

Facilitating Digital Equity in Educational Contexts with Teenagers at Risk of Social Exclusion: the ICT Facilitator Competence Profile

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Abstract—This research explores the possibility of defining the competence profile of ICT facilitators aimed to ensure digital equity in educational settings. In order to define the professional profile of the ICT facilitator, a selection of various competences is presented as a survey study and distributed to digital literacy instructors working in areas of high risk of social exclusion. The selection of competences was done first through a bibliography search process based on the Spanish and Catalan (due to the local context of study) and European frameworks for digital literacy skills. The selected competences were iterated with experts from a non-profit organization specialized in digital literacy training in contexts with minors at risk of social exclusion. Finally, the survey was administered to other ICT instructors with expertise in similar contexts asking them to assess the relevance of the competences that an ICT facilitator should have to promote digital equity. Competences that have been identified as highly important are the following ones: communication, respect, interdisciplinary coordination, relational skills and interpersonal skills. This research contributes to the current debate of proposals to guarantee digital equity in formal education environments through the definition of the ICT facilitator's competence profile.

Keywords—Social exclusion, digital culture, digital equity, ICT in education, teacher education

I. INTRODUCTION

In the report 'Rethinking Education in the Age of Technology' [1], the authors state that the worlds of private schooling, home-schooling, and informal learning spaces have been more receptive to the advantages promised by new media technologies than the context of formal education (i.e. schools). Non-profit organizations (NGOs) focused on digital literacy training play a fundamental role in areas with minors/teenagers

at risk of social exclusion [2]. During the 2016 International Conference of NGOs at UNESCO Headquarters the main topic of discussion was: "The challenge of the digital revolution", which gathered 250 NGO representatives from around the world. The conference was organized around four subthemes: "The digital revolution and its impact on the diversity of cultural expressions"; "The challenge of access to digital information"; "Does e-learning address challenges of education systems worldwide?"; and, "Science and the digital revolution: which ethical implications?". Three of the four subthemes were especially oriented to discuss the importance of cultural diversity, access to digital information and ethical implications as factors that are critical to ensure digital equity, especially in contexts of minors at risk of social exclusion. This means that from a pedagogical perspective there is a need to think how to consider aspects of social inclusion to reduce the digital divide [3 and 4]. As Warschauer [5] states, traditionally the original sense of 'digital divide' is attached to the importance of the physical availability of computers and connectivity rather than to issues of content, language, education, literacy or community and social resources.

This paper presents a study elaborated by a group of researchers and members of an NGO from a disadvantaged area of Barcelona (Catalonia, Spain) named Colectic, situated at the 'Raval' district. The main aim of Colectic is to work for the inclusion, autonomy and empowerment of people and communities in the social, labour and technological fields, understanding and using technology as a tool for participation and social transformation. Colectic understands technology as a facilitating tool for the autonomy of people. They develop transversal projects with the aim of improving the quality of life of the residents of the Raval, with special attention to groups at risk of social exclusion (migrant population, women, young people and the elderly). This study is framed in the 'Makers for the inclusion' project. This project is focused on trying to

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palliate the digital inequality of the disadvantaged area of the Raval of Barcelona. Raval is a district in Barcelona where approximately 50% of its inhabitants are from outside the EU. There are more than 40 nationalities living together. In this context, and as described in more detail in this paper, there is a high risk of social exclusion for teenagers especially when digital equity it is not considered as a pedagogical strategy action to be facilitated by ICT instructors. Makers for the inclusion is aimed at children and young people, women, vulnerable groups or at risk of exclusion, families, agents of the educational community, non-profit organizations, and social education professionals. The main aim of this study is to define the professional profile of digital literacy instructors in an educational context with minors at risk of social exclusion by identifying the most relevant competences that are needed to ensure digital equity in this context. To define the set of competences for this profile, the team of researchers and experts from Colectic developed a first iteration of competences (based on the literature and their expertise accumulated across projects). And a second iteration of the collection of competences was done by distributing a survey to 12 instructors with previous experience in this type of contexts.

This paper is structured as follows. First, we discuss the current proposals from educational committees locally in Catalonia, Spain (due to the context of this study) and Europe, with the main aim of identifying the 21st century digital skills in educational settings and how they consider digital equity on them. Next, in the Study section we describe the local context of this study, and how the survey was designed and distributed. In the same section we also present the results obtained after the analysis of the responses provided by 12 ICT instructors with expertise in contexts with minors at risk of social exclusion. Finally, we conclude with a discussion of the most relevant results and future plans.

