A Serious Game for Digital Skill Building Among Individuals at Risk, Promoting Employability and Social Inclusion

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Abstract. The EMPLOY project addresses the development of digital skills among young learners with the objective of enhancing their future employment opportunities in innovation-related sectors that are expected by policy makers to drive economic growth. Digital skills are considered among the basic and transversal competencies that are necessary in wide economic sectors and as such must be developed among individuals with diverse professional and career aspirations, independently of area. It also promotes the strategic deployment of ICT in education as a learning tool, and the development of ICT applications for learning and the integration of digital tools as complementary educational content within wider, blended learning and teaching processes. The integration of proposed technology and pedagogies offer broad learning benefits to both students and teachers by enhancing motivation, promoting long-term engagement with the learning process, providing timely and constructive feedback, and promoting critical and entrepreneurial thinking mind sets.

Keywords: Serious games · Digital skills · Employability · Inclusion

1 Introduction

According to the Grand Coalition for Digital Jobs [1] in the coming decade there will be a shortage of 900.000 ICT professionals in Europe in the ICT sector and ICT using sectors. This shortage is seen as a threat to economic growth as it may be an obstacle to business development activities of corporations and SMEs alike that cannot find skilled personnel to pursue entrepreneurial expansion. According to the Coalition, economic recovery and growth in Europe is expected to be driven by the knowledge economy, which has elevated needs on skilled personnel, especially in relation to digital skills. Some argue that for every job that opens in ICT 5 more jobs open in other sectors. Recognizing the potential threat to economic growth and sustainability of business activities in broad sectors, the European Commission has introduced a number of initiatives, including the Grand Coalition for Digital Jobs and the New Skills for New Jobs Agenda [2], that identify digital skills as core, basic competencies to which priority is given in the context of ET2020 [3] and other educational and development strategic initiatives.

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On the other hand, it is expected that there will be a loss of jobs with low skills that may reach as high as 16 M positions in Europe in the coming decade. This trend in the job market may be a contributing factor to rising unemployment rates and threaten social cohesion. Low skilled individuals, who in the present may be attracted by jobs that have low entry level requirements, may face increasing challenges in becoming employed as the demand for highly skilled professionals is expected to rise.

The EU-28 unemployment rate was 10.8% in January 2014 according to Eurostat [4]. This is the result of an increasing trend in unemployment which was 8.5% in 2001 and has been exaggerated during the crisis in the years following 2008. Youth unemployment rates are significantly higher exceeding 50% or even reaching 60% in southern Europe. The retraining or refocusing of unemployed individuals in relation to digital skills may contribute to closing the gap between competence availability and demand, reducing unemployment, and facilitating sustainable economic growth.

Individuals who are at risk of exclusion, including persons who are not employed and/or not in education or training (NEETs), have dropped out of school early, are of low social economic status, are migrants, constitute minorities, and others are at increased risk of facing employment challenges as a result of ineffective or misaligned skill sets and inadequate digital competences. This is a consequence of vicious cycles in which any of the above factors or combinations of two or more drive individuals at risk of exclusion, i.e. at the fringes of social networks, out of educational channels in pursuit of jobs with low skill requirements with the objective of covering day to day needs. The missed training opportunities further exasperate the mismatch between available skills in those individuals and ones demanded by the market resulting to further reduced possibilities of becoming socially included, active citizens pursuing broad options for personal and professional fulfillment.

The above point to the urgent need for interventions in education and training practices towards strengthening the digital skill profiles of individuals at risk of exclusion, with an emphasis on the next generation that will become professionally active in the coming years. Enhanced digital skill sets, driven by market demands, will increase the employability of this group for their own benefit by enhancing their ability to follow dreams, for the benefit of their communities through enhanced social cohesion, and for businesses through enhanced capacity of businesses to support economic activity in an evolving, knowledge-driven economy. It will further strengthen the competitiveness of Europe in the global economic environment through a highly trained work force that can support innovation-related economic activities.

2 EMPLOY, A Game-Based Learning Approach

The EMPLOY project aims at building the digital skills among young learners at risk of exclusion through strategic use of ICT, and specifically game-based learning that facilitates exposure to work-driven activities that require digital competencies, problem-solving capacity, and analytical thinking. The advantages of the proposed active learning, game-based approach are linked to increased knowledge retention, ability to transfer knowledge to the real-world, and learning games that drive

inspiration from the needs of the world of work thus broadening professional options through awareness of market needs and enhancement of skill sets.

