

Social interaction and gamification with youth at risk of social exclusion: The technological approach of the Keystone project

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ABSTRACT

This paper presents the Keystone project, which proposes a multidisciplinary approach to improve the opportunities of young people at risk of social exclusion. The focus of the paper is the technological approach built from the results of research using lifeworld analysis to identify the barriers and drivers to youth participation. This technological approach combines on the one hand, the KEY Tool, a simplified goal-oriented social network to share and interact with local and international peers; on the other hand, the KEY game, a false instant-messaging application based on a voodoo story, where the user has a key role. Several pilot groups worked under the programme implemented in the Keystone project, including working with those digital tools. Results show important benefits for participating young people in areas such as respect, digital literacy and multi-cultural abilities, and highlight several opportunities to take further advantage of these tools.

1. Introduction

According to Eurostat [1], populations at risk of social exclusion suffer one or more of these conditions: 1) above average at-risk-of-poverty rates, which means having under 60% of the net median equivalised disposable income¹; 2) severe material deprivation; and 3) a high incidence of households with very low work intensity. In 2018, 26.3% of the 16-to-29 age group in Europe were at risk of poverty, a 0.2% increase from 2008; 6.8% suffered severe material deprivation; and 9.4% lived in households with very low work intensity.

On the other hand, social exclusion goes beyond the economic situation, since it is also related to the perception that people have of belonging to society [2]. Among the subjective aspects that Pohlen [2] summarised as part of social integration, we find the difference between an individual's capacity to act and actual actions, as well as the individual's closest environment and their position in society, to cite some of the contributing factors. Bourdieu [3] highlighted the importance of *social capital* as one of the forms of capital, explaining that one's social capital depends on the size of the network to which one belongs and how powerful that network's members are. Members of social networks recognise their need for each other with feelings of gratitude, respect or

friendship, for example. They establish rituals of acceptance and limits to maintaining membership within the group. The group defends each and every one of its members, from the one who talks on behalf of the group to the weakest one. Belonging to a group gives the individual the opportunity to increase their relationships by means of different events and meetings that bring together similar people. Therefore, a lack of these relationships limits a person's capacity to take part in society.

This problem needs to be addressed, particularly in young people, in order to help them to improve their future opportunities. The likelihood of children and young people of suffering poverty and social exclusion is linked to their parents' situation, in terms of employment, household structure, education and number of dependent children, for example [4].

We can introduce gamification as a way to address this problem in young people by enhancing their motivation and trying to keep them engaged in the learning process. Gamification is defined as the use of game design elements in non-game contexts [5]. This is typically translated into the use of scoring, badges, levels and prizes in a more *traditional* (digitally based or not) learning process.

In this scenario, the Keystone (Knowledge, Enterprise and Young People – supporting youth transitions in the new economy) project

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¹ https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Glossary:Equivalised_disposable_income.

(2017-2-UK01-KA205-037106) is intended to help young people at risk of social exclusion to be aware of their own possibilities, recognise their surrounding problems and take action to improve their further possibilities. This goal is addressed with a three-point approach (the Keystone's programme), including the use of a collaborative face-to-face program, a simplified target-oriented social network (the KEY tool) and a gamified conversational-based application including different materials in a voodoo mystery story (the KEY game²). Five pilot experiences incorporating these three elements have been developed in Greece, England, Italy and Portugal. The pilots have involved a total of 177 young people [6].

The rest of the paper is organized as follows: Section 2 sets out key issues and relevant literature related to youth exclusion; Section 3 outlines the Keystone project; Section 4 presents the KEY tool as a meeting point for young people taking part in the pilots, both nationally and internationally; and Section 5 explains how the KEY game offers several training material items inserted in a gamified application. In section 6, we present the results obtained during the project regarding the use of those applications as part of an intervention plan. Finally, section 7 summarises the conclusions and implications of our research.

2. Youth at risk of social exclusion, social interaction and gamification: Related literature

Social exclusion has a number of triggers, which have been studied in the scientific literature ([7], cited by [8]): discrimination against immigrants, ethnic minorities, the disabled, the elderly and ex-offenders. However, several studies have also focused on how the use of Information and Communication Technologies (ICT) also constitutes a matter of social exclusion. Khalid and Pedersen [9] have concluded that, at least in higher education, one of the drivers of digital exclusion is social exclusion, understood as low incomes, ICT-avoidance as the norm, lack of motivation and commitment, and physical or mental disability. They found some recurrent patterns that usually occur regardless of the country or the area of living (rural, urban). For example, they found that some people suffer social exclusion due to their lack of digital skills and that a 'vicious cycle between digital exclusion and social exclusion' exists. This cycle is also related to the existence (or not) of infrastructure. Moreover, the concept of 'dual exclusion' is well-established in the literature. The evidence shows that, rather than digital technologies supporting the social inclusion of vulnerable people, they play a major role in reinforcing social inequalities themselves [10,11]. And, going deeper into the parts of capital, Bourdieu [3] has demonstrated that there is a cultural capital/class divide that also contributes to issues relating to social capital and access to opportunity and promissory networks (Woolcock & Narayan, 2000; Putnam, 1993; [12]). Taking this into consideration, the Keystone's programme needs to find a way to provide access to ICT.

On the other hand, the society of the early 21st century, which features large amounts of information available on the Internet and the massive use of them, has provided new possibilities for learning, entertaining and socialisation (among others), but has also built an increasingly demanding society. Thus, in addition to the need for political actions (legislation, institutions, service systems), education, both formal and informal, must be given a prominent place in the list of solutions [13].

In this networked world, ICT offer possibilities to learn further (but without necessarily excluding) than schools by exploring the digital representations or collections in museums, broadcast media, public libraries and other options that are available almost daily via the Internet ([14] cited by [15]). From that standpoint, being able to consume proper information from the Internet is a need, over all when users have a lack

of training in this field or when they are not used to use the Internet to learn.

