EduScratch: a case study on the development of key competences in Europe

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Abstract
This paper is based on the ongoing work of the Key Competence Network (http://keyconet.eun.org/) and discusses how several European countries have reacted to this framework and introduced it into their own educational systems. The adopted methodology was based on a multiple case study with an initial set of 35 cases from 13 different European countries. The initiatives related to key competence development presented differ in various ways, according to the nature of the key competences addressed, the implementation process used, the number of students and teachers directly concerned, the type of actors involved, and the duration and stage of development. The main conclusions drawn, so far, from this project emphasize: the existence of national initiatives mainly concentrated at the secondary level; the recognition of both formal and non-formal contexts for their development; that most initiatives focus, to some degree, on curriculum and the transformation of pedagogical practice so as to be more innovative, collaborative, motivational and student-centered; and even though the majority of initiatives involve investment in in-service teacher training, they rarely address initial teacher education also.

Keywords: Key Competences; European Curriculum, Competence Development; Curriculum Studies.

Introduction
Currently, there is a clear support for competence based learning. This educational strategy is regarded as the promoter of rich and realistic learning environments that will better prepare our students for the challenges of an evolving professional scenario where lifelong learning is recognized as cornerstone for the future of individuals and organizations. However, there is still little guidance for the development of such competence based instructional systems.

The DeSeCo project (Directorate for Education, Employment, Labour and Social Affairs, 2002) presents competence as the capacity to successfully respond to individual, and societal, solicitations or to successfully perform a task or activity, requiring the mobilization of knowledge (both implicitly and explicitly), abilities, attitudes, emotions and values. Competence is defined as the capacity to respond to individual, or societal, demands in order to perform an activity or complete a given task (Lizzio & Wilson, 2004; Messick, 1984; Perrenoud, 1997, Tillema et al., 2000). Competences are observed as a result of individual's actions in a given context. They are developed through acting and interacting in both formal and informal educational or professional contexts, and require going beyond the mere reproduction of acquired knowledge. At its highest level, this conceptualization of competence implies to choose and adapt from within the
acquired processes the ones necessary to solve an unknown complex task or problem (Rey, Carette, De France & Kahn, 2005). Competences represent a complex web of knowledge, capacities and attitudes that need to be used in order to solve a problem (Perrenoud, 1997). Moreover, as Le Boterf (2005) points out, competences and competitiveness are two words with a related etymology: early in 1999, the Bureau International du Travail stated that the level of competence is one of the main advantages needed in a globalized market.

1. The definition of Key Competences in Europe

Key competences are described by the European Commission as combinations of knowledge, skills and attitudes, which facilitate the application of knowledge to real world contexts. Individuals need them in order to function effectively in the 21st century (Lawn & Grek, 2012). Eight key competences are seen as essential by the European Framework; these are communication in the mother tongue, communication in (multiple) foreign languages, math competence and basic competences in science and technology, digital competences, learning to learn, social and civic competences, sense of initiative and entrepreneurship, and cultural awareness and expression. There is a range of terminology used to refer to “key competences” in EU member states, which sometimes reflects differences in emphasis and contexts. Alongside social and economic changes, there are three main theoretical influences that have shaped the development of key competences as a policy objective: these are a social perspective on education, and ideas about workplace competences (Gordon et al., 2012).

2. Key Competences in National curricula

Key competences came onto the policy agenda in EU member states at different times over the last two decades partly through the influence of European Commission and OECD research (Gordon et al., 2012). Their particular manifestation is shaped by a member state’s history, prevalent educational philosophy and educational structures. There has been some debate about the ideological focus of key competences. As such, there is no common model across EU member states for the incorporation of key competences into national curricula. They are often conceived of in terms of a cross curricular approach, rather than treated as separate subjects (Pepper, 2011). In order to integrate key competences into an existing curriculum, decisions need to be made about how they sit in relation to existing subjects; whether one set of key competences applies to all learners or whether different sets are needed according to age or grade; and whether key competences can be acquired in a cumulative fashion, and therefore whether progression routes should be specified.

3. Key Competence Network

The Key Competence Network (KeyCoNet) is a European Policy Network on the Implementation of Key Competence Development (KCD) in School Education. This project aims to analyse the implementation process for key competence development in various European countries in general education at primary and secondary level. The network includes a total of 18 partners from ten European countries focused on identifying and analysing emergent strategies in
implementing key competences into education reforms, and on this basis aims to produce recommendations for policy and practice. The objective is to identify, analyse and map key competence development initiatives and their implementation strategies across Europe and to effectively impact on policy and practice by increasing the network’s influence through dissemination and enlarging its membership.