EMPLOY is innovative by addressing the issue of digital skill building among individuals that are at risk of social exclusion early in life, in primary and lower secondary school, through activities that are linked to real world needs. By addressing digital skill development among youngsters aged 10 to 15, the project aims at preventing the issue of less than adequate digital skills among individuals at risk of social exclusion, which is often a result of reduced access to learning opportunities and services, from ever arising, thus promoting equity and inclusion in education. The project promotes the broadening of career options for individuals at risk of exclusion by raising awareness on professional profiles that will be in demand in the coming years and by building the skills that are necessary for entering the knowledge economy by:

- Increasing access to learning resources through openly available serious games
- Empowering learners to take control of their lives by addressing core digital competencies early, in school education
- Deploying and evaluating serious games as learning tools towards building skills among individuals at risk of social exclusion that will enhance their employability and as a result their capacity to be socially included and civically active
- Raising awareness on broadened professional development paths related to innovation

The project uses ICT in a strategic manner by introducing serious gaming as a means for exposing young learners to activities that simulate the real world but are age appropriate. Research shows that students remember only 10% of what they read; 20% of what they hear; 30% if they see visuals; 50% if they watch someone doing something and explaining it; and 90% of what they do themselves, even only as a simulation [5]. There is a wide consensus in the scientific community on the educational value of serious games towards enhancing motivation, engagement with learning processes, and knowledge scaffolding. However, scientists also agree that the educational effectiveness of serious games in specific learning contexts still needs to be tested. Serious games evaluation efforts are so far scattered and no common evaluation approach appears to be broadly adopted. Often, failure of serious games as learning tools is related to implementation that does not address all aspects of serious games, i.e. pedagogical design, gaming design, and user-game interaction design. EMPLOY contributes to research related to serious gaming evaluation in learning contexts by designing and executing an extensive evaluation strategy for establishing the added value of the learning games.

The project also innovates at the learning intervention level:

- EMPLOY promotes active learning by doing, which has been seen to significantly contribute to knowledge retention (FAS)
- It links gaming to specific learning objectives tied both to school activities (e.g. STEM education) and work practices
- It contributes to linking learning activities to desired learning outcomes through immediate feedback

- It empowers learners to transfer new knowledge to other educational and life activities through real-world inspired learning scenarios
- It promotes knowledge transferability through role playing
- It promotes analytical thinking skills, which are gradually favored in the job market as compared to routine manual and cognitive ones [6]
- It stimulates entrepreneurial thinking and creativity by encouraging learners to come up with original solutions
- It nurtures the development of latent digital skills that to a certain degree young individuals possess towards advanced digital literacy relevant in the world of work
- It exploits gamification features including competition, collaboration, and awards towards learning through activities that are inclusive and encourage participation

3 Design Goals of the EMPLOY Serious Game

Learning digital skills is sometimes resumed in learning how to use the most common digital tools in the market, focusing on a more mechanical and technical aspect rather than a more global approach.

In order to avoid this dry approach and to go beyond the simple use of a spreadsheet or a word processor, the EMPLOY Serious Game aims at presenting in an interesting way digital skills themselves rather than how to simply implement them. In other terms, detach the user from the digital tool to teach them how to use any tool in any circumstances.

Here is a list of a series of digital skill the game aims to cover:

- Understanding the concept of databases
- Using a search engine to find the desired information
- Understanding the concept and the management of digital identities
- Knowing how to use email
- Knowing how to use instant messaging
- Knowing how to use video calls
- Knowing how to use social media
- Shopping online
- Managing your bank account
- Using government online services and saving time
- Using accurate sources of support
- Teaching yourself simple tasks using video lessons
- Using feedback from other internet users to solve common problems
- Identifying and assessing accurate sources of information
- Getting quick, effective solutions to problems from safe, accurate sources
- Recognizing scams, phishing, and other types of cyber malevolence
- Protecting yourself from fraud or scams by recognizing secure websites
- Protecting your personal data
- Respecting the privacy of others/third parties
- Using secure websites for financial transactions
- Being aware about the notions of copyright and knowing the available solutions
- Protecting personal data

4 Design and Implementation of the EMPLOY Serious Game

By playing the game, the users of the software will be placed in an office environment where they will need to solve daily tasks of varying difficulty. All the tasks presented will require a certain digital skill or a combination of several of them to be performed adequately. Each in-game day correspond to a certain amount of game time and at the end of the game day in-game currency will be earned according to the successes and failures of the players in the given tasks. A certain amount of currency (fixed or variable according to some events) will also be deduced from the players' accounts every day for up-keeping/maintenance/etc. purposes.

