one of the focus groups carried out on early July 2022 [19, 22].

2.1.1 Education in Mathematics in Game-Based Immersive Contexts

E-MaGIC is a project that has been carried out with the participation of teachers, programmers and researchers from Portugal, Germany, Greece, and Italy.

The project partners are multidisciplinary: a software development company and professors from different backgrounds and backgrounds. Together they designed and developed a cutting-edge educational mobile game called Clash of Wizardry (available for free on Google Play https://bit.ly/2YkQNWW and the Apple App Store https://apple.co/34WXQHF).

The need from which the project arose is to make learning mathematics more attractive and ensure that students with serious problems in this subject feel comfortable working with maths problems.

This game has an innovative teaching approach that offers teachers help to improve their students' math skills. It can be used both formally and informally to help improve school achievement, thereby increasing the chance of success. It also promotes inclusion (the game can be adapted to the abilities and level of the student) while managing to motivate and inspire students to be interested in science and mathematics.

The project is fully integrated into the teaching program, a fact that contributes to its continued use, in addition, they have proposed subsequent projects to improve its functionality.

2.1.2 Fun and Curriculum Oriented Exercises for: Information Technology

This project involved the preparation, organization, and creation of a mobile phone application for an international competition in all the schools involved.

The participating schools were in Germany, Greece, Poland, and Spain. It was a collaborative work between teachers, who implemented the design, and students who created the questions and answers for the game in project groups. This allowed the students to improve their skills and knowledge in the subjects that were worked on for the game and contest (for example, English, history, etc.) and greatly improved their language and intercultural skills.

The latest Erasmus projects that the partners had carried out had shown that the students who participated in these activities were often extroverted. The challenge was to involve more students who are good at Science, Computer Science or Mathematics, who tend to be quieter and more melancholic with difficulties in communicating in foreign languages. However, they could contribute a lot with their ICT knowledge and their enthusiasm for programming and mobile phones. It was a way of motivating them by using their knowledge in the context of the curriculum.

The developed application is available for download (https://bit.ly/3mxzJtP) and is regularly used by the participating centres after the project.

As in the previous project, the methodology and application were integrated into the study plan of the schools, which favours its continuity.

2.2 Vocational Education and Training Field

In the field of vocational education and training there was also a wide variety of good practice projects with mobile applications, therefore two have also been selected that are

good practices and have developed this type of apps, one of them has participated in all stages of the research cited and the other was only part of the initial sample of selected projects.

2.2.1 Fit for E-Commerce

The main output of this project is an e-book that describes three key concepts of an e-commerce course: "Setting Up an Online Shop", "Facilitating Online Marketing" and "Fundamentals of Internet Programming". Thanks to this tool, students and teachers improved their digital skills in the field of e-commerce and developed an entrepreneurial spirit. And it is still used today.

Additionally, two software tools, PrestaClassroom and PrestaCollege, were developed to allow teachers to easily create learning environments using the open-source software Prestashop. The source code for all project results is freely and openly available at https://github.com/fitforecommerce.

The project is integrated into the training of the marketing specialty and had the participation of companies to carry out real practices. It encourages the development of e-commerce entrepreneurship projects that is totally topical. The fact of choosing a current theme with a wide projection capacity helps the projects to remain active.

2.2.2 Strengthening Capacities for Caregivers to Choose a Valid Lifting Technique at Daily Practice

Techniques to lift patients in an appropriate way help to avoid casualties among the caregivers, so it is advisable to improve training on the use of the correct lifting techniques, which could prevent injuries related to the spine. This, together with a lack of precision in the techniques and innovation in the way they are taught, gave rise to this project in which four products were developed: an electronic book based on best practices and evidence, resources for teaching and training of caregivers, development of the specific didactic approach when teaching patient management and the main result that was the mobile app as an innovative and technological method to deliver the training and contents.

The development of the app was done with the support of the Finnish technology partner and an expert in 3D animations and is freely available for Android and iOS and is called eUlift (https://eulift-app.com/es/).

One of the strengths of this project is being able to offer visual tools on professional practices that everyone can use as a learning tool and also allows collaboration and exchange of good practices among all stakeholders. These aspects guarantee a valid and useful project.

2.3   Youth Field: The Suitcase, the Map, and the Voyage of a Youth Worker

For the youth sector, a good practice project has been chosen that has participated in the first stages of the aforementioned research (sample, screener and questionnaire). It does not develop a mobile app, but it is related to the use of games to improve learning and for that goal they developed a web platform. It was designed to be used from any type of

mobile or desktop device. In addition, this project is not only labelled as a good practice but also as a success story, for this reason, despite not having passed all the phases of the research, it has been considered very valuable as an example that can inspire other educational projects.

This project aimed to create online tools that could facilitate young people's professional life planning, including non-formal learning, in addition to a basic knowledge at European level for the future youth worker.

All the main products are available online, free access, and useful till today (http://thevoyage.eu). Specifically, the outputs are:

1) The Career Box - Interactive career guidance guide.
2) Job simulator - Interactive area.
3) Online course on the competence of learning to learn, time management, information, and lifestyle.
4) Online course - Youth worker: the profession, responsibilities, teamwork, communication, types of intelligence, learning, motivation, diversity, conflict management, personal and professional plan, SMART goals, etc.

What has made this project useful to date and considered both a good practice and a success story has been that it addresses the clear needs of young people when facing the search for a job. In addition to providing interactive tools, easy to use with clear guidelines.

Both this and the previous projects are characterized by meeting real needs on innovative or current issues and integrating the products developed in the institutions, in addition to making them accessible to all interested public.

3   Conclusions

This article presents a group of Erasmus+ educational projects representing 3 sectors: schools, professional training, and youth in the field of interactive education through educational apps.

The main objective of the publication is to offer examples of projects with an impact in the different sectors in which the use of games through technology as a tool to motivate students in learning has been effective.

Each example presents a different solution to meet the real needs of a specific educational field and that are close to the social reality that students live. The developed applications continue to be available for use by the school community and are very useful. Not only are they still used by the institutions that participated in the projects, but they are also used by other related institutions and are available to educational centers that want to use them as educational resources.

Showing these applications and others like them can help many educational professionals to improve their teaching methodology. They can also be a source of inspiration to replicate these good practices in other settings.

The main success outputs of these projects are the design of technological solutions to cover an educational field in which they detected a clear need and have proven to be

efficient and successful in their proposed objectives. All of them have made products that are available to all users, an aspect that guarantees their transferability and impact on other institutions and users and makes their games sustainable and useful over time.

The challenge ahead is to keep these applications adapted to unstoppable technological progress. Sometimes the educational projects that are developed thanks to the European Union grants are not maintained beyond the grant period due to the need to adapt the developments to the technological changes of the moment.

To make sustainable projects, it is important to create an infrastructure in the own institutions that allow the products to continue to be updated and include them into educational practices and study plans.

In addition to this, sometimes it is necessary to seek support from the Administration or other institutions that can collaborate in the continuous maintenance of the resources. Another way to continue keeping it alive is to create a line of research with new projects that allow the scope achieved by those projects to be expanded.

These are some of the factors that have helped the projects mentioned in this article to stay alive over time and that can undoubtedly help other projects to also achieve a good impact and sustainability.

In conclusion, the good practices presented here are intended not only as resources for our teachers and students, but also as inspiration to develop new educational projects.

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