II. STATE OF THE ART

21st century digital skills in educational settings

There are different actions to introduce the development of students' and teachers' digital literacy skills in the context of formal and informal education in Spain and Europe [6 and 7]. First, we review how this is dealt in the national/regional case of Spain for formal and informal educational settings. Second, we describe the European perspective.

In the case of Spain, the document proposed by the Spanish Ministry of Education [8] is a reference framework describing the digital competences that teachers need to have for conducting their teaching practice. It structures different skills in five different areas, and it establishes six levels of expertise. The areas that it considers are: (1) Information and data literacy, (2) Communication and collaboration, (3) Digital content creation area, (4) Safety, and (5) Problem solving. Firstly, the information and informational literacy area refers to the ability for searching, evaluating, and storing data collected from digital resources. Secondly, the communication and collaboration area refer to the interaction, sharing, citizenship participation, collaboration with others, behave properly and administer digital identity through digital applications. Thirdly, the digital content creation area is related to developing new digital content or using the existing one modifying it, taking into account the

royalties, and being able to program informatic programs or modify existing ones and use it for educational purposes; Fourthly, the security area for protecting the devices used, protecting personal data and digital identity, avoiding health risks, and protecting the environment. And lastly, the problem-solving area includes to be able to solve technical problems, identify needs for using resources and how to provide solutions, innovate and use technology creatively using it as a source of expression, and identify which digital skills should be improved in oneself and the others. In this framework, 'cultural diversity' is included as an aspect to be considered only when students share information in online and virtual environments, but not as a factor to consider within your own group of students to design adequate digital literacy educational activities for them.

In a more regional level, the government of Catalonia proposes a document specifying the digital literacy skills that students need to have to be able to interact successfully with today's society [9,10]. In Catalonia, for schools it is mandatory to plan and propose the scholar curriculum for the correct use of digital technologies. This has to be done in the context of "pla TAC" standing for Technologies for Learning and Knowledge (Tecnologies per l'Aprenentatge i el Coneixement, in Catalan) which is the method that facilitates the organizational planning for the introduction of these technologies. There are ten competences classified in four dimensions. The dimensions are: (1) Tools and applications; (2) Information management and organization of the learning and working environments; (3) Interpersonal communication and collaboration; and (4) Digital identity, civic-mindedness and habits.

In the dimension for tools and applications, the competences that should be developed are: selecting, using and programming digital devices depending on the tasks that are being carried out, using the basic functions of text editors, number editors and multimedia presentations, and using programs and applications for creating and editing drawings, sounds and videos. In the second dimension, information management and organization of the learning and working environments, the competences that should be developed are the ability of searching, comparing and selecting digital information considering different sources, constructing personal knowledge through the use of digital devices, and organizing the work and learning in digital environments. In the third dimension, interpersonal communication and collaboration, the student has to develop the competence for communicating virtually and using digital publications, and for working in teamwork taking advantage of virtual collaborative environments. Lastly, in the dimension for digital identity, civic-mindedness and habits, the competences that have to be developed are health usages of technology and responsible, critical and prudent way of acting when using digital technologies by considering ethical, legal, security, sustainability and digital identity issues. Again, in this case, we observe how the aspects related to 'cultural diversity and ethics' are only considered from the point of view of building a virtual identity in social media channels. But not from a critical thinking perspective stimulating the debate of digital equity.

In the case of Spain, the figure of the 'ICT facilitator' (Dinamizador TIC, in Spanish) also exists. The role of the ICT facilitator begins to be outlined in numerous communities as part of the infrastructure to support teachers in schools. Its figure is

incorporated with the purpose of promoting the use and integration of ICT in the pedagogical activities of the formal educational centres [11 and 12]. This is still a process in progress, it is expected that at least one person will occupy this position, typically the computer science teacher of the educational centre. However, some centres are also considering the presence of two people, one dedicated to the management of technical equipment and another one in charge of promoting the use of ICT from a pedagogical perspective. There is still no consensus on the role of the ICT facilitator and for this reason it is important to identify the competences needed to perform this position. In order to identify the most relevant competences (beyond the ones related to the technical knowledge) and with the aim of integrating a digital equity strategy, we think it is necessary to consider the opinion from digital literacy instructors with experience in contexts of social inclusion to this debate. This is the objective that we pursue in this study, but first we have also considered the European perspective in relation to the competences that are recommended to work digital literacy in educational contexts.

From a European point of view, it is proposed that the 21st century skills (in general) and the digital skills (in particular) are concepts that emphasize a broad spectrum of skills [13 and 14]. There have been defined seven core dimensions of the 21st century digital skills, which are: (1) Technical aspects; (2) Information management; (3) Communication; (4) Collaboration; (5) Creativity; (6) Critical thinking; and (7) Problem solving.

