



**CODING FOR
INCLUSION**

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COD1NC: Report Colectic, Spain

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Colectic - Codinc report

EXECUTIVE SUMMARY

Disadvantaged kids and young people need to **access quality labor opportunities in the future**, and they won't if they are not **digitally prepared**. Starting from school (and leisure) activities with kids and young people, we want to introduce concepts, skills, knowledge and techniques around computational competences, coding and robotics, that, a priori, are not accessible to migrant and disadvantaged communities in the Raval (Barcelona).

The Codinc project is based on service-learning and peer learning methodology. In Barcelona it was piloted in 2 secondary and 2 primary schools in the Raval neighbourhood. During the pilot **75 secondary school students** were trained on computational and pedagogical competences in a 15 hour workshop. In 10 hours of peer-2-peer learning activities the students trained **97 pupils from neighbouring primary schools** on coding and robotics. The evaluation showed a significant change in classroom relationships and student-teacher relationship as **indicators for inclusion**.

Education is still inherited! In the Raval district all secondary schools are classified as high complexity schools, with a significant number of families with lower education level and low skilled jobs, high unemployment rate, high rate of families depending on social services, high percentage of students with special needs and/or newly arrived immigrants. (Ministry of Education, Catalonia, 2014).

CODINC **motivates kids and young people to choose STEAM careers**. We foster self-esteem and confidence, but also social skills and computational thinking, which helps to **change social relationships in- and outside classroom**. We want to create a constructive image of digital technology and maker technology related careers, and with an strategic alliance with partners on European level achieve a **change in compulsory school curricula** (primary, secondary and teacher training) introducing computational thinking.

INTRODUCTION

Colectic has a long-standing experience in introducing computational competences through project based learning in classroom and in afterschool activities. We work with the Autonomous Government of Catalonia to design and provide innovative activities to foster STEAM and ICT vocations in economically deprived areas of Catalonia.

CODINC, short for Coding for Inclusion, aims to showcase and prove how coding, educational robotics a programming can be a tool for inclusion.

CODINC uses methodologies for peer-learning and service-learning to foster motivation for STEAM and ICT careers and provoke changes in classroom relations between students and with teachers. Secondary schools' students teach their younger peers from a neighbouring primary schools computational competences. First, we trained secondary school students during a 15 hour workshop about offline activities, Scratch, Makey Makey and MicroBit. Afterwards, we connected primary with secondary school, the secondary students taught the same workshop activities to primary school kids.

Education is still inherited! Colectic worked with in-house trainer and e-facilitators with experience in facilitating robotic workshops with young people in economically deprived areas. The education system in the Raval district is heavily segregated, middle- and higher class families send their kids to private schools outside the district, while in the public schools we have mostly low income and migrant families. All participating schools are "maximum-complexity schools"¹ according to the Department of Education², defined as schools with a high percentage of families in economic difficulties and a high percentage of migrant families.

The implementation of the CODINC methodology in Barcelona took place between December 2018 and June 2019. The secondary school workshops were organized with 2 schools during the second trimester, and the service-learning workshops with primary school was implemented during May and June 2019. One secondary school decided to replicate the

1 Definition and list of maximum-complexity schools in 2018 (in Catalan)

<http://educacio.gencat.cat/documents/IPCNormativa/DisposicionsInternes/>

[Resolucio_plantilla_escoles_1819.pdf](#), published by the Catalan Ministry for Education

2 Actually, all public primary and secondary schools in the Raval district are schools of maximum complexity.

workshop with another group on their own. A 3rd secondary school has already approached us wanting to implement the CODINC methodology in the next school year. The training for primary school teacher also joint staff from the local library as they have robotics kits and want to foster STEAM and maker activities in the library.

REGIONAL CONTEXT

DEMOGRAPHIC SITUATION

The Raval is part of the Ciutat Vella district, located in the south of the city. It covers an area of 109.8 hectares and is one of the densest areas of Barcelona, with 47.000 inhabitants in 1.1 km².

The Raval is one of the most multicultural neighborhoods in Barcelona, which has been stigmatized for many years, but it's precisely in this sense that it has become a laboratory for coexistence and one of the places where the efficiency and coordination of the public institutions is highly necessary to achieve progress in social policies.

The migration rate in the Raval is 113 per thousand with 50% of the population of foreign origin, well above the city average of 60 per thousand. There are more than 40 nationalities living together in the Raval.