This network of partners includes nine Ministries in charge of education or national agencies specialised in curriculum and assessment issues, inspectorates and school heads representatives, and seven university departments, some of them specialised in key competences issues, others providing teacher training; two European partners; Ministries connecting departments/national agencies in charge of curriculum development, teacher training, student assessment, learning resources, etc. In fact, the network aims to bring together those able to make strategic and potentially systemic decisions (Ministries) in cooperation with practitioners (teacher trainers, inspectorates), and grounded by evidence (university departments); in addition, individual scientific experts will also be associated to this partnership.

To illustrate the development of initiatives in this area, the network as so far gathered a collection of 35 exemplary cases, from 13 different European countries, on initiatives selected by network partners and drafted by their initiators according to common guidelines, from which five case studies have already been developed, considered as the most interesting by the network members; for the most inspiring case studies, videos will be produced (interviews with initiators, classroom practice when applicable, etc). Next, we will present one of the developed case studies so as to illustrate a particular initiative, supporting the development of key competences in school contexts in Europe (Tinoca, Gomes & Valente, 2013).

4. EduScratch

The EduScratch initiative aims to contribute to the creation and development of a teachers’ community of practice on the educational use of an intuitive programming tool. This tool (http://scratch.mit.edu/) allows the development of computational thinking and has proven to have huge potential in developing different types of skills (digital and subject-relate) in students.

EduScratch is an initiative aimed at promoting the educational use of a programming language – Scratch – by supporting, training and sharing good practices among the Portuguese educational community. It has been successfully implemented in grades K-12, with a naturally increasing level of complexity. Moreover, it contributes to the curricular integration of ICT, as well as giving context to the implementation of ICT curricular goals in grades seven and eight. This initiative has been implemented through a partnership between the Directorate-General for Education of the Portuguese Ministry of Education and Science and one of its ICT Competence Centres.

Even though its natural focus is on ICT competences, EduScratch has also had a diverse impact on a variety of other key competences, depending on the different implementation context. For example, when implemented within the context of mathematics classes it has clearly contributed to the development of mathematical competences; when used in the context of foreign language
classes it has had an impact on the development of competences in this area. Furthermore, given the innovative nature of EduScratch projects, the initiative has also brought about a clear development of other key competences: e.g. communication skills when participants are required to share, discuss, clarify and present their projects; learning to learn competences due to the highly student-centred approach; and also initiative and entrepreneurship, since students are encouraged to adapt and customise their own projects. Therefore, although the main focus of EduScratch is on the development of digital competences, we have found that all other key competences have also been supported, to varying degrees, depending on the contextual factors of implementation.

Since its introduction, the popularity of EduScratch has grown steadily. In 2009-10, the initiative began with in-service training workshops across the country. This approach has developed a network of certified trainers in several ICT Competence Centres, contributing to a growing impact of the initiative. From an initial development based in the Setubal ICT Competence Centre, there are now four centres across Portugal (Minho, Coimbra, Santarem and Évora) that are actively engaged in dissemination and training activities. However, the impact at classroom level has not yet been clearly quantified. Project leaders have developed an implicit notion of the impact of the initiative through levels of participation in national conferences and in EduScratch Day (2010; 2011; 2012; 2013) where students presented their projects (with an exponential growth in the number of participants), and also from the growing number of student projects shared via the EduScratch online portal.

4.1 Methodology

This research is based on qualitative case study methods (Merrian, 1998; Stake 1999; Yin, 2003). It aims to produce a qualitative description of the application of the Scratch programming tools, in use at Portuguese schools in a variety of classes. Two people were interviewed for this case study: the coordinator of the ICT Competence Centre, also responsible for the coordination of the EduScratch initiative, and the professor of the Polytechnic Institute responsible for accompanying and supporting the project. These individuals were chosen as they have been involved in the project from the beginning, overseeing its implementation and development, and because they represent key partners of the initiative.

The theoretical interpretation of the data emerged from its systematical analysis, implying a very close relationship between them (Strauss & Corbin, 1998). It is important to clarify that this interpretation of the theory is sustained by a set of well-defined categories (concepts or themes) that are systematically interrelated through statements of relationship originating a theoretical framework that explains the situation being studied. From this analysis 8 main categories emerged: contextual influence; substance related issues; partnership related issues; strategy related issues; mainstreaming related issues; systemic aspects; evaluation related issues and next steps.
4.2 Contextual influence

One of the most important enablers for the introduction of EduScratch has been the official recognition of digital competences in the curriculum, and also the official inclusion of Scratch as a recommended language for the development of this competence. Nevertheless, there have also been some contextual obstacles, namely the recent curricular revision (2012) pushed forward by the Ministry of Education that greatly reduced the presence of ICT in the curriculum, as well as the time allotted to project work, during which EduScratch was often introduced. Moreover, there is clear necessity for further human resources to be allocated to the project in order to sustain and expand this initiative.

