

Key skills for co-learning and co-inquiry in two open platforms: a massive portal (EDUCARED) and a personal environment (weSPOT)

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Abstract

This paper presents a qualitative investigation on key skills for co-learning and co-inquiry in the digital age. The method applied was cyber-ethnography with asynchronous observation (forum and wiki) and synchronous discussions (webconference) for analysing skills developed by a co-learning community. This study focuses on participants from different countries who interacted during nine months in two open platforms: the massive educational portal EDUCARED of the “7th International Conference on Education 2012-2013” and weSPOT, an European “Working Environment with Social Personal and Open Technologies for inquiry based learning”. As a result of this study, it was observed that the EDUCARED portal led to the development of more explicit digital literacies, possibly because it was a simpler and familiar interface (forum). And in the weSPOT environment, experienced participants with digital technologies had more opportunities to develop other skills related to Critical-Creative Thinking and Scientific Reasoning.

Keywords: Skills; co-learning; co-inquiry; social networking; ELGG platform; NING platform

Introduction

The digital age is marked by the accelerated development of knowledge technologies, intelligent networks, massive and personalised platforms where individuals and communities instantaneously access, create and share information. In this context, it becomes relevant to investigate “Open Education in the 21st century”. Nowadays, the rapid advances of the Web and innovative pedagogies, participants requires participants to be able to collaborate together in order to co-learn and develop skills for co-creating knowledge anywhere and anytime.

In the decade of OER, MOOC and Massive Open Events, opportunities for open collaborative learning and investigation and the development of different competences have been increasing considerably. New platforms with innovative resources are emerging, such as the EDUCARED portal (<http://encuentro.educared.org>) and the weSPOT environment (<http://weSPOT-project.eu>).

This paper describes a qualitative study which focuses on the relevant skills that were identified by participants (learners and educators) for collaborative open learning (co-learning) and cooperative research (co-inquiry) in the weSPOT inquiry personalised environment and the EDUCARED massive educational portal.

The EDUCARED portal was developed for the 7th International Conference on Education organized by *Fundación Telefónica* from April 2012 to November 2013. The aim of this conference was to discuss “*what 21st century education should be like*”. This portal was based on the online platform NING (<http://www.ning.com/>), which allows participants to create their social networks with communication in various languages. Its interface comprises tools such as Alerts; Forums, Chat, Webinars; Photos, Video, Twitter, Integration with Twitter, Facebook and YouTube.

This massive open online conference comprised 18 months of discussions in online environments and face-to-face meetings every two months, conducted in both Portuguese and Spanish. Participants of the EDUCARED portal were more than 50,000 people, including teachers, family, school principals, pedagogic coordinators, students and other education professionals. Approximately 5,000 people were active in the platform who contributed more frequently to the portal. Their interests were related to the nine themes proposed by Telefónica Foundation (<http://encuentro.educared.org/page/temas>): society & employment, technology & education, learning on the digital age, learning and teaching, educator’s role, leading changes, family, lifelong learning, educational visions & trends. Each theme contains four different types of open activities:

- **Debating:** total of 181 presentations with live debates, 102 face-to-face and 79 online webconferences using Adobe Connect;
- **Sharing:** total of 56 studies and research using YouTube video clips and discussion forum;
- **Practicing:** total of 28 practical activities with live workshops using Adobe Connect meetings and webpage comments;
- **Discussing:** total of 41 community discussions on topic of interest to families, students and experts using discussion forum.

The weSPOT environment (where weSPOT stands for *Working Environment with Social, Personal and Open Technologies*), funded by the European Commission, is being developed by a group of nine countries from 2013 to 2015. Its aim is to provide teachers and learners social, personalised open technologies for collaborative inquiry based learning. This environment based on ELGG platform (<http://elgg.org/>) focuses on a learner-centric approach in secondary and higher education that will enable co-investigators to: personalise their inquiry-based learning environment as well as build, share and enact inquiry workflows individually and/or collaboratively with their peers. This personalised social networking platform allows the creation of community blogs, file repositories, e-portfolio, RSS technology, activities, bookmarks, and groups. Besides these interfaces, it also allows the inclusion of plug-ins such as users, network, user activities, websites, environment and individual inquiries, data collector, hypothesis, notes, conclusions, files, pages, questions, answers and mapping. weSPOT Smart tools aim to support co-learners orchestrate their inquiry workflows through mobile apps, learning analytics support, and social collaboration widgets. Co-learners can then filter inquiry resources and tools according to their own needs and preferences. In addition, they can interact to with their peers in order to reflect on their inquiry workflows, receive and provide feedback, mentor each other, thus forming meaningful social connections that will help and motivate them in their co-learning. weSPOT Smart support tools are grouped in four categories:

- A **mobile personal inquiry manager** supporting a self-directed approach for creating and managing inquiry.
- A **context-aware notification system** that enables the contextualized sharing and notification of real world experiences. Learners can link inquiry projects to certain locations, physical objects, or combinations of contextual factors, notifications can trigger the data collection.
- A **mobile data collection system** supports the direct submission of sensor data and manual measurements into the workflow system, to collect data to test a hypothesis. It also supports

submission of annotations and multimedia materials, to enable reflection, peer support and collaborative inquiries.

- A **mobile inquiry coordination interface** supports inquiry coordinators by giving them access to on-going multi-user inquiries and the contributions of all participants. It allows central dispatching of messages and management of tasks and data.

Eight weSPOT inquiries themes have been developed by partners in nine countries: Food/Health, Biodiversity/Environment, Earthquake, Sea, Energy, Future Education, Innovative research and Economy. This study is part of the Future Education pilot.

The following section presents the methodology. Section 3 introduces data collected in both platforms. Section 4 presents the analytical discussion of EDUCARED data, followed by section 5 that discusses weSPOT data. Section 6 presents a comparative discussion of outcomes and section 7 highlights some final remarks.

Conceptual Framework

This qualitative study focuses on key skills for co-learning and co-inquiry in massive and personalised open platforms. C-o-learning - “c”ollaborative “o”pen “learning” (Freire, 1986, Smith 1996) is a concept that gained more meaning due to the creation and interchange of knowledge generated by participants in Web 2.0 (Brantmeier, 2005; Okada, 2008, 2013). This process includes the rapid dissemination, interpretation and sensemaking of relevant content and best practices shared by communities or social networks. It is also enriched by OER, MOOC and open learning platforms that allow participants to share questions that generate collaborative investigation (co-inquiry), relevant resources for increasing understanding and tools for co-authoring collective research. Co-learners and co-investigators can enhance the process of collaborative construction of collective knowledge when their communities or networks create opportunities for reflective practitioners to evaluate content, technologies, methodologies and practices, which include competences and skills. In this context, the role of educators is essential, not only for opening possibilities for the use of more varied and advanced technological resources, but also for the development of skills for open education, lifelong learning through social and personalised networks. Educators’ interventions are also essential for supporting co-learning and co-inquiry for co-learners co-authoring knowledge together.

Co-learning has already been taking place in informal ways mainly among users who master technologies in the context of OER, MOOC and Social Networks. However, these users need to develop more advanced skills and competences in order to take full advantage of both co-learning in Web 2.0 collaborative environments and Web 3.0 semantic platforms (as shown in Table 1). Those users who “learn to c-o-learn” more easily in Web 3.0 platforms may benefit even more in advanced searches, intelligent networks, automated services and personalized environments. Nevertheless, technological skills need to be developed in an integrated way with scientific citizenship skills and for that, the role of educators is essential as a guide in the different stages of research and critical constructive mentor of knowledge and skills that are developed by the students.

Inquiry is a continuous process of raising important questions with experts or specialists, integrating relevant information and generating acceptable lines of thought based on scientific assumptions and knowledge areas. Such a collective process, co-inquiry (Heron, 1996), becomes even more complex. Pedagogic intermediation becomes even more essential. Teachers need to provide support to co-learners based on strategies, methods and orientation, helping them apply what they already know and the concepts they are learning in problem-based activities (Edelson, Gordin & Pea, 1999; Tractenberg, Struchiner & Okada, 2009). This process requires and provides opportunities

Table 1. Comparison of Web 1.0 to Web 3.0 evolution and pedagogical approaches (Okada, 2013)