One of the most important transformations experienced by the Raval in recent years has been the rejuvenation of its population³. Among other factors, this phenomenon is intrinsically tied to the newly arrived population, but the most important thing is that it has a positive impact on the neighborhood's future. The Raval houses 2.500 businesses and more than 250 non-profit organizations, working for employability and inclusion, family support, leisure activities, school and learning support, newly arrived families and people, etc. and

The kids and young people in the Raval, as well as their families, are a great value for the district, and institutions must be more aware of their needs and demands. A population sector requiring specific services and equipments, especially social, health, education, employment and cultural services. The social reality is not always easy for the population, mostly suffer kids from the lack of open public spaces, playgrounds and sustainable leisure activities.

The unemployment rate has remained between 8.5 and 9.9 during 2018, and is also the highest in the city (6.7 on average). The income level remains below the city's average with an index of 74.6%. The population pyramid presents a slight deviation with an increase in the male population in the age group of 20 to 60 years.

3INFORMES ESTADÍSTICS. Característiques de la població de Barcelona segons el Padró Municipal.

Gener 2019 <https://www.bcn.cat/estadistica/catala/dades/inf/lecpadro/lec19/lec2019.pdf>

EDUCATIONAL CONTEXT

The competences for education in Spain are transferred at regional level, Colectic is located in Barcelona and has been working within the Catalan public-school system. The Catalan school curriculum includes digital competences directed towards a user level knowledge of the digital world, but does still miss computational competences, although various non-profit initiatives are working in the field of introducing computational competences in the public school curriculum.

There is a disturbing distance between families and school, which contributes to processes of segregation, socio-economic inequality and high early school dropout rates (17% Catalonia vs 10% EU). 90% of students in public schools come from immigrant families, but only 49% of the people who live there are foreigners, and - as detailed by the community working-group of TotRaval Foundation on education - this also is happening in non-formal education and leisure activities.

From our experience, the young people we are working with mostly don't have a mobile phone, about 70% of them regularly has access to a computer and internet outside of school, mostly in public libraries and NGOs or internet cafes for playing computer games or watching videos on youtube.

El Raval, our the territory of action, is characterized by⁴:

- Low "science capital" in disadvantaged regions, few children have access to higher education or university levels.
- 21,1% unemployment for 16-29 year, and even higher for 16-24 year 27,4%, starting with a higher pre-school dropout rate in disadvantaged districts, we find more young people out of work and school.
- Job perspectives are low, 40% of young people in a job are overqualified, 50% of their contracts and 80% of newly signed contracts are temporary.
- The Catalan educational curriculum begins to include subjects such as robotics, programming and computational thinking, both in primary and secondary schools. But we find ourselves with a very different reality. Many teachers do not have the proper training to be able to work on these subjects.
- We are in a district where all of their educational centres are highly complex. This reality means that often from the centre it is more difficult to allocate time and resources to develop these types of projects, and that these public centres are not capable of preparing children to be producers or, at least, prosumers in digital life.

Empowering and motivating these communities to foster social mobility is an important political discussion, 40% even reach a lower education level, and only 35% of kids from low income families reach higher level education than their parents.

⁴Diagnostic de l'Educació al Raval. Fundació TotRaval 2016._

https://www.totraval.org/sites/default/files/diagnostic_educacio_al_raval.pdf [accessed 1/10/2019]

EXPERIMENTATION

PHASE 1 - SCHOOL SELECTION PROCESS

October – December 2018

The school selection process was centered in 3 strategies:

1. Schools already working with Colectic in similar projects
2. Multiplier event in November to present CODINC to interested school principals, teachers and education professionals
3. Open call for interest through the city's department for education

The feedback from the Open Call was mostly from schools we are already working with, which finally confirmed our preselection of schools based on collaboration experience.

With this schools we reached an informal agreement, but it was very important to make clear that we are NOT talking about simple workshops on coding, that the project's goals go further beyond learning coding, that we want to provoke social changes in the classroom and foster motivation for STEAM careers. The logistics of fitting the workshops within school hours was complicated in one secondary school and in all primary schools, the other secondary school had a foreseen time-frame for project based learning where CODINC was included. We respected as much as possible the school terms and internal planning to make it easier for schools.

A 3rd secondary school finally could not participate as their internal programming prioritized other activities, but they have already approached us asking for an implementation during the following course 2019-20.

