

A Gamified Community for Fostering Learning Engagement towards Preventing Early School Leaving

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Abstract. Early school leaving is a complex phenomenon that may adversely affect on a learner's future development. ESL is the result of a combination of factors, such as insufficient school curricula understanding, low value placed on education by families, unavailability or low capacity of parents to support learners in schooling, insufficient parent-teacher-learner communication, and more. Many factors are socio-economic and are related to the extended social environment of learners. This work aims at strengthening the ties of school networks aiming at preventing ESL risk factors to set root in a learner's life through early interventions that start in primary school. This is pursued through a gamified school community and supporting gamified complementary to school curricula learning activities that aim at fostering engagement of parents, teachers, and learners. The community promotes a sense of affiliation, opens-up communication channels, and promotes a positive school environment for the benefit of learners and their parents.

Keywords: communities, gamification, inclusion, early school leaving.

1. Introduction

Early school leaving (ESL) have adverse effects on the future development of a child, personal and professional. ESL leads to the inadequate acquisition of skills and as a result may inhibit the fulfillment of a child's full potential [1]. This can be a result of access to reduced professional opportunities as a consequence of limited skill sets which, in turn, results to higher unemployment risk and higher risk of social exclusion and poverty [2]. For this reason, EU countries have renewed objectives initially set in 2010 of reducing ESL rates to less than 10% by 2020 [3].

The New Skills for New Jobs initiative states that in the coming years there will be increased demand for highly skilled individuals. Over 16M low skilled jobs are expected to be lost in Europe in the coming decade. In the past, low skilled individuals found employment opportunities in sectors with low entry requirements. In fact, the ability to find employment with reduced skill sets was one of the reasons that may have encouraged ESL even though the best interest of learners is always to complete at least secondary education. In the face of a shift among broad business sectors to highly skilled professionals, individuals with low skill sets are less likely to find employment even in industries that in the past offered employment alternatives for ESLs. On the other hand, the EU-28 unemployment rate was 10.8% according to Eurostat, up from 8.1% in 2001. Youth unemployment rates in some countries exceed 50%.

ESL has significant negative consequences on the well-being of an individual. According to a study of US graduates 56% of ESLs are unemployed as compared to 16% of those who have graduated [4]. Other studies show that ESLs may show social maladjustments such as behavioral disorders and delinquency [5][6][7].

The above indicate that addressing ESL is more relevant than ever for the benefit of individuals and communities towards enhancing smart, sustainable, and inclusive growth, individual and community well-being, and social cohesion [3] [8].

Initiatives for addressing ESL can be widely categorized as actions for mitigation and actions for prevention. Mitigation efforts usually focus on bringing individuals that have left school back into the educational system with the objective of completing at least secondary education [9]. Such initiatives include second chance schools, transitional classes and more. Prevention efforts typically strive to identify individuals that are at risk of dropping out of school and subsequently providing a support structure for ensuring that these individuals will continue to be engaged in formal education. Prevention initiatives include after school study, personalized learning paths, and mentor support [9].

According to the ET2020 Working Group on Schools Policy ESL is a complex phenomenon that cannot be 'attributed solely to schools or be solved by schools alone' [10]. There is not one single factor that contributes to ESL. ESL is a complex phenomenon that is a result of a combination of factors that may differ in urban vs. rural areas as well from one cultural and economic environment to another. However, some factors emerge as significant: understanding of school curricula by learners and parents, especially of migrants exposed to a new school and social environment; low value on education placed by families who may consider work at a young age as a viable alternative to education; the socio-economic background of a family, including families of low income or with unemployed parents [11]; low availability of parents to help their children with learning and schooling, for example with homework as a result of lack of skills or long working hours; insufficient communication among parents, teachers, and learners; a perception that school curricula are not tied to or relevant in real life; and more.

Most of the ESL contributing factors discussed above are socio-economic and are related to the extended environment of learners, including family and school. Furthermore, many of these factors emerge early in a child's life in primary or even pre-primary education. Research demonstrates a link between parental engagement in

a child's learning early on, in ages 3-9, and dropout rates at the age of 17 as evidenced through an analysis of the child-parent center programs in the City of Chicago [12].