Actually, although the possibility of using ICT for learning is a reality nowadays, 84% of young people in Europe use the Internet to interact in social networks and 88% to send and receive e-mails [16]. Indeed, the use of social networks is considered as a means of social inclusion by digital natives ([17], cited by [18]). Young people use these media to share information, which has led to their incorporation into the cultural and social spheres ([19], cited by [18]). Van den Bosch et al. [8] have explained, after a reflection on other authors' findings, that the influence of ICT on inclusion and learning is more related to how someone uses ICT than to whether they can access them or not. Moreover, they have proposed using ICT and, in particular, social software, as a tool to complement other face-to-face activities developed for young people facing social exclusion and the work that welfare organizations usually perform with them. More precisely, they developed the INCLUSO project, which included a manual on how to use social media tools in a safety focused way, aimed at supporting social inclusion of young people. This perspective is needed to be considered as a crucial factor to train youth in risk of social exclusion.

On the other hand, another engagement strategy is worth mentioning: gamification [5]. Gamification is a well-known technique that introduces game elements into environments which are not fun in nature. A large number of studies and applications related to this concept have been developed in recent years (see, for example, the literature review by Dichev, 2017; or, more recently, [20]). In particular, there are some proposals that include using gamification to foster any kind of education.

Gamification is commonly used in European projects. For example, the Social Seduction project [21] was intended to train people at risk of social exclusion in social economy entrepreneurship skills. To do that, a gamified learning experience was developed in which users played the role of social entrepreneurs while they developed their business plans. This process, assisted by a facilitator, allowed users to meet other people in similar circumstances, to reflect about how they could contribute to local development while they built their own enterprise ideas and to safely gain first-hand experience in how a start-up enterprise is run.

However, gamification has also been used in many other scenarios, as Rauch [22] explained: contributions in forums, engaging users with products and unlocking new educational content, for example. Still others can be found in the scientific literature: behavioural change [23], energy saving [24], e-health [25], marketing [26], human resources [27], etc.

In this paper, we are interested in training and education, a field in which gamification has also been widely explored in the last years, as summarised by Ofosu-Ampong [28]. In particular, we include narrative as a significant part of our gamification educational approach, which has been proven to be highly effective but is still poorly covered in the scientific literature [29].

In the Keystone project the consortium has combined the face-to-face work typically delivered by organizations working on the ground with excluded young people with social interaction and gamification, in order to provide a comprehensive approach and improve the likelihood of young people engaging with programs.

Thus, this literature review supports the need for a comprehensive solution which combines providing the infrastructure to have access to technology, the training to discover and get interested in other uses of ICT as part of learning and formative interrelation, and narrative-based gamification as a winner bet to maintain motivation.

3. The Keystone project: An overview

Keystone (Knowledge, Enterprise and Young People – supporting youth transitions in the new) is an Erasmus + project (2017-2-UK01-KA205-037106) placed in the KA2 action (Cooperation for Innovation and the Exchange of Good Practices). Keystone's main goal is to connect

² EvilMind Entertainment as collaborating company in the KEY game development.

the training program with interests and needs of young people, especially those who are at risk of social exclusion, to foster their interest in learning, make them aware of their possibilities and limitations, and to encourage them to get involved in changing their own lives as well as in improving their communities.

To develop this project, a multidisciplinary partnership was created between Arcola Research LLP (United Kingdom), coordinator of the project, contributing with its experience in educational research, work with young people, and developing and applying innovative research and evaluation methods; from the Universidad Internacional de la Rioja (UNIR, Spain), the UNIR Research group (currently, the Research Institute for Innovation & Technology in Education – UNIR iTED), focused on Information and Communication Technologies applied to education and innovation in education; Borgorete (Italy), who worked in several EU projects for empowerment and re-qualification for the labor market, working in areas including outreach, community animation and learning for young people; Mind2Innovate (Greece), who works in education, training, lifelong learning, social inclusion, employment and innovation; and from the Universidade Catolica Portuguesa (Portugal), the CEPCEP group (Study Centre on Peoples and Cultures) is experienced in a variety of relevant fields, including skills anticipation and development, medium and long-term employment scenarios, skills auditing, low-skilled policy research, migrants and job opportunities, and education and training needs in the context of lifelong learning programs (authors).

The project started by carrying out a lifeworld analysis (LWA) on drivers and barriers for youth engagement [30]. As is well known, such an analysis puts the focus on ‘lived experience’ – in this case how the world/life is perceived by disadvantaged young people in their daily lives [31]. In this case, the analysis was intended to act as a guide for the design of the training program and the technological tools. To develop this report, partners from Portugal, Italy, Greece and United Kingdom developed a two-phase methodology: 1) a desk research review; and 2) focus groups with young people. After an analysis combining results from the four countries, several key findings were obtained. These findings are summarised here:

- Young people need to keep real-life physical connections, not just digital ones, in order to keep them integrated in the mainstream, feeling safe, learning and developing themselves. They also like a training programme involving vocational, social and emotional skills. And they need to have a ‘role model’ to follow, professional guidance and people in whom they can trust.
- The policy analysis, which focused on assessing national public policies for people at risk of social exclusion, identified a need for proactive policies and showed the importance of involving a facilitator or animator to support the integration of young people and their empowerment as co-creators of support programs.
- The intervention analysis showed that better results are obtained when interventions are co-produced with young people, focusing on their interests as well as being relevant and realistic. Interventions also work well when they provide practical links between young people’s and the rest of the world’s reality, mediated by trustworthy mediators; and, in order to maximise results, when they foster coordination and collaboration between organizations and NGOs.

Furthermore, observational work with young people and specific communities in the UK [30,6] in particular suggest that class, education and culture play a part in the ways in which digital tools and social networking (i.e. phones vs. PC-based platforms) are used, and which tools and platforms are most associated with access to power and citizenship.

From those conclusions, and previous successful experiences like the Social Seduction project [32], which worked with people in risk of social exclusion focusing the attention on benefiting local communities, the KEYSTONE Project consortium developed a Collaborative Support

Programme (CSP) to offer a comprehensive training intervention to young people at risk of social exclusion. This CSP was based on three pillars: 1) periodical face-to-face meetings in a physical place; 2) a *fixing real-life, local problems* approach; and 3) a technology-based communication and training strategy. This CSP was concretised and developed in four of the countries participating in the project, making a total of six community labs: two in London (UK), one in Lisbon (Portugal), one in Perugia (Italy), one in Athens (Greece) and one in Thessaloniki (Greece). All these labs followed a common spirit of promoting creativity, collaborative work, and social innovation, guided by local mentors, in order to achieve both individual and common benefits (‘what’s broken and how do we fix it’). The intervention was developed in the autumn of 2019, reaching a total of 177 participant aged from 14 to 20. Although different characteristics could be found in the different labs, the typical participants had a disadvantaged background, came from single- or absent-parent and/or at-risk-of-poverty families, and often belonged to ethnic minorities. The results of the intervention showed that 75% of participants expressed that they learned new things because of participating in the programme, 74% said that they would change their future behaviour, and 67% stated that they changed their thinking about life [6].