	WEB 1.0	WEB 2.0	Web 3.0
Pedagogy	<i>e-Learning</i>	<i>Co-Learning</i>	<i>Co-learning based on Co-Inquiry</i>
Environment	Closed virtual Platform	Collaborative open Platform	Massive and personalised platforms
Focus	Information	Collective construction	Intelligent networks and agents
Content	Generated by institutions	Generated by any user	Focused on individual and communities preferences
Format	Limited –web pages or files for printing	Open and diversified hypermedia for re-editing or remixing	Semantic interoperable content for managing
Resources	Browsers	Accessible applications	Intelligent search, localisation, sharing and integration
Technologies	Information and communication	Knowledge and social networks	Semantic networks, mobile interfaces
Access	Reading	Edition with shared authorship	Via intelligent agents for knowledge capture and reuse
Examples	Concept maps in Encyclopaedias	Several types of maps in Wikis, blogs, LMS . . .	Smart search, virtual stores, virtual worlds
Features	Image or hypertext	Open environments for download, reediting and remix	Semantic Web, intelligent data analysis, Knowledge Technologies
Learners	Passive readers	Communities of co-learners	Competence and skills developers
Educators	Knowledge source	Collaborative mentors	Competence and skills facilitators

for developing essential skills in scientific inquiry: formulating scientific questions, defining methodologies, collecting data, implementing analysis, discussing results interpretations and communicating research results with scientific explanations for feedback, evaluation and dissemination (weSPOT, 2013).

Co-learning based on co-inquiry aims at the collaborative construction of knowledge, in which co-learners are able to expand their social networks, integrate open learning with collective research and co-author collaborative productions. It is enriched through the wide participation for co-creation and peer review in a much more open, critical and innovative way. Co-learners as co-investigators play important roles, such as massive and personalised platforms participants, intelligent network agents, open community managers, knowledge technology users and key skill practitioners. Those roles can be represented by the “C” model (figure 1), which was developed during this research to summarize seven groups of skills described below:

1. PLAN: goals, time and self-management. Participants are able to identify common objectives and other requirements to achieve expected and unexpected outcomes during the process.
2. USE: various tools - search engines, hypermedia, translators, notifications, upload/download, tags, RSS feeds and applications. Participants are able to use open platforms by searching, aggregating, generating and disseminating content.
3. SHARE: questions, links, ideas, comments, annotations and open content. Participants are able to contribute to the platform including a diversity of files, messages and content in wiki pages.

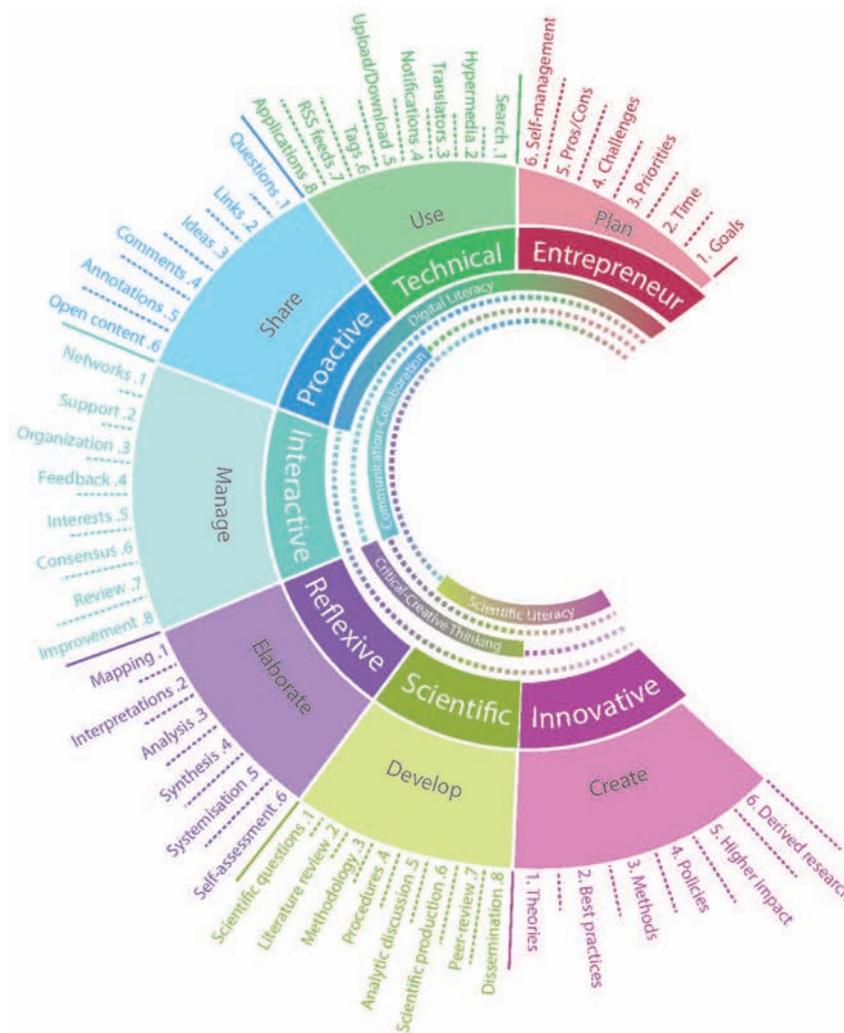


Figure 1: “C Analysis Model” – Competences for co-learning and co-inquiry (Okada, 2014, p. 53)