The LINC project builds on early work on preventing ESL by focusing on enhancing the engagement of the entire school community, including parents, learners, and teachers with the objective of reinforcing social networks that can support learners to stay in school [13][14]. The proposed learning interventions start early on, in primary education, and continue throughout lower secondary education. Through this approach the project aims at preventing ESL contributing factors from setting root in a child's life by enhancing communication among learners, parents, and teachers, building the confidence and potential of parents to effectively contribute in their child's learning and schooling, and empowering teachers to become leaders in their school communities on preventing ESL by enhancing their capacity to design community-building activities. The above are pursued through two main activities: the development of a gamified school community that encourages parent participation in school life and opens-up channels of communication among parents and teachers and the introduction of gamified learning activities designed for joined execution between parents and learners the results of which are made available through the LINC virtual community.

The proposed ESL preventing community is validated through real-life learning pilots that take place in Greece, Sweden, France, and the Czech Republic. Early results demonstrate positive reactions of parents and teachers and a sense of affiliation and community. The work will be completed in November 2015.

2. A virtual school community for preventing ESL

The LINC virtual community [15] is designed as a complementary tool that can be exploited for enhancing community-building activities that already take place in schools. The objective of the community is to strengthen the ties of the social network of teachers, parents, and learners in a particular school or network of schools and to contribute to the development of a positive, enabling, and supporting environment for learners, parents, and teachers with the objective of preventing ESL contributing factors to become ESL risks [14].

For parents, the community introduces a set of resources that allow them to develop awareness of ESL contributing factors, to build understanding of school curricula, and to be informed on events and activities in which they can participate for promoting their own lifelong skill development with the objective of enabling them to become meaningfully engaged in their child's schooling and learning. In addition, the community provides services through which parents can communicate with each other as well as directly and easily with their child's teachers providing an additional channel for making school easily accessible. Parents can further review projects of their children with the objective of coming closer to the activities that take place in the classroom. Furthermore, through the community parents can easily communicate with their child's teachers through links to the teachers' professional email accounts provided upon login in a personalized manner to each parent (see Figure 1, right).

For teachers, the community offers access to content and links to resources related to building a thorough understanding of the issue of ESL as well as ESL contributing factors. It allows communication with other teachers for the exchange of knowledge and good practices on the issue of ESL. It promotes communication with parents publicly through forums and personally through email. Most importantly, it introduces learning sheets that describe learning activities that can be deployed in the context of school collaboration for enhancing communication among all members of the school community, including parents, learners, and teachers with the objective of helping teachers become leaders in their school communities on initiating activities that help prevent ESL.

For learners, the community offers the possibility to publish school projects either related to the proposed community-building activities or wider classroom practices introducing a sense of achievement and self-confidence. This function further promotes a community spirit among class members. Publication is allowed either with teacher mediation or, for older learners, with parent consent. Safe navigation of the community is achieved through account-controlled access that allows only members of a specific school community to use the services.



Figure 1. The LINC virtual community for preventing ESL: individualized login screen (left); home screen for parents with direct communication links to teachers (right).

Content can be published on the LINC community by community members. Individuals become members of the community after approval to ensure control on who has access to the services; this is an important point for ensuring the protection of learners and for ensuring that community members are related to participating schools. LINC community members can either create articles and publish them as resources or publish with references links to interesting articles related to education, educational and cultural activities that may be of interest to school learners and teachers, events, articles on ESL, and more.

The LINC community is not designed for use as a standalone service. Rather, the community is designed as a complementary educational tool that helps integrate informal and formal learning practices in schools through the active engagement of all school community members, including teachers, learners, and parents [14]. The community allows the monitored publication of outcomes of learning activities and projects that take place either in the context of formal school curricula subjects, such as math, science, or culture, or in the context of extra-curricula activities, as for

example visits to museums or engagement with technology beyond school curricula requirements in off-school hours, including weekends.

3. Gamification of community-based learning activities designed for increasing school ties and learning process engagement

Gamification of learning processes refers to the introduction of gaming elements and mechanics in learning design [17]. Gamification elements in learning may include rewards, role assumption, group collaboration, recognition, competition, social sharing, and more. Gamification in learning is popular in professional and corporate training for enhancing employee participating in training processes. According to an article published by Meister in the Harvard Business Review blogs, research firm Gartner Inc. predicts that gamification will be used in 25% of redesigned business processes by 2015. According to the same company, gamification of business processes will grow into a \$2.8b business by 2016; 70% of Global 2000 businesses were expected to be managing at least one gamified application or system by 2014. This work discusses the introduction of gamification elements in primary and secondary education community building initiatives in the context of LINC.