The technological approach in the Keystone project, which constitutes the focus of this paper, is based on two ideas: 1) connecting with young people by providing them with a theme-centered and supervised (simple) social network; and 2) engaging them in the training process with a gamified application which delivers content whilst they take part in an engaging and mysterious narrative journey. These two ideas, together with the inclusion of the technological approach into the global CSP, try to avoid the ICT’s inequities presented by Khalid and Pedersen [9] and Bourdieu [3]: all the users work together focused on the same goal, they are supervised to help them when a lack of knowledge or training provokes some rejection, and the infrastructure is provided in the labs where they meet.

In Fig. 1, we present a flowchart to clarify the work process. The starting point is the LWA, from which the consortium obtained all the conclusions related to the target group. These conclusions allowed designing the CSP and the technological approach included in it, meaning the needs to be faced, the perspective to better results and the training technologically based approach. Since the gamification is proven to be a successful technique to be included in people at risk of social exclusion learning processes, a specific study was conducted in that field. From that study, the consortium’s previous experience, and the advice of game designers, the gamification strategy was developed, based on the most commonly used gamification elements, including narrative and contents (see Section 5).

In Fig. 2, we have represented the main elements in the technological solution, which are further developed in the next section: YouTube would act as a main entry point to the technological support of Keystone, which is a video-based social network itself, allowing comments and likes. This entry point would give young people the opportunity to know about the KEY Tool, a supervised, theme-oriented, smaller and simplified social network which would be the center of the labs digital work. From the KEY tool, users link to the KEY Game, a gamified application designed to deliver training contents while they took part in a story in which voodoo playing a starring role.

4. The KEY Tool: An international and supervised meeting point

As previously explained, the KEY Tool is a theme-centred and supervised (simple) social network which was designed and developed on the basis of recommendations from the LWA [30]. In particular, we followed the recommendations regarding the technological approach, which can be summarised as follows:

- It needs to allow young people to share the activities they do and interact with others.

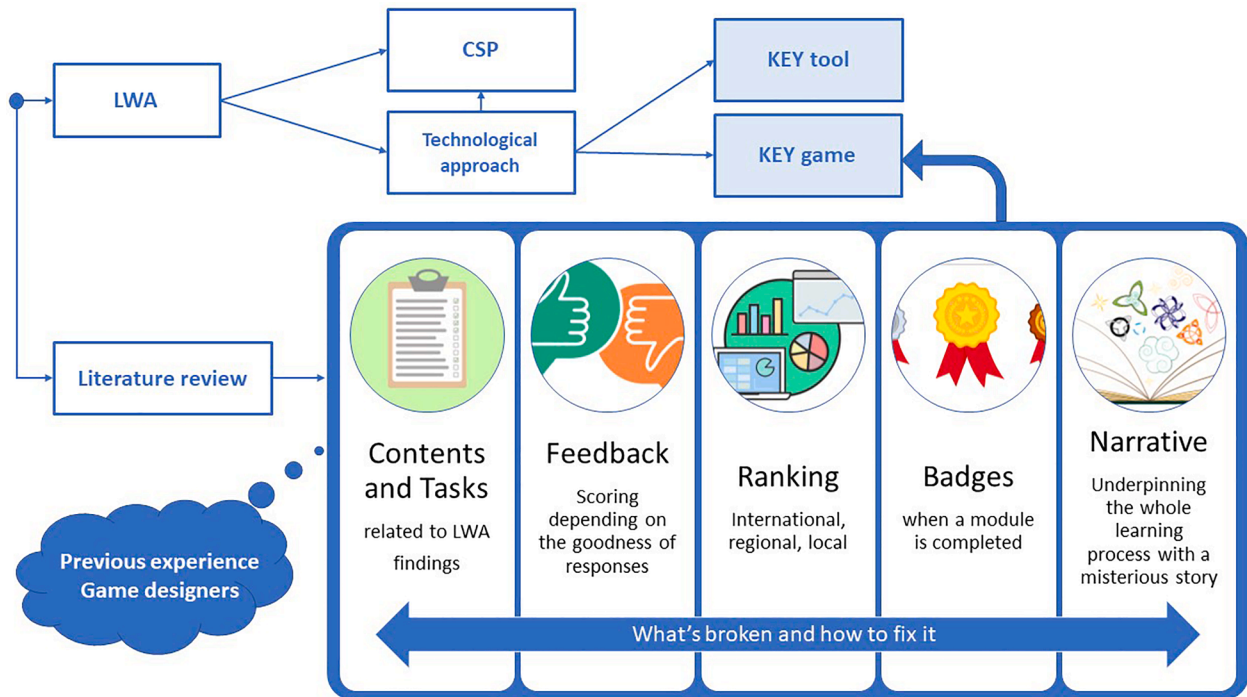


Fig. 1. Keystone project flowchart.