Firstly, the technical aspects such as understanding and using information and communication technologies (ICT); Secondly, the information management in relation to the fact of defining the research statement using ICT, accessing the information from online sources, evaluating the usefulness and sufficiency of information using ICT and managing the organization of the information using ICT; Thirdly, communication based on the skills to use ICT to transmit information to others; Fourthly, collaboration thanks to the use of ICT to develop a social network and work in team; Fifthly, creativity, using ICT to generate new or unknown ideas or to create new products or services; Sixthly, critical thinking developed through the correct use of ICT to make informed judgements and choices clarifying questions, judging the suitability of a source, invoking arguments, linking ideas and suggesting new ideas for discussion; And finally, problem solving using ICT to cognitively process and understand a problem and find a solution acquiring implicit and explicit knowledge and applying it.

According to Van Laar et al [15] five 21st century dimensions of digital skills should be also connected to the core ones mentioned in the previous paragraph, these are the contextual ones. These competences bring the possibility to take into consideration the social context where the digital activity is going to be performed: (1) Ethical awareness; (2) Cultural awareness; (3) Flexibility; (4) Self-direction; and (5) Lifelong learning.

Firstly, ethical awareness means to behave in a socially responsible way making a responsible use of ICT and understanding its social, economic and cultural impact;

Secondly, cultural awareness means to show cultural understanding and respect towards online communication with people from different cultures; Thirdly, flexibility includes the skills to adapt one's thinking, attitude or behaviour to changing ICT environments; Fourthly, self-direction is the ability to use ICT to set goals for oneself, take control of them, take steps towards the goals and monitor the progress; And finally, lifelong learning for constantly explore new opportunities when using ICT to create useful knowledge individually.

In this line and based on the different initiatives presented, we think it is necessary to identify the most relevant social/contextual competences of ICT facilitators to facilitate a digital equity strategy for educational contexts. To accomplish this objective, we believe it is critical to bring into this debate the experience of digital literacy instructors working in contexts of social exclusion. For this reason, our study is focused on identifying the most relevant competences that should be prioritized based on the experience of these professionals.

III. MATERIALS AND METHOD

A. Context of Study

Considering the professional experience of digital literacy instructors in contexts of digital inequality, it is critical to ensure a digital equity strategy in educational settings. This study has been framed as part of the 'Makers for the inclusion' project, collecting opinions from professionals working in a socio-economically underdeveloped area of the city of Barcelona. 'Raval' is one of the most densely populated areas in the world where 444 inhabitants per hectare coexist, with more than 40 different nationalities, with predominance of Pakistan, the Philippines and Bangladesh. The 7.9% of the population of the district have insufficient studies (7.6% in Barcelona), 54% have compulsory studies (39.5% in Barcelona), 17% have higher studies (25.3% in Barcelona), and only 21% have university studies (27.5% in Barcelona). The 90% of the students in schools from this district come from immigrant families [16].

There is a disturbing distance between two contexts: the home context and the school, which contributes to processes of segregation and social and economic inequality in general, and that have direct repercussions on the students in the neighbourhood. 90% of the students of the educational centres come from immigrant families, but only 49% of the people who live in the neighbourhood are foreigners, this phenomenon also occurs in the field of non-formal education organizations. The digital inequity in this particular context produces the following consequences:

There is a low "science capital", few children/teenagers from this district have access to higher education or university levels. In general, the youth unemployment and school drop-out rates are higher in disadvantaged districts.

Schools in disadvantaged areas as the Raval, have difficulties to allocate time or resources to promote digital literacy competences. Consequently, these competences are facilitated through public civic spaces organized by NGOs in a format of informal learning activities.

Based on this situation, we have approached professionals with experience in this social context with the main aim of identifying the most relevant competences to facilitate digital equity in educational contexts with teenagers at risk of social exclusion.