4. **MANAGE:** networks, support, organisation, feedback, interests, consensus, review and improvement. Participants are able to manage contacts and content for improving the collective discussion.
5. **ELABORATE:** mapping, interpretations, analysis, synthesis, systematisation and self-assessment. Participants are able to reflect co-produce and assess diverse types of collective representations.
6. **DEVELOP:** scientific questions, literature review, methodology, procedure, analytic discussion, scientific production, peer-review and dissemination. Participants are able to improve their learning through a set of activities for scientific research.
7. **CREATE:** theories, best practices, methodologies, policies, higher impact, and derived research. Participants are able to disseminate their co-authorships and exploit new work or studies through new publications and research opportunities.

Methodology

The aim of this research work is to investigate key skills for co-learning and co-inquiry in the digital age in open platforms, particularly massive online portals and social, personal inquiry environments.

This paper reports an exploratory multicase study based on cyber-ethnography, as the study object is not physically delimited, but based on the cyberspace (Ward, 1999; Keeley-Browne, 2011). Such virtual space is constituted by people (educators-co-investigators, in the case of weSPOT and educators co-learners in the case of EDUCARED Forum) who are interconnected by dynamic relationships capable to build a symbolic cognitive system (Lewgoy, 2009) that emerges in online open platforms, such as a massive educational portal and a personalised inquiry environment.

Among all research methods, ethnography seems to be the most appropriate approach to attempt to understand interactions that are developed in virtual communities. The application of ethnography in online environments is also known as virtual ethnography or cyber-ethnography, which becomes appropriate for observing virtual messages in order to obtain knowledge about symbolic meanings, attitudes or patterns of specific groups (Kozinets, 2009).

For this research, cyber-ethnography was used both as an asynchronous observation method (as the data collection from the EDUCARED Forum was conducted offline) and synchronous observation method (during 20 web conferencing sections conducted from April to November 2013).

The informative basis allowed an interpretative investigation approach, exploring the way digital technologies support needs, skills, aspirations and circumstances of both co-learners and communities in their work practices. In this process, all participants were considered as co-learners and co-investigators in the collective study, where theoretical assumptions are interwoven with reflexive collaborative actions.

Data analysed in the EDUCARED portal comprises the thematic forum entitled “New approaches for assessment of collaborative open learning”, which was moderated by a facilitator from March to April 2013 as part of Theme 6 of the conference “How to conduct changes in educational centres”, but the interactions occurred until December 2013.

Figure 2 shows the online portal with the synchronous and asynchronous activities that are part of this research. Data analysed in this forum comprised 129 messages posted during a period of 9 months, from March to December 2013.

A total of 40 participants interacted in the discussion forum about new approaches to assessment in co-learning era using three languages: Spanish, Portuguese and English. Most part of group interaction happened between March and May 2013. During this period it was accessed by 1870 members of the portal. In the discussion forum, active participants shared questions, commented on posts, suggested links with media, established connections with papers and shared concept maps. Five participants proposed to organise and group relevant information in the forum. This initial organisation facilitated the systematization of knowledge constructed by the group, but the challenge was to update it. These participants promoted co-learning through collaborative actions by developing: (1) a list of references shared by participants, (2) a conceptual map of key terms discussed in the forum (3) a graphical visualization of the network interaction, (4) word clouds with key ideas shared in the debate (5) a synthesis of the reflections through a collective paper and videoclip.

Based on shared mediation, which was initialized by facilitators in charge of the discussion forum (who included the author of the activity, coordinators of the event in Spain and Brazil), it was possible to observe group self-management as the participants acted in different roles.

As competence-based assessment was one of the most discussed topics in the forum, some participants suggested using co-inquiry in order to approach the topic more deeply with the following question: Which are the key competences for co-learning and co-inquiry in the digital age? This issue became a collective objective for the interested participants. Participants, however, found difficulty in keeping the contributions in the discussion forum organised due to the increasing number of messages.