PHASE 2 - WORKSHOPS WITH SECONDARY SCHOOL STUDENTS

February to May 2019

The workshops with secondary schools worked very well, from the beginning we explained the goals of the project and connected to the methodological framework of Service Learning, a well-known concept in Barcelona, Catalonia as it's already part of the school curriculum. This part of the project was a very motivating part for the students, but some of them also were afraid or worried because of the Service-Learning part.

During the workshops the offline activities were very much appreciated, as a funny and creative way to introduce computational thinking concepts in group activities and dynamics. These activities definitely helped to motivate the more disconnected students, and the ones who weren't so motivated for programming and robotics, and gave them more self-confidence and motivation for the project.

The two secondary schools worked out a little bit different, because each of them had some peculiarities, so we had to adapt logistics, planning and to some minor extent the project.

At the **Institut Miquel Tarradell** we worked with two classes of up to 30 students divided each in 2 groups, which means 4 groups in total. We had sessions of 1 hour per week with mostly 2 educators from Colectic, and the teacher collaborated also. The sessions were done during school hours at the informatics classroom at the school. Two of the 4 groups were done by the schoolteacher and 2 groups by Colectic educators, who joined our classes to learn and see how to facilitate the workshop, and then replicated the sessions with the other 2 groups.

The 4 groups worked out really well, and the feedback from students and teachers was very positive.

At the **Institut Salvat Papasseit** we worked with groups of 8 students, who because of school internal management and logistics limitations could arrange to participate in the project with some limitation. Because of school planning, the participants rotated every two months, therefore we worked with 8 different students every 2 months. This was a difficulty for the group management, and also the reason for higher "drop out" rate of the workshop, the students simply stopped showing up, and the school included new students halfway through the project to complete the group of 8. Altogether, the project was an exit at this school, the students who finished the project were very motivated and their evaluation was very positive.

PHASE 3 – WORKSHOP WITH PRIMARY SCHOOL KIDS

May – June 2019

The activities with primary schools presented some other difficulties compared to the secondary schools. In the first place, because to provide maximum flexibility and autonomy to the secondary schools in logistics and planning for the Service Learning part with primary schools, we offered the possibility to cooperate in the selection process for primary schools and with what schools they would prefer to work with, based on their knowledge of the primary schools, proximity and timetables. This procedure seemed great for us and for the schools, but in the end the problem was that the secondary schools were very slow in contacting the primary schools, so we didn't have all agreements with primary schools before finishing the first part of the workshops with secondary schools.

Service learning workshops were organized in different ways, one school decided to do weekly activities of 1,5 hours, while the other two schools preferred a more compact format with the workshops done in two days.

The experience during the workshops was very positive, the project was very welcome and highly valued by the kids and their teachers. The Service-Learning workshops were implemented in 3 primary schools, Escola Milà I Fontanals, Escola Mediterrània and Escola Drassanes.

PHASE 4 – TEACHER TRAINING

June 2019

For the workshop with primary school teachers we invited the local library workers of the neighbourhood. Both teachers and librarians confirmed the need for this kind of specific training on computational competences and valued positively the specific activities included. And they insisted on the need for more exhaustive training, so we will organize a second workshop for teachers, librarians, teachers and educators in February 2020 after finishing the Codinc project.

Furthermore, we implemented 2 hands-on workshops during the multiplier events in June 2019 for education professionals from Catalonia. The participants welcomed the activities, and the overall feedback was very positive, we hope to find new implementation partner for replicating CODINC.

Participants in secondary schools:

- Institut Miquel Tarradell: 54
- Institut Salvat Papasseit: 21

Participants in primary schools:

- Escola Drassanes: 12
- Escola Mediterrània: 60
- Escola Milà i Fontanals: 25

Teacher training:

- 4 primary school teacher
- 2 librarians from the local library

Date	Center	Type Session
From 7 February to 30 May	IES Salvat Papasseit (1,5h each Thursday) IES Miquel Tarradell (2h each Monday)	Workshops with secondary schools
3 and 17 june 2019	Escola Drassanes	IES Salvat Papasseit Service Workshop with primary school
5 and 12 june 2019	Escola Milà i fontanals	IES Miquel Tarradell Service Workshop with primary school

6 and 7 june 2019	Escola Mediterrània	IES Papasseit Service Workshop with primary school
13 june 2019	Biblioteca Sant Pau	Primary school teachers and librarians workshop
4 june 2019	Jornada Punt TIC i presó	Multiplier event Workshop for education professionals, NGOs and policy makers
27 june 2019	Jornada Internet Social	Multiplier event with presentation and hands-on workshop for education professionals, NGOs and policy makers
24 august 2019	Scratch Conference in Cambridge	Presentation/discussion with NGOs and education professionals

SURVEYS

Administering the questionnaires was especially difficult for the primary schools, as the school contact was made late, project time was running out, and the time schedule in April, May and June is very intense.