Gamification elements in the LINC virtual community aim at promoting engagement with the learning process of all school community members in an inclusive manner with the objective of creating a positive and supportive school environment that allows learners, parents, and teachers to feel affiliated to the school network. This inclusive process that engages not only learners but also parents is part of a wider, holistic learning design that supports learners both in schooling, i.e. in educational activities related to school curricula and the school program, as well as learning, i.e. in wider knowledge and skill building efforts that are part of a learner's everyday life [12]. The community aims at complementing existing school practices by introducing conditions that help further engagement in learning of individuals that can positively affect a learner's educational efforts, including teachers and parents.

More specifically, gamification in LINC promotes communication, fosters participation in learning, and helps build a community spirit of collaboration, competition, and inclusion. Gamification is introduced at three levels:

- In the learning activities themselves, which are organized as learning games
- In the community functionality through rewards and recognition mechanisms
- Through links to social media

Gamification in learning activities is manifested through actual learning activity design. The activities that have been proposed by schools and school teachers that are members of the LINC network are diverse and span the school curriculum. Some of the learning activities that have been developed are:

- Cultural treasure hunt: in this activity which learners accompanied by their parents visit sites of interest in their town and discover historical, cultural, or other information that helps them build a deeper understanding of their town's history, the everyday life of inhabitants, and their interests and goals

- Technology: it's magical not magic! Learners work with their parents in pairs towards constructing and programming an Arduino structure. The activity helps learners and parents build confidence through collaboration by executing under mediation and in a playful environment non-trivial programming tasks that many would consider as hard to implement
- A s-troll: learners and their parents engage in activities inside the school as well as throughout their town that help them discover the mythology of trolls in Scandinavian culture
- Reversed classroom: learners play the role of teachers and deliver presentations to an audience consisting of parents on themes that are of interest to their class and wider school community
- Parents' jobs to future children's jobs: parents are invited to the classroom to present their job. A discussion follows on what skills are required to perform this professional activity and how school curricula contribute to the development of the required skills. This activity helps learners understand the connection between school and real-life and allows parents to become engaged in school through activities that are familiar to them

Many of the proposed learning activities introduce gaming principles such as searching for pieces of information that combined can be used for synthesizing the solution to a puzzle as is the case in the treasure hunt and s-troll activities; competing in terms of reaching a rich solution in the minimum amount of time among participating teams, a design element deployed in the cultural treasure hunt activity; role-playing approaches such as those used in the reversed classroom activity; exploring and collaborating in a group, as deployed in the Arduino programming activity; and more.

Furthermore, the virtual community design integrates gamification elements in informal learning activities in the form of rewards that aim to enhance participation. The following gamification elements are supported:

- A 'participant' component in which photos, profiles, and activities of members can be observed by others in the community. By joining the community a user can immediately see his or her profile in the community group thus getting immediately a sense of affiliation
- A 'hall of fame' component is further presented in the home page of a user upon log in presents photos of the most active users in terms of publishing and reviewing content. By clicking on the photo a user can see the profile of the hall of fame member
- 'Stars' and 'badges' are attributed to users that achieve a specific number of publications to the community or a specific number of article reviews

Additional gamification elements may be implemented into the community functionality in the future through suggestions of community members.

Finally, the LINC community is connected to popular social media such as Facebook® and twitter®. A LINC community Facebook® page provides an alternative interface for communicating with other members. Users can optionally connect to the LINC services via their Facebook® account if they do not want to create a LINC account. Notably the existence of a Facebook® account is not a requirement for connecting to the LINC community, which attributes to users dedicated LINC accounts upon user request and approval by the LINC administrators,

but is only supported by LINC as an alternative log-in process. The information on the LINC Facebook® page is replicated in a corresponding community module that is visible on the home page of each user. Similarly, posts on the forums of the LINC community are replicated on the LINC Facebook® page. Links to popular social networking platforms offers a number of advantages: first, it provides an alternative interface for publishing to the LINC community or reviewing community content through social media pages; second, it allows members to access the LINC community without creating an additional account by using authentication through social media; and finally, it allows LINC community members to use popular functionality of social media services such as ‘likes’ on publications which themselves offer gamification elements.