4.3 Substance-related issues

The main official focus of this initiative is the development of digital competence, present at various levels throughout the curriculum. Activities have therefore been developed to work with teachers and students from grades K-12. In particular, the main efforts to spread this initiative have been targeted at the development of in-service training for teachers at all levels and in all subject areas. This training has taken a variety of formats, ranging from two- to three-hour dissemination presentations, to 15-hour officially-certified workshops. These longer workshops have been the main format adopted and are where the greatest efforts have been channelled. The workshops have adopted an extremely interactive model in which, after a short presentation of the Scratch software, participating teachers are prompted to actively engage with the programme in order to develop their competences. Moreover, participating teachers are required to develop classroom projects with their students that are supported and discussed throughout the workshop, and then to present their projects and student products in the final workshop sessions. Furthermore, there has also been an effort to customise the in-service training workshops for different grade levels and subject areas whenever possible.

Nevertheless, the programme coordinators point out the necessity for more applied research into the development and transference of key competences into traditional curricular areas through the use of EduScratch. Even though the impact is clear from the presented student projects (both in traditional conferences and on the online portal), and from teachers’ reports on students’ accomplishments and increased motivation in a variety of areas (even outside of school), there is a recognition for the need for formal research in the area in order to more clearly explore this intended result.

4.4 Partnership related issues

The main partner for the development of this project has been the Ministry of Education, through the official support of EduScratch in the form of human resources (one of the project coordinators is provided and paid for by the ministry) and also technical support for the project’s online portal. The partnership formed with the private internet service provider SAPO has been important for the development of the project’s online presence, through resource-sharing via the SAPO web portal, and more recently with the MEO cable TV (Channel 151232). Finally, the establishment of partnerships with other ICT Competence Centres...
has also been a decisive factor for the network development and coverage of the project, which is currently present throughout Portugal.

4.5 Strategy related issues

The focus on in-service teacher training has been an active investment to empower a large number of teachers in order to reach many student classrooms. However, there have also been two decisive factors supporting the development of this project from two other sources. Firstly; the development of a large community of practice of teachers who support each other (online and face-to-face) and who help their colleagues with the implementation of Scratch projects and resources. Secondly; the emergence of a number of highly-skilled volunteers (mostly retirees) who offer their time and expertise to support teachers and students throughout their Scratch projects (both online and in the classrooms).

However, one particular obstacle in this area has been the erratic functioning of the EduScratch portal, crucial for the maintenance of the community of practitioners, and which has recently been targeted by spam attacks that led the ministry systems administration to temporarily reduce the portal’s interactive resources.

4.6 Mainstreaming related issues

The goal of this initiative was the mainstreaming of the Scratch tool throughout the Portuguese K-12 educational system. However, shifting government policy has been one of the major obstacles encountered by the project in the process of mainstreaming. There has been a recent (2012) curricular reform movement that leans towards a more ‘focused’ curriculum, in which transversal areas have been reduced while mathematics, science, and Portuguese have been reinforced. This approach has led to a reduced investment in transversal skills, and even in the reinforced areas of mathematics, science, and Portuguese, with a move towards a much higher focus on traditional content and high-stakes testing that has left teachers with the feeling that they have fewer opportunities to engage in these curriculum-enrichment activities.

Moreover, the reduced size of the official team coordinating the project inhibits its possible outreach and support to a larger network of participating teachers. This obstacle has been partially overcome through the development of the capabilities of the ICT Competence Centres to support EduScratch-related activities throughout the country. Nevertheless, it would be highly beneficial to finance a larger coordinating team that is exclusively dedicated to this project (the current team is also responsible for other ICT-related projects).

Furthermore, the diversity in the levels of school and student resources is often an obstacle to ICT-related projects in general, and to EduScratch in particular. In fact, while some schools are already very well equipped, most schools do not have enough functioning resources.

4.7 Systemic aspects

The initiative has been designed as systemic from the very beginning, particularly given its focus on teacher training and on the development of a network of teacher trainers to support EduScratch activities. For this reason, and
due to the fact that teachers in Portugal need to complete a minimum number of 50 in-service training hours per year, the programme developed certified workshops so that they could be counted towards teachers’ required training hours. Moreover, these in-service workshops were managed by certified instructors with both general training experience as well as knowledge of the EduScratch initiative. There has also been an effort to provide direct support to schools (teachers and students), not only through an active community of practice for Scratch users, but also through the projects developed at the schools, in order to showcase successful experiences and to promote students supporting other students and teachers.

4.8 Evaluation related issues

No formal large-scale evaluation of this initiative has been attempted so far. There is a formal evaluation of the teachers who participate in the workshops, and there is an informal evaluation of the initiative in order to assess the national coverage, based on the number of training workshops, the student projects presented on the national conferences (e.g. EduScratch day), and on the number of resources made available and shared on the online portal. Nevertheless, the programme coordinators recognise the need to attempt to establish a more systematic and formal evaluation process, in order to better assess the project’s impact and coverage.