Secondary schools

With secondary schools it was much easier, one secondary school asked for a formally signed contract regarding GDPR regulations and they administered half of the surveys without Colectic professionals being present for presentation and explanation.

With the other secondary school, the coordination with the teacher was complicated in terms of finding "a moment" for administering the pre-surveys before starting the workshops and they decided to do the surveys outside of our workshop hours to have more time for the actual workshop activities on computational competences. The high absence rate and some internal conflicts in the group also complicated the learning process with the group.

Primary schools

The primary schools didn't really understand why the questionnaires were administered to their students, what outcome we expected. In administering the surveys the teacher and our educators confirm an important finding, kids had language difficulties in understanding some questions, and tried to explain the meaning in an easier way as best as they could. Primary schools also returned the survey data with huge delay after summer holidays, which caused a delay in digitizing and analysing the survey results.

ASSESSMENT AND EVALUATION RESULTS

Working with secondary school students in service learning workshops with younger kids showed clearly the growing self confidence and motivation in students, a great exit for the project. After initial worries about how to teach coding to kids, most students really liked helping primary school pupils in learning how to code with Scratch or playing the offline activities on computational skills.

The evaluation results of the administered surveys were not available as of January 15th 2020, and will be included when available.

CONCLUSIONS

The CODINC project worked out well in Barcelona and for Colectic, our main goal was to provide a motivating and stimulating methodology for learning computational competences in a background of social exclusion and disadvantages, both for teachers and for pupils and students.

LESSONS LEARNED IN BARCELONA

Coding really offers solutions and motivation to raise low income areas

Learning to code in a creative way is a strong motivation for young people towards STEAM learning and careers. Even better when they can show learning results in teaching younger peers.

CODING as a pre-job experience – teaching gives a new perspective

Teaching kids how to code can be a challenging and sometimes frightening experience for young people, even following the CODING toolkit. Training on group dynamics, how to present an activity, how to motivate kids, and the opportunity to practice these skills in a safe environment is a very realistic pre-job experience for the young students. And through the practical experience of "being a teacher for a day" makes students reflect on their own habits in the classroom.

The power of service learning

Service learning as a methodology for fostering community work and relationships is already included in the Catalan school curriculum. CODINC is the first time where though service learning in secondary schools, kids learn and practice computational competences in a playful way.

Understand the complexity of school logistics

Before beginning the project, it's vital to understand the school logistics and requirements, to be able to adapt your implementation according to school specific needs. Even knowing the schools beforehand, the logistics for scheduling workshops involving 30 secondary school students in groups of 4-5 and two primary school classrooms was challenging in terms of time schedule, computer classes with needed infrastructure, and accompanying minors between schools.

POLICY RECOMMENDATIONS ON A NATIONAL LEVEL

Computational competences are the key for future jobs, learning computational competences needs to be included in the **school curriculum** for primary and secondary education.

Coding should be included as a **transverse** topic which can span over various subjects and include project based and challenge based learning methodologies, that allows to teach **coding as a tool to solve real world challenges**.

Strategic alliances for teaching coding and computational thinking were the key for convincing schools to participate, this motivated teachers learned how to teach coding by their own initiative. While most teachers in participating schools don't have coding or project-based learning training. Coding, computational competences and project-based methodologies should be part of the basic **training for teachers**, and already working teachers need professional training on how to teach coding with stimulating and motivating methodologies.

The role of participating **young people** in **defining their own learning goals and objectives** is very important for their motivation. Coding can be used with project-based and challenge-based learning or service-learning to allow students to design their own learning path working towards a specific result. Coding and computational competences can help to solve real world challenges, and that's a very motivating result and learning process for students.

Schools, at least in Barcelona, have quite strict, complex and rigid logistics, where **flexibility** has no place. Project-based learning or service learning methodologies are quite a challenge for participating schools for the lack of flexibility. Sometimes, just allowing students to stay in the building after school hours to work on the project would be very helpful and allow students to establish a different connection.

In disadvantaged areas **working with families** would be a great opportunity to change



CODINC Experimentation Report - Colectic, Spain

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the shared social image of computer science, which often is connected to the freak or nerd image from TV. Families usually do not have a clear imagination of what a career in computer science would mean for their kids.