B. Methodology

A survey study is conducted to investigate which is the competence profile of a digital literacy instructor in an educational context with minors at risk of social exclusion. This study involved: an entity (i.e. non-profit institution aimed to teach digital literacy in contexts at risk of social exclusion) and 12 instructors of robotics and programming education. The content of the survey was designed in two phases: First, we selected a set of competences based on a bibliography search process (detailed in the previous section). Second, 3 members of Colectic, with high expertise in contexts of high risk of social exclusion, helped us to iterate the selection of competences and improve the description associated to each competence. Finally, the survey contained the following sections to collect information from the instructor's profile and their opinion about the set of competences needed in the context of study:

- Background data: demographics, level of studies and previous professional experience related to the context.
- A set of competences to be selected considering their priority following six categories. The survey contains an open question at the end to include new competences in case they thought that relevant ones are missing:

1. Critical thinking

- Open to questions: Stimulate debate and collaboration in the classroom.
- Social: Bring the conversation to social media to explore possibilities outside the classroom context.
- Ethics: To promote an attitude of critical and responsible citizenship between students.
- Reflection: Reflect on the problems that technology introduces in our society and favour responsible and critical use of them both in the professional and in the personal context.
- Cultural: Knowing how to acquire knowledge about different cultures and their values and how to understand them.

2. Pedagogy

- Organization: Organize the agenda and the time correctly to cover the content in its entirety.
- Methodology: To favour and enhance the learning and development of personal and professional competences, by applying appropriate methodological and assessment strategies, in accordance with pedagogical and ethical models adapted to each context and educational situation.
- Understanding of educational processes: Understand the complexity of educational and teaching-learning processes

(educational functions, theories of development and learning, teaching role ...).

- Promotion of autonomous learning: Promote the students' autonomous learning based on the objectives and contents of the course and develop strategies that avoid exclusion and discrimination.
- Evaluation: To use the evaluation in its pedagogical function and not merely accrediting itself as a regulator and promoter of the improvement of the learning.
- Orientation: Tutoring students through specific steps.
- Theoretical: Be familiar with the most recognized and accepted basic educational theories.
- Adaptation: Know, evaluate and decide on the adequacy of the available materials for the teaching of robotics.

3. Communication

- Communication: Develop communication processes in an effective way (reception, interpretation, production and transmission of messages through different channels and media according to the context).
- Interdisciplinary coordination: Participate in interdisciplinary teams in a coordinated way, vertically and horizontally; To lead and / or collaborate in training and evaluation activities; Generate new ideas and manage teaching projects adapted to new situations and needs based on the objectives and resources available.
- Interpersonal: Participate and collaborate efficiently and constructively in social and professional life; Solving conflicts that are inherent in the interaction with other individuals or groups in personal and public contexts, based on the codes of conduct and generally accepted uses in the different societies and environments; Respecting the integrity of people and social and cultural diversity and fostering intercultural and interpersonal communication, equality and non-discrimination of any kind.
- Respect: Respect the cultural and personal differences of the students and other members of the educational community.
- Relational: Establish a good relationship with the child/teenager.

4. Creativity and inventiveness

- Innovation: Actively apply alternatives and processes of change in the design, development and evaluation of teaching activities according to each context and aimed at improving the quality of teaching and learning of students. Be willing to innovate and try both teaching techniques, educational applications, ICT tools and electronic devices.

- Design and development: Design and develop educational projects that allow the content of the course to be adapted to the socio-cultural context.
 - Adaptation: Know, evaluate and decide on the adequacy of the available materials for the teaching ICT content.
5. Technical and resolute competences
- Technology: Use, in an imaginative, critical and selective way, Information and Communication Technologies as a means and support for the development and improvement of the teaching-learning process.
 - Knowledge of the contents: Know the contents that will be taught.
 - Resolution: To know how to provide different solutions to the same problem.
 - Interdisciplinarity: be able to combine different disciplines to achieve the resolution of the problem
 - Creativity: find innovative or different formulas to face a situation
6. Transversal competences
- Commitment: Be committed to the work and education of children / teenagers.
 - Tolerance: Do not prejudge and treat all students alike.
 - Gender Equity: Ensure that equality of opportunities among all the participants is guaranteed, with special emphasis on disassembling stereotypes related to the role of girls in the technological areas.

The participants of the survey had to indicate in which level they thought it is important to have the different competences to be an instructor in an educational context with minors at risk of social exclusion. They did it by answering a Likert scale which responded to “not appropriate”, “not at all important”, “slightly important”, “fairly important” and “very important”.

Descriptive statistics were used to report results of the closed questions in the questionnaires. The statistical analysis has been performed using SPSS (IBM Corp.). An inductive thematic analysis based on our research questions was used to report the results of the open questions.

IV. ANALYSIS AND RESULTS

A total of 12 instructors participated in the survey study (4 females, 8 males; age: $M = 39.67$, $SD = 7.07$). Most of them had completed bachelor's degree studies (66.7%), as well as other courses (66.7%) or self-learning (50%). Their academic background was about Programming and robotics (50%), Computer Sciences and Communication (41.7%), Sociocultural services (25%), Arts and Humanities (16.7%) and Education (8.3%). Most of them had previous experience working in a fieldwork related to technology (58.3%) as well as developing robotics related activities (57.1%).