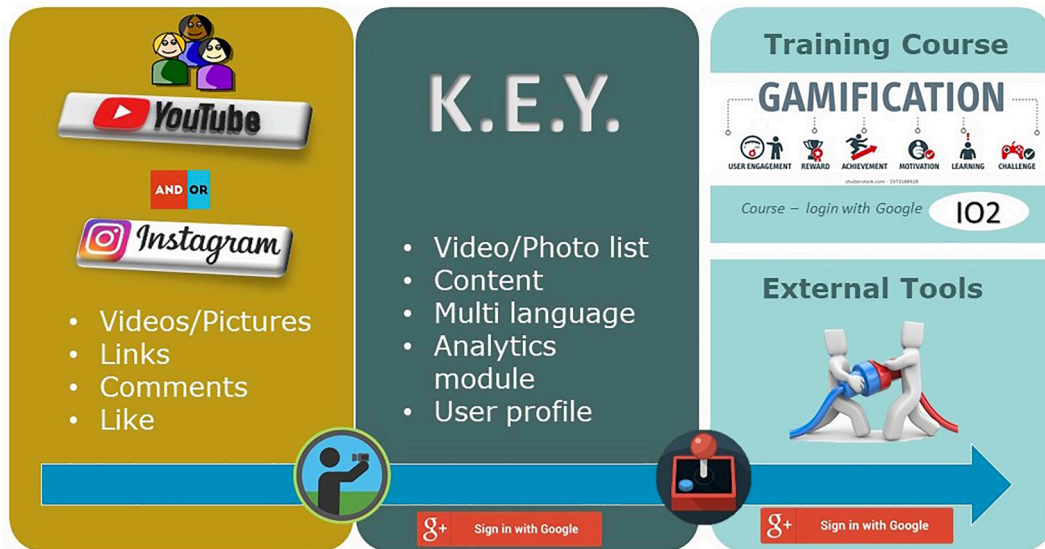


Fig. 2. Keystone's technological solution abstraction (). adapted from [33]

- It should have a user-friendly app to facilitate the uploading of content, allowing an interactive learning space within the training program.
- It should allow meetings and messaging with a mentor.
- It has to include respectful language, with control policies.
- Each user has to have a profile, connected to his or her other social network profiles, to feel represented within the intervention.
- It should include a competences passport, so users know what has been achieved and what still remains to be accomplished.
- It should have clear rules about participating and monitoring participation, to guarantee respectful interactions.

- It should be attractive and simple to use, including automatic responses to questions about who participants are, what they like or what they want to do in life.
- It should provide information about events, online training, legal information, job opportunities, internships, etc., while also publicising the project's results and young people's achievements.
- It should include a test allowing participants to be able to evaluate their self-growth and social/emotional development
- It should introduce concepts such as tolerance, respect, gender equality and human dignity by using gamification.

Moreover, there are two conclusions that were specially taken into consideration in the design of the technological approach in Keystone

[30]: young people primarily use the Internet for Facebook, Instagram, SnapChat, and WhatsApp; and they like computer games (combat and action games) and PlayStation (soccer).

Thus, keeping these previously explained conclusions in mind, the KEY Tool [33] has been developed to encourage participation in a small supervisor-controlled social network. The intent is for them to share activities and creations developed by trainees in the frame of the CSP, but also any other content that supervisors judge of interest for them. This way, the project works in the direction that Van den Bosch et al. [8] explain about guiding the way in which people at risk of social exclusion use ICT: technology is used to learn about something of their interest as a complement of face-to-face activities.

4.1. Organizing the international participation

As explained above, a common goal was pursued in all of the community lab locations via the collaborative support programme, but flexibility and differing local needs helped frame the specific content and approach in all of the local ‘community labs’ through a co-creation approach. Following this approach enabled a knowledge community to be built, both locally and internationally.

To organize content and work from each country, and following a bottom-up approach, an individual space was created for users in each country/language to interact. Thus, the KEY Tool had four language-based spaces, one for each of the following: English, Italian, Greek and Portuguese. This division was also intended to avoid dropouts because of a possible mess of languages on the same webpage, which some of the users could not understand. The selected language depended on the default language set in the navigator. If that was not one of the available languages, the user would see the English homepage.

Additionally, the KEY Tool enabled interaction with international participants, since both trainees and supervisors could easily access other landing pages in order to read, comment or contribute to another language’s site. To access content in other languages, a user had only to select a different language in the menu (Fig. 3).

4.2. Moderating participation: Roles and visibility

In order to meet recommendations from the LWA, the KEY Tool was moderated to supervise the correctness and appropriateness of messages and contents that young people shared. To organize this behavior, a set of visibilities was implemented by a set of roles, as described below.

Public access allowed everyone to access the URL <https://kt.unir.net/keystone/> and read the contents in any of the languages.

If someone wanted to *contribute* with a comment or a post, they needed to register in the tool by using the Google single-sign-on. Everyone could contribute and, in particular, users from all the labs were asked to register in order to share their activities and to comment about others’. In order to become a contributor and be able to propose and upload content, the user had to go to the item ‘Contribute’ in the menu shown in Fig. 3.

Moderation was carried out by approved users who were allocated a *supervision* role. This role is currently held by partners in the Keystone project, who lead the labs. They are in charge of reading and judging the content proposed by contributors, allowing or denying its availability for public access. Although there are no strict rules to approve content, the principles of respect and relevance are always met.

4.3. Organizing contents into specific and common categories

In order to be able to provide young people with accessible and organized content, different categories were established. Those categories came from a deep analysis and debate within the partnership. They were intended to: 1) provide a complete but simple set of categories; 2) obtain an interesting and understandable set of categories; and 3) facilitate finding and cataloguing proposals from contributors. As a

result, the next categories were defined [33]:

- Life’s challenges: the challenges that young people face.
- Needs and problems (as an example in Fig. 4): How can services and support for young people be more relevant?
- Community: What’s up with belonging? Communities, friends, family, peers.
- Talents: developing your skills and talents: The creative potential that young people have, finding and developing their talents.
- Learning: Education, personal development and training opportunities, learning support.
- Opportunity: Services for young people. Employment and development opportunities.

4.4. YouTube: A misleading entry point

One of the main goals of the project was to include the technological solution as a part of the daily routine of the young people. Since the LWA revealed that young people use the Internet for social networks, the partnership designed an attractive entry point via YouTube. The underlying idea was to connect young people to the project by a YouTube channel³, where interesting content would be uploaded. That content would have to be discussed and commented on in the labs and in the KEY Tool.

However, although the YouTube channel was managed and several interesting videos were uploaded, its usefulness was limited to a repository function, since young people came to the KEY Tool directly. The KEYSTONE lab leaders in each country published a post in the KEY Tool identifying the most relevant videos in order to give young people the information together with the video, and provoke both face-to-face and online debate.