4.9 Next steps

The coordinators’ main concerns for the next steps of the project are mainly regarding its sustainability and evaluation. Concerns for the project’s sustainability focus on assuring an on-going investment in teacher training, with the aim of enabling the project’s community of practitioners to become more autonomous and self-driven, with the establishment of medium- and long-term goals. Also crucial for this will be an increase in the number of staff involved in the implementation of the project and a more active engagement of the ICT Competence Centres. Furthermore, there is also a clear concern regarding the creation of a monitorization and evaluation process in order to adequately accompany the project’s development and gauge its impact on students’ learning and their development of a wide range of key competences.

Conclusion

Our first recognition must be that there is a wide heterogeneity between the 12 case studies developed, representing a variety of National, regional, local and school projects. There is no uniform approach to implementing key competences, and approaches vary greatly according to the education system and school context. The implementation of key competences can be supported by changes in school culture, since they apply across all school subjects and necessitate changes in curriculum, assessment, learning environments and the role of teachers. As an initial guide, schools could focus their attention on changes to learning, learners’ experiences, and different ways to support learners and teachers. Schools should involve teachers in decision-making around implementing key competences, and consider involving partners including
universities, social services, other schools and families and communities, in the planning stages and on an ongoing basis (Dabrowski & Wisniewski, 2011).

There are several enablers emerging from this case study that hint us into possible strategies to develop innovative key competence based curricula. In particular, clear communication on the objectives and a participative process associating the main stakeholders (teachers, students, parents) from the beginning of the initiative, and the development of new partnerships with outside stakeholders and better integration of the school in its economic, social and cultural environment. Moreover, the design of a systemic strategy of change that includes: teacher education and professional development, learning activities, learning environments, school organisation, evaluation and assessment procedures and criteria, empowers the participants to take ownership of the new curricular innovations. Finally, the promotion of teamwork of teachers from different subjects in order to design and organise interdisciplinary activities and to reflect upon the criteria and procedures allowing to assess the acquisition of KC and a relevant use of ICT and a technical support from specialists were also cornerstone for the success of this particular initiative.

Based on this case study, in order to advance KCD curricular innovations some policy recommendations can also be made both at the national/regional level and at the school level. At the more encompassing national or regional level it is important to formulate clear general objectives for the curriculum in terms of key competences and to define a pattern of systemic approach of sustainable change that includes objectives to be achieved, teacher professional development, assessment tools of student achievement, reflection on the learning environments, school organisation of time and learning activities, relevant use of ICT, action research, communication and participative process associating all stakeholders from the beginning. It is also crucial to organise communication on interesting innovations and their results, in order to facilitate cross-fertilisation of initiatives and so contribute to disseminate the results of research in the field of KC learning and teaching.

At the school level, it is also important to organise a reflection between the main stakeholders (teachers, students, and parents) for defining achievable targets in terms of KC, requiring a common understanding of what is meant concretely by KC, levels of expectations, criteria and procedures for assessing their achievement. Moreover, it is recommendable to organise a reflection on the most appropriate learning environments and facilities, including a relevant and effective use of ICT but also about the organisation of time for learning activities and to support teachers from different subjects to design interdisciplinary activities.

While the motivation behind the move towards key competences in school education is largely social and economic, their entry into education policies represents the mainstreaming of several long-running themes in educational and social research. Among others, these concern the social aspects of learning, theories about the most effective ways to transfer knowledge, and theories about the competences individuals need to work effectively. Although some key competences refer to subject knowledge, they are essentially cross-curricular in nature, and hence can be developed through every school subject. This is challenging given that schools in most EU member states, particularly secondary
schools, are structured according to subjects. There is no uniform approach to integrating key competences into school curricula, which requires decisions about how to identify, define and frame key competences, including specifying the ways in which they are relevant to different levels of schooling. Implementation at the national level will depend on educational philosophies, historical context, outside influences and a range of other factors. The implementation of key competences in schools can require a shift in culture because they require addressing as part of every subject, rather than being standalone. This is also because successful implementation requires buy-in from all school staff. Research from Finland indicates that school cultures that are conducive to the uptake of innovative practice tend to be open to risk-taking and teamwork (Niemi, Kynäslahti, and Vahtivuori-Hänninen, 2012). A frequently recommended method for teaching key competences is the provision of interactive learning environments. These may be enhanced by technology and typically require learners working both autonomously and collaboratively to apply creativity, problem-solving and exploration to real-life, multi-disciplinary problems, allowing several key competences to be developed simultaneously.

References


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