About the competences related to critical thinking, most of the professionals considered that it is very important to be open to questions (75%) or at least quite important (25%). The social field was also considered as very important by most of them (66.7%), indicating the perceived importance of bringing the debate to the social networks to explore possibilities out of the class. Furthermore, the cultural field was also considered as very important (66.7%), referring it to the necessity to know how to acquire knowledge about different cultures, their values and its comprehension. Reflection and potentiation of a critical citizenship attitude was considered as fairly important (41.7%), and ethics was considered as slightly important (50%).

In relation to the competences regarding pedagogy, most of the instructors indicated as very important self-learning (83.3%) and two persons considered it fairly important (16.7%). The methodology and the evaluation were also considered very important (66.7% each), the first one regarding the importance of supporting students' learning as well as their personal and professional skills development, and the second one regarding the function of evaluation as a learning potentiator. Adaptation of the materials and tools and comprehension of the educational processes were also considered as very important for half of the teachers (50% each). On the other hand, orientation was considered as fairly important by half of them (50%), and the organization competence was considered as fairly important (33.3%) and very important (33.3%). Nearly half of the instructors considered that theory was slightly (41.7%) and fairly important (41.7%).

The competences related to communication were considered as highly important. Respect was considered as very important by most of the instructors (83.3%), referring to respect the cultural and personal differences of students. Relational competences related to the importance of establishing a good relationship with the infant or adolescent, were also considered as very important (75%). Interpersonal competences and interdisciplinary coordination were considered as very important by two thirds of the participants (58.3%). Finally, communication was considered as important by most of the participants (66.7%) and very important only by one of them (33.3%).

About the competences related to creativity and inventiveness, most of the instructors considered that innovation and adaptation are two very important competences (66.7% each). The first one, innovation, refers to the ability to apply changes in the class design, development and evaluation to improve the teaching quality as well as students' learning. The second one, adaptation, refers to the ability to know, assess and decide the adaptation of the available materials oriented to teach robotics and programming. Design and development has been considered as fairly important by half of the instructors (50%) and very important by nearly half of them (41.7%), referring to the ability to design and develop educational projects that allow to adapt the course material to the sociocultural context.

In relation to the technical and resolute competences, nearly all the instructors indicated that it is very important to be creative (91.7%) in relation to being able to find innovative ways to face a situation. Technology knowledge was also considered as very important by most of them (66.7%), followed by

interdisciplinarity and resolution also considered as very important (58.3% each). The content was valued as very important by less than half of the sample (41.7%) fairly important by half of them (50%).

Finally, the transversal competences that were considered very important by nearly all of them were tolerance and gender equity (91.7%), being the first one related to not having prejudices and the second one related to guarantee the same opportunities breaking the gender stereotypes. Lastly, it is considered very important by most of the instructors to be compromised with the task and children and teenagers' education (75%), being it considered as fairly important by the rest (25%).

V. DISCUSSION AND CONCLUSION

The conclusions set out in this section are framed within the context of 'Makers for the inclusion' project in the specific context of the Raval district in Barcelona. Due to the need of considering the characteristics of the context, common in qualitative studies, the results cannot be generalized. Yet, we think that the process conducted, the design of the survey, and the results collected provide insights into the current debate of how to facilitate digital equity as discussed by other authors internationally during the last decade [1, 17, 18 and 19].

According to the feedback obtained by the experts from Colectic and the 12 instructors who participated in the survey study, they all agreed that the survey is useful in defining the competences necessary to be able to define a new professional profile for ICT facilitators aiming to promote digital equity.

More specifically, in relation to the competences that an ICT facilitator should have, the survey helped us to identify the most relevant ones. First, regarding critical thinking, both groups have considered it is important to be opened to questions. Next, about pedagogy, they have coincided in the importance of the methodology. The competences related to communication that have been identified as highly important are the following ones: respect, interdisciplinary coordination, relational skills and interpersonal skills. For creativity and inventiveness, many have agreed that innovation and adaptation are very important competences. Next, with reference to the technical and resolute competences, technology, resolution and interdisciplinarity have been highlighted. Finally, the transversal competences that have been indicated as most important have been tolerance and gender equity - being the last one, gender equity, an aspect that needs urgent actions especially in disadvantaged areas [20 and 21].

The main conclusion of this study is that beyond technical competences, the competences related to the social context and the capacity of development in environments of social exclusion are even more important. A next step in our plan is to distribute the survey to a higher number of ICT instructors in Spain and also in Europe to extend the study.

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