5. KEY Game: The gamified contents delivery tool

As part of the CSP, a common core of content needed to be developed, to be further explored according to the needs in each of the labs. After a deep and reflexive discussion inside the consortium, a triangle-based proposal was developed, composed of three sections, which were then divided into nine modules, organizing content according to the following structure [34]:

- **Section 1:** Understanding the context: how the user defines their ‘selfhood’ and identity
 - o Module 1: Personal awareness and development tools
 - o Module 2: Who can I turn to?
- **Section 2:** Who am I? / what’s my context: the ‘lifeworld’ in which the user operates; the challenges - and resources - that operate in the lifeworld and which affect the user’s life opportunities
 - o Module 3: Making sense of my lifeworld
 - o Module 4: What’s work for?
 - o Module 5: Where I live and life opportunities
 - o Module 6: Learning for opportunities
 - o Module 7: Belonging and otherness
 - o Module 8: Staying healthy
- **Section 3:** What can I do?: the strategies and actions the user can take to change who they are in their context and so change their life opportunities
 - o Module 9: Taking action

Those items were presented in a set of 85 selected videos, taking the advantage of taking learning further than schools but doing a selection to focus the attention on the goal that the Keystone project is pursuing

³ This YouTube channel is available at the URL https://www.youtube.com/channel/UC_w6WysHCwcFK9VXLARfHOg.



Fig. 3. Language - content selection in the general menu.

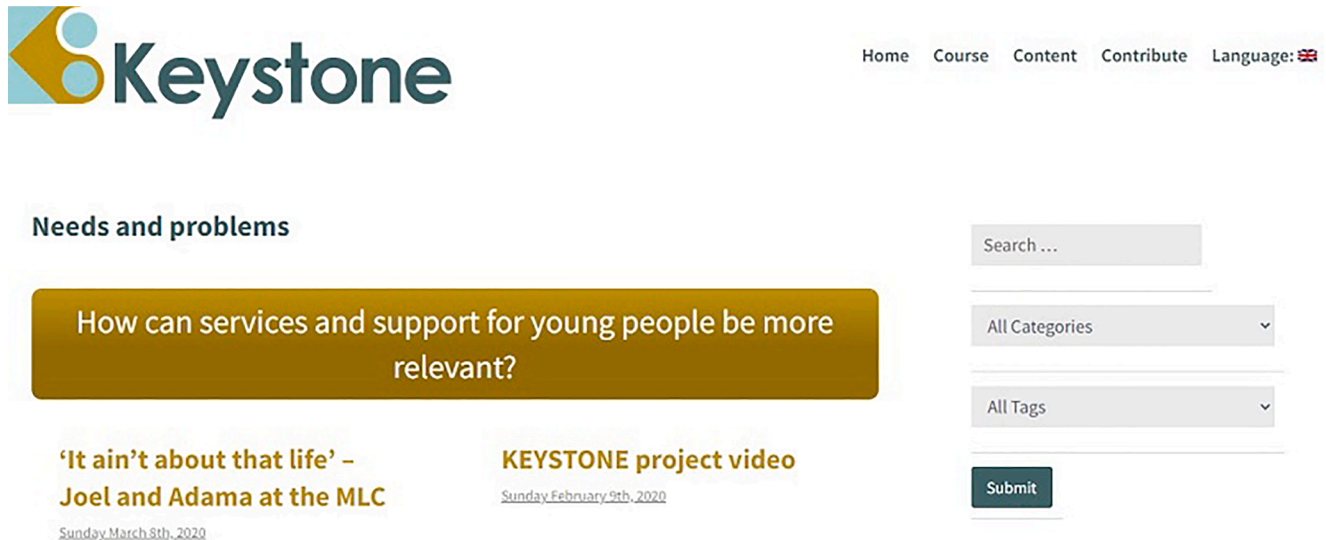


Fig. 4. Screenshot of the main screen for the category 'Needs and problems' [6].

[14] cited by [15]. These contents, with related quizzes, were later revised and curated to produce a smaller set of the most relevant ones.

These contents were included in a gamified learning experience, implemented as a responsive website⁴. This application, which can be accessed with different kinds of devices, is driven by a digital fantasy story along which the curated contents are included. The rest of the material is available at the end of the game.

To design the gamification approach, lessons learned from scientific literature were considered. For example, good gamification practices from several enterprises were considered as inspiration [22]:

- The Oracle forums were a gamified community where useful answers were rewarded with points and badges, leading to leaderboards and motivated users. Considering this success case, we include points and badges in the KEY game. In addition, to properly manage local, national, and international users / communities, we give the option to include a filter in order to have the own position in each of those situations.
- Oracle also presented some games to foster the use of some of its products. Following this idea, the KEY game presents contents in a gamified application in order to provide useful knowledge for users, to be used in the CSP activities.
- Levels are one of the techniques that designers consider when gamifying. In KEY game, badges are linked to levels and to models in

the educational contents. That way, both educational and motivational elements are related.

Furthermore, some other case studies were considered:

- Involving users in the design of gamification was a success practice in changing behaviors of secondary students [23] and a conclusion when studying gamification in e-health. Although users of KEY game were not involved in the gamification process, the consortium took into consideration the LWA conclusions as well as local experts' opinion in order to get the application as closer as possible to users' interests, as Sardi et al. [25] and Hsu and Chen [26] conclude. Moreover, Sardi et al. [25] explain that an expert confirmation about validity of the tool would assure its effectiveness; and including game design expert would reinforce the motivation mechanism.
- Bergman et al. [24] studied the influence of avatars in the effectiveness of motivation. Since further research is needed to obtain final conclusions, the KEY game does not include any avatar and images for the messaging application are very neutral, except for the starring character's sister.

Taking all these findings into consideration, we adhered to the MDA (mechanics, dynamics, and aesthetics) model proposed by Hunicke, LeBlanc, and Zubek [35] (cited by [20]) but a deep study about gamification elements to be further studied was conducted. According to Dichev & Dicheva [36] and Ramirez & Acquire [29], studies including narrative were scarce, but the later study by Manzano-Leon et al. [20], also managed in Ramirez & Squire [29], highlights that including

⁴ <https://kt.unir.net/keystone/keygame>.

narrative-based strategies in low motivated students can be very effective, noting that both narrative and challenges are now more frequent in educational gamification proposals. In addition, they explain that a known or shocking narrative can raise the students' motivation. In that frame, we focus on narrative as a relevant component of aesthetics. Additionally, we include achievements, tasks, and correct answers of the questionnaires as a matter of feedback. Finally, the classic PBL triad (points, badges, and leaderboards) is included, which is largely used in gamification [36] (see Fig. 4).