4. Early piloting of gamified community-based learning activities

The LINC community-based learning methodologies [14], the related gamified learning activities [14], and the proof-of-concept virtual community [15] are being validated in practice through deployment in learning experiments that engage learners, parents, and teachers in real-life learning contexts in Greece, France, Sweden, and the Czech Republic. During the evaluation learners and their parents participate under teacher mediation in one or more of the inclusive learning activities described above working in pairs or groups for achieving learning goals and objectives. The activities to be deployed are selected by each participating school based on the interests of the wider school community that surrounds a specific class.

One of the early activities that has been implemented was Arduino programming for exposing learners, parents, and teachers to the magic of technology as a means for synthesizing solutions to given puzzles [14]. As shown below in Figure 2, learners worked in pairs with their parents. A total of 16 individuals participated voluntarily in the early activities that took place in March 2015. In an introductory session, learners and their parents were exposed for the first time to the Arduino platform and its objective of allowing users to solve problems in a constructivist [16] manner that advocates that knowledge is synthesized rather than transmitted, that learners already possess knowledge on which they build every time they engage in learning, and that the teacher is a facilitator in explorative learning processes. Learners and their parents were presented to basic functionality of the Arduino® platform and the corresponding programming environment that allows interaction with external constructions. Through the programming platform learners and their parents executed simple, introductory exercises such as lighting a led, producing sounds, and more. The efforts of the teams were documented in digital projects that were published through the LINC virtual community for the benefit of the entire participating class and for fostering a sense of achievement and pride in the completion of a non-trivial exercise.



Figure 2. Arduino programming activity with the participation of learners and their parents that work as a team for implementing non-trivial ICT-related activities.

The participants in the learning activities, learners, parents, and teachers, reacted in a very positive manner. Viewing programming as a serious game enabled the highly engaged participation of learners and parents in activities that complemented school curricula in science and math. Parents particularly commented in a positive manner on the opportunity to work with their children on projects that they initially considered as complex and were particularly satisfied to achieve completion of the given exercises under the mediation of teachers and engineers that were present for guidance and support. The follow-up to the learning activities that is provided through the publication, under teacher mediation, of projects onto the LINC community further introduced an element of recognition of achievement and acted as a bridge activity between two consecutive Arduino programming sessions. Through the posting of results on the virtual community learners and parents had the opportunity to review their efforts and introduce additional comments, an activity that further enhanced communication among school community members. As a parent commented: ‘The organisation of school activities for joint participation by students, parents and teachers is an excellent idea! We all together explore the sky and the asteroids. Not only me but also my child enjoyed it!’.

Finally, teachers commented that the gamified learning activities allowed learners to take initiatives that introduced a sense of ownership of their own learning and schooling activities, allowed them to self-evaluated their existing knowledge and desired learning goals, and promoted a sense of advanced responsibility on their behalf towards enhancing their knowledge for their own benefit. This was demonstrated by requests by learners towards their teachers to provide them with additional activities for further developing related skills. As a teacher commented: ‘The participation rate was very high. Only 4 parents did not come. This was a big success. It seems that the activities gain more and more supporters. The activities are considered of great importance by the parents. I was surprised and excited to hear their request for additional activities as well as the extension of the length of the activities’.

5. Conclusions

The LINC gamified learning community and learning activities designed for joined execution by learners and parents have been designed with the objective contributing to the preventing of ESL through early and continuous interventions that start in primary school and continue throughout lower high school with the objective of strengthening the ties of the wider school community of learners, parents, and teachers, promoting enhanced communication, building the self-confidence of parents in their ability to effectively engage in the schooling and learning of their children, and introducing good practice paradigms in the form of learning activities designed for fostering engagement in learning processes. The community and related activities are currently under deployment in real-life contexts in primary and secondary schools in Greece, France, Sweden, and the Czech Republic. Early results demonstrate a positive impact on the engagement of parents in schooling and learning through their participation in activities designed for joined execution with their children. Findings further demonstrate that exposing learners to informal learning that is complementary to school curricula can further promote an interest in educational and help learners understand the connections between education and real-life. Finally, findings demonstrate that teachers recognize the need of mobilizing the extended school community towards preventing ESL and have positive reactions to the proposed interventions through gamified learning design.

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