The overall goal of the game is being able to keep playing, with the earnings from the successes in the daily tasks outweighing the general costs incurred.

The Unity engine and development tools will be used to create this game, ensuring a multi-platform reach for the EMPLOY product. A 2D perspective has been selected while retaining the full capacities of the 3D Unity Engine.

The game can be used both inside and outside of the classroom. The software needs to be used in the context of a course, and its design has been adapted to the constraints of classrooms and courses by warranting playtimes of various lengths, anywhere between 5 min and several hours.

Each game in the EMPLOY Project corresponds to the work life of an employee or entrepreneur or any worker faced with having to deal with computers and digital challenges in their everyday work life. The goal of the game is to keep playing, which in game terms means keep working. A savegame will be automatically created at the end of every in-game day, in order to allow the player to go back in time if they need or want to do so. At the beginning of every in game day, the player will start at a desk or in an outdoor environment. The tasks will be exactly similar in both cases, the main difference being that in the outdoor environment the player will have to use mobile devices instead of computers to complete the assigned tasks. Every in-game working day will last the exact same real time duration. Once the player arrives in the daily environment, he/she will be presented a general briefing for the day. There will be an infinite number of tasks presented to the player, in a serial fashion. The next task is only presented once the last one has been completed.

The player will be able to drag and drop important information from the task given to his/her work environment in order to achieve the task. For example, if the task is to send an email, the body, subject, recipients of the email can be dragged and dropped from the task zone to the work environment zone, here an email client.

The tasks could be presented by colleagues or clients, either in the flesh if the player is in an indoor environment or through email or text messaging if the player is outdoors.

Some task might require a combination of different skills. For example if an email is to be sent to the CEO of a company the player doesn't have the email address of, then it means that the player will need to do an Internet research in order to find it. Alternatively, the user could also use instant messaging to ask a colleague. Several approaches could be possible to solve a certain given task. As the whole game is based

Fig. 1. An early version of the main menu

on time performance, the amount of time each sub-task and task will take has to be carefully weighed for game balancing purposes.

A visual and/or audio cue will signal in advance the end of the in-game work time. Once it is over, the player environment freezes and a new screen appear, summing up the performance of the day. The daily summary of the players' successes and failure

Fig. 2. A later version of the game design, where the three zones described in Fig. 1 are still present but blend better into the environment

could be presented either as a detailed lists of all tasks undertaken or in a more simple fashion a screen to transform each success into a credit in the form of the game internal currency. Each failure could be transformed into a debit of in-game currency, but this might be a bit harsh as it is a double punishment. After the summary of the player's daily action, a certain amount of in-game currency will be deducted from the player's account. The screen detailing the successes and failures and the one summing up the daily costs could be merged into one.

This means that the players are obliged to succeed in a minimum amount of tasks per day; the exact number of those successful tasks will be ironed out during a game balancing phase later on during the game development (Fig. 2).

5 Conclusions

The EMPLOY projects foresees the creation of a methodological learning framework that exploits emerging ICT, and specifically active, explorative, and collaborative learning through serious games, for enhancing key digital and STEM competencies of school learners so that they are in-line with industry and market demands fostering employability. The framework will take into account analyses on the training requirements of school learners as well as needs for building the competencies of teachers and will be designed for integration into existing school practices enriching learning experiences and learning outcomes.

The project consortium will also author a proof-of-concept serious game for the development of ICT skills among individuals at risk of exclusion. The game will draw inspiration from real-life activities that deploy ICT for work purposes and will build digital capacity among young learners in primary and lower secondary education; the game interface will be available in all languages represented in the consortium through project partners, i.e. Turkish, Greek, Estonian, French, and Italian, as well as in English. An accompanying user guide on the proposed ICT-skill building serious game, acting as a reference on game use; will be available in Turkish, Greek, Estonian, French, and Italian, as well as in English.

Instructional support content in the form of good practice videos will facilitate the integration of proposed methodologies and tools into existing school practices, enriching learning for the benefit of the ultimate end-users, i.e. learners and teachers.

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