Moreover, according to Bogost [37], videogames can (and must) be perceived as a social media with cultural and social effects. Actually, he explains how rules and procedures build the procedural game rhetoric, which allows players to understand the game world and to compare it with the material world. That way, players can interpret, critic, and get involved in the situations derived of the game. Similarly, since gamification includes game elements in non-fun activities, we can assume that this idea can be extrapolated to the narrative included in the KEY game. This idea is also supported by Ramirez and Esquire [29], who say that users could get greater control on their learning and provide reflection opportunities when gamification is well designed in a learning system. However, they also recognize the difficulty of implementing a good gamification approach, since it is not a mere almost-automatically-built layer which can be included in any system, whatever its goal is. Moreover, authors cite a YouTube series which highlights how enterprises can persuade their employees to work harder motivated by gamification strategies while they obtain more and more benefits (whatever they are). This negative perspective is also underpinned by other authors cited in that work, who show that gamification can provide users with an unreal feeling of progress. On the other hand, that document also include authors who underpin psychological bases justifying the use of gamification techniques. In any case, Ramirez and Esquire [29] conclude that good and bad examples of gamification exist and the key point is to do a good user-centered design.

To translate the content into the gamified experience, each of the first eight educational modules were translated into badges. The ninth one was fully developed face-to-face, to support young people co-producing action research projects aiming to solve concrete issues in the local environments. Experiences, conclusions, or any other relevant finding from the action would be shared with the community by the KEY tool.

The selected videos were embedded in the application and presented to the users as the story progressed. To encourage young people to see videos, a score of 40 points was assigned to each of them. When a user had seen a video, they had to validate it by clicking on a button. Quizzes, however, had a score of 100 points, but the score obtained depends on how well the user answered them. Since all the quizzes had the same scoring rules, the reward or penalty for successes and failures are calculated in terms of the number of questions included.

The gamified application is conversation-based. A main story is developed in terms of the answers selected by the users. It has a simple decision tree with a set of pre-defined answers, which gives the user the illusion of deciding the story.

Pretending to be an instant messaging application, the user becomes, unexpectedly, the key actor in a story that starts when a strange woman sends him or her an instant message. This woman is lost in a strange world and is unable to remember anything. The user helps her to discover what happened to her, why she is lost and how to solve the problem, which is embedded in several voodoo enigmas.

The application has four characters who interact with the user along the story. When the user has to answer, a set of options are provided and they have to choose the most appropriate one, in their opinion. Answers from the character will be in line with the text from the user and the story development. Two screenshots of the application can be seen in Fig. 5.

6. Using KEY tool and KEY game in community labs [6]

As tools to support the work performed in labs, the KEY Tool and KEY game have contributed to the dissemination of information, to get inspiration and to keep users in labs connected, both within the country and, later, with labs in other countries. Thus, the face-to-face program and work have been complemented with these tools, which offer the possibility to share local concerns, ideas, activities and proposals with other young people in a similar situation.

6.1. Results

In order to control the incoming traffic to the KEY tool, the general behavior of users was monitored with Google Analytics, which offered comprehensive reports about type of connections, time slot, connection time or device, amongst others. On the other hand, sessions in KEY game were monitored with an ad-hoc application, which offered information about the number of connections, country and scores obtained by each user.

To show the activity performed with these tools in labs, Table 1 summarises the number of posts published in KEY Tool, separated by language/country, in the time slot when the pilot was being developed. Compared to 40 posts expected, the KEY Tool registered a total number of 174 posts, 163 out of them finally published and 11 still in draft. This means a 335% (or 307.5% if we discard drafts) greater success rate than the consortium committed to when the project started.

During the pilot, a total of 679 sessions by 177 users were started in KEY Tool, including all the roles allowed. According to the final report [6], 120 out of those 177 were registered in the CSP (Fig. 6).

On the other hand, the bounce rate is reported as 37.11%, which means that 37.11 users out of each 100 left our website without interacting with the page, just reading in the landing page. Finally, the average connection time was 6 min and 47 s (Fig. 6).

In addition to the analytics, a focus group was developed to analyse the experience. Speaking about the use of KEY Tool, one of the stakeholders highlighted that *'Another important positive was the possibility of contacting with other young people from a different country. These young people never leave the neighbourhood. Keystone provided several opportunities for them to experiment outside new and safe experiences in the physical space, but also in the virtual space. They experienced something unique for them: "the world is bigger than my neighbourhood"'* [6]. However, although the benefits of the tool were confirmed by the evaluation, participating young people also identified improvement opportunities. In particular, the KEY tool was perceived as time-consuming, and they would have liked it to be more similar to such applications as WhatsApp or SnapChat.

The number of users registered in KEY Game was 44, as shown in Table 2, with further details about location in Fig. 7. Out of these 44 users, 23% reached the last level. Users obtained, on average, three out of nine badges available in the game.

The feedback obtained from these users revealed that they liked the game, but they had few opportunities to play during the pilot: *'The game was fun and I enjoyed the tasks; sadly we didn't spend more time to play the game'* [6]. Stakeholder interviews confirmed that the game needed further development.

In summary, the outcomes reached with the KEY Tool and KEY Game could be outlined as follows [6]:

- Interaction with young people in other countries, which enhanced inter-cultural respect and awareness of different cultures, contexts and nationalities.
- Improvement of language skills, in particular, practicing English to be able to interact with people in other countries.
- Improvement of digital skills, reported by 75% of participants, due to the use of several digital tools, including KEY Tool and KEY Game.

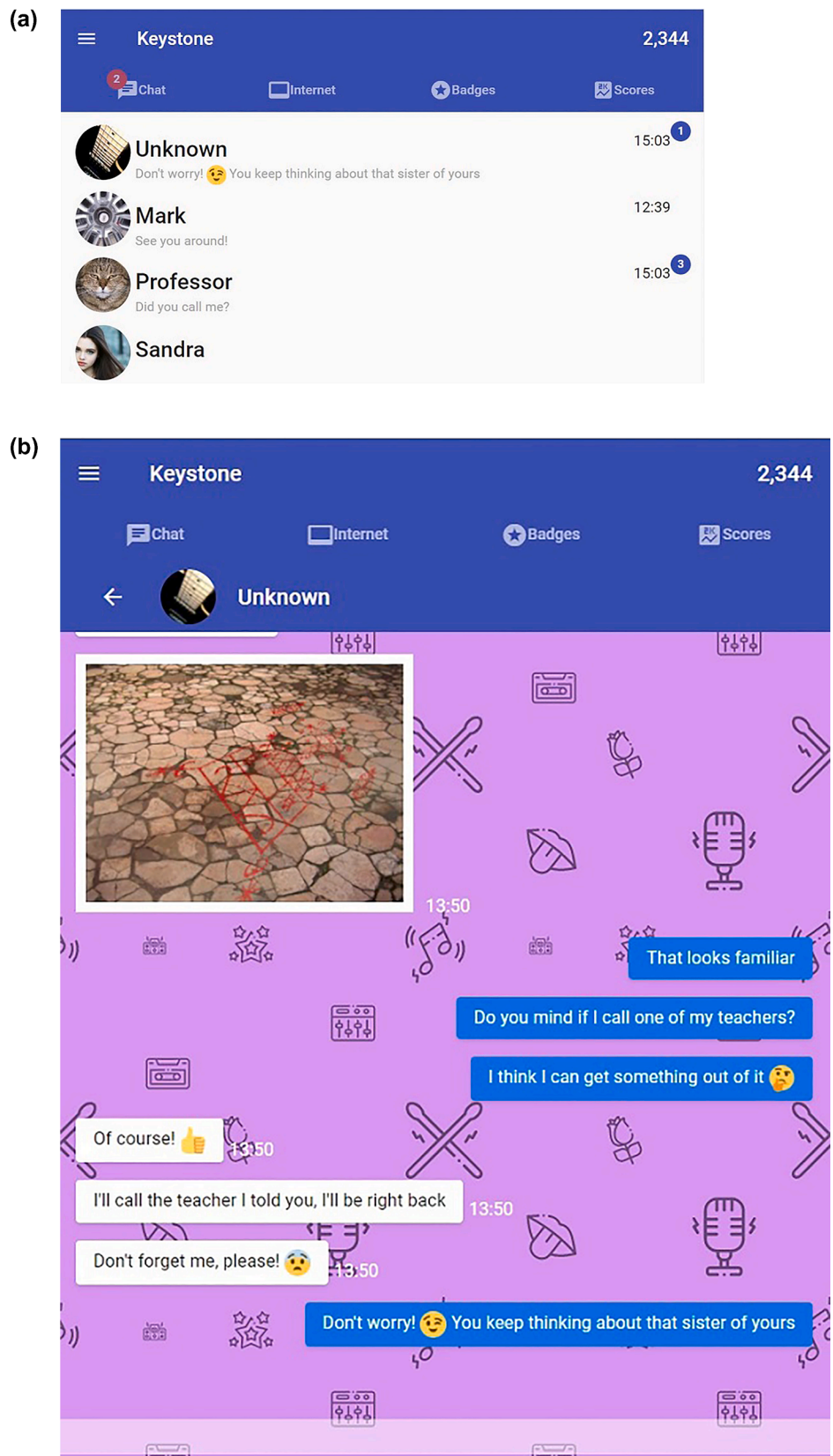


Fig. 5. KEY Game characters and example of conversation [6].

Table 1
Number of posts in KEY Tool [6].

Language	Published posts	Draft posts	TOTAL
English	54	4	58
Portuguese	33	1	34
Italian	34	0	34
Greek	42	6	48
TOTAL	163 ²	11	174 ¹

¹ Posts published in several languages have been considered once for each of them. Some posts have no language assigned. Posts posted by the users Key-stone_project and admin_jose have also been taken into consideration for the final count.

number of posts, over 300% higher than expected. This surprising level of interaction was translated into a better understanding of features, similarities and differences between different cultures, since young people were allowed to explore and comment on the activities from other countries. This finding supports the claim by [19], cited by [18], who stated that this use of social media incorporates young people to different spheres. Young people also improved their language skills and inter-cultural competences, taking advantage of the informal learning possibilities provided by the Internet [8,14] cited by [15]. Additionally, the number of users registered in the KEY Tool demonstrates that it was clearly used by more users than those participating in the pilot labs.

Moreover, indicators of traffic for KEY Tool were positive, since the

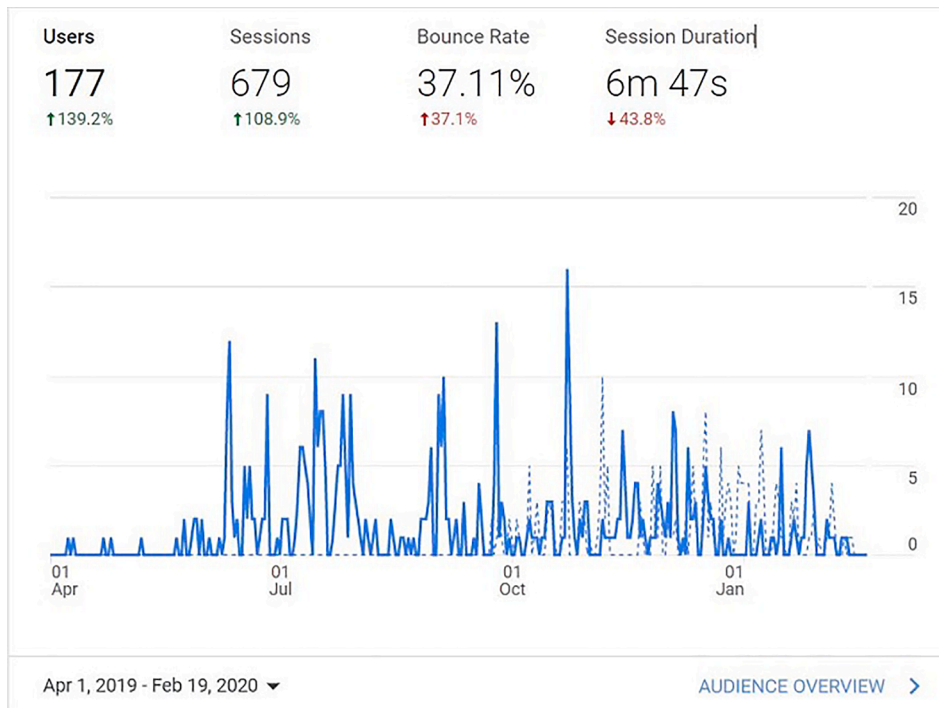


Fig. 6. Google Analytics information - connections to KEY Tool [33].

Table 2
Number of users in KEY Game [6].

Language selected	N° users
English	22
Portuguese	8
Italian	4
Greek	10
TOTAL	44

- Increased learning outcomes, since the content of the keystone project was delivered in non-traditional ways, including outdoor activities and the gamified experience (KEY game).

6.2. Discussion

The KEY Tool and KEY game had an important role in the project development, in different ways, as explained in the previous section. On the one hand, the CSP and, more precisely, the community labs, provided young people an access point to ICT together with trainers who showed them different ways to use the Internet and promote their digital skills, as several authors proposed [10,9,11]. On the other hand, we could assume that the fact of young people mostly uses the Internet for social purposes [16] contributed to the significant increase in the

bounce rate was in the ‘excellent’ range according to some studies in the field⁵. The session duration of 6 min and 47 s was also remarkable, since the most popular current social networking app (TikTok) has 10.85 min, followed by Pinterest, with 5.06 minutes.⁶

Finally, on the positive side, we could guess, although further studies would be needed to confirm it, that the narrative-based gamification contributed to the enrollment of users in the programme [29]. According to Kang [38], just a 6.6% of students taking a MOOC finish the course. The gamified approach presented in the KEY Tool registered 23% of users reaching the last level, which is a remarkable number.

The evaluation also highlighted some opportunities for improvement. We will take the improvement opportunities for the KEY Tool and KEY Game, which were linked to the time limits on the program development [6], into consideration for further development. We will also consider the stakeholders’ views about their good points: ‘The main constraint to game utilisation appears to be lack of time and opportunity, rather than aversion to the game itself’. Although good opportunities arise

⁵ <https://www.gorocketfuel.com/the-rocket-blog/whats-the-average-bounce-rate-in-google-analytics/>.

⁶ <https://www.statista.com/statistics/579411/top-us-social-networking-apps-ranked-by-session-length/> <https://www.statista.com/statistics/579411/top-us-social-networking-apps-ranked-by-session-length/>.

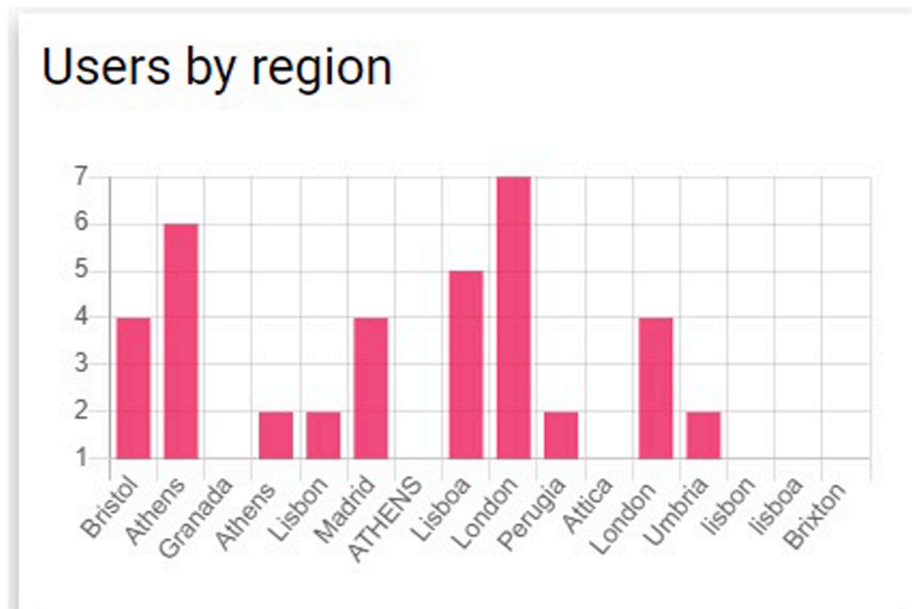


Fig. 7. KEY Game Users by Region [6].

when narrative-based gamified educational applications are combined to other activities [29], we learnt that more time to interact with the game would suppose better advantages since it would provide a better balance among time spent with CSP contents and time spent with game. Or, at least, it would give us the chance to have a more extensive experience with the game to find more potential improvement opportunities in the story or in any other aspect.

7. Conclusions

In this paper, we have presented the Keystone project, focusing on the technological approach included in the program: the KEY Tool and KEY Game.

The KEY tool acted as a moderated goal-oriented simple social network, which allowed young people to express themselves, share their activities and better understand the lives of other young people. This highlights that key positive results of the project were linked to the improvement of inter-cultural and linguistic abilities developed in the interaction with young people in other countries. Furthermore, both the KEY Tool and KEY Game contributed jointly to other digital-based activities carried out in labs, and thus to the improvement of the digital skills of users.

The KEY game was a gamified learning tool that delivered the content linked to the training program while a voodoo-based story was presented. Young people had a starring role in that story, since they had to solve the mystery while *chatting* with the different characters via a fake instant-messaging tool. Although stakeholders proposed further work on this game, young people liked the proposal and they would have liked to have more time to play.

Although some improvement opportunities were presented, the good results obtained in the pilot came from the adherence to recommendations obtained in the Life World Analysis in the design phase. Taking into consideration as many of the findings in that analysis as possible, the comprehensive intervention, including both face-to-face activities and technological approaches, reached a high level of efficacy, and allowed the participating labs and external participants to join and continue working with the tools developed.

Declaration of Competing Interest

The authors declare that they have no known competing financial

interests or personal relationships that could have appeared to influence the work reported in this paper.

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