The screenshot shows the Encuentro.EDUCARED portal. At the top, there's a header with the Telefónica Fundación logo and the event title 'International event on Education 2012-2013' with the theme 'How should be the 21st century Education?'. A navigation menu includes Home, Event, Themes, Activities, Debate, Conferences, Conclusions, Best Practices, Members, and My page. A search bar is located in the top right. Below the navigation, there are social media icons for Facebook, Twitter, and YouTube. The main content area features a post titled 'New approaches of Assessment for co-learning' with 40 members and a last activity on Dec 10, 2013. The post includes a video player and a discussion section with 129 answers and 85 likes. A 'Legend' table is located in the bottom right corner of the screenshot.

Legend		
Area selected to		Item
Plan	Goal and interests	5
Use	Search	1, 3
	Hyper(multi)media	8
	Translators/ idioms	2
	Upload/download	5
Share	Questions, links, comments,	9,10
	networks	4, 6, 7
Interact	Feedback, support,	10
	Ideas, Summary,	10
Elaborate		

Figure 2: *Encuentro.EDUCARED* - Portal

In order to facilitate this process, the facilitator suggested using another platform, weSPOT (*Working Environment with Social Personal and Open Technologies for inquiry based learning*). Twenty-three members of EDUCARED platform started also using weSPOT from May to November 2013.

Figure 3 shows the inquiry based environment where previous discussions were deepened and new texts were produced using wiki with various feedback from participants through comments. The interaction was also organised by inquiry phases: (1) scientific questioning, (2) methodology planning, (3) literature review (references), (4) research procedures: conceptual mapping, reflective group discussion and platform interactions analysis, (5) systematization of a report and questionnaire (6) peer review and dissemination.

weSPOT participants used a wiki to describe their individual projects related to the collective theme of key competences and skills for the digital age. Most of the interactions reverberated the co-inquiry effort established among the participants and their study plans. Constant constructive feedback, which was initially offered to individual projects by the facilitator, was evidenced among all the participants of the group identifying convergent topics among their individual researches.

Participants continued sharing questions, comments, links to media, connections with papers and maps in both platforms: EducaRed and weSPOT. However, they did that in a systematised manner according to individual and collective interests as the weSPOT environment enabled them to organise



Figure 3: weSPOT environment

information in a wiki, presented by inquiry, theme and chronological order. They were able to follow relevant messages through notifications and provide feedback in both environments. They were able to embed images, graphics and videoclips in both platforms. It was possible to notice that some participants used open content searching interfaces, translators for multilingual forum and other applications to create visualisation and maps.

The perception of these varied forms of interaction led the production of the reflections that are presented here and established new bases for deepening the studies on co-learning and co-inquiry key competences for the 21st century. Thus, the categories for analysing the interactions in both platforms comprise the skills that emerged in both open environments. These interactions were analysed through Bardin’s Content Analysis (2007) and then, listed in seven groups of skills (analytical dimensions), whose evidence could be identified through their varied components (instruments) as illustrated in Table 2.

The line of thought assumed in this paper follows the arguments of Durand (2000), Cheetham & Chivers (1998, 2005) and European Communities (2007), which define competences as a set of knowledge, skills and attitudes that are adequate to the consecution of specific aims. Four key competences (presented in Table 2) were identified in the literature review conducted by participants in weSPOT environment as the most frequent key issue for the 21st century or digital age: collaboration-communication, critical-creative thinking, digital literacies and scientific reasoning.

Table 2. Collective analysis or research reports

Competences		References													
		T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	T14
Digital Literacy	Digital Literacy		X					X						X	X
	Information Literacy	X		X	X	X	X				X			X	X
	Media Literacy			X	X								X	X	X
	TIC			X	X	X	X			X	X	X		X	X
	Technologies							X	X		X	X		X	X
	Digital skills											X		X	X
Communication-collaboration	Communication Collaboration	X	X	X	X	X	X	X	X	X	X	X		X	X
	Collaboration	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Communication			X			X	X						X	X
Critical creative thinking	Critical creative thinking	X	X	X	X	X	X		X	X	X	X	X	X	X
	Critical thinking	X	X	X	X	X	X	X	X	X		X	X	X	X
	Creativity							X						X	X
Scientific reasoning	Scientific Literacy						X		X		X	X	X	X	X
	Inquiry			X	X			X			X			X	X
	Academic skills							X	X					X	X

Legend of References

Paper	Description
T1	National Research Council – Washington (2012)
T2	Government of Alberta (2010)
T3	Hewlett (Finegold & Notabartolo, 2010)
T4	OECD (Ananiadou &Claro, 2009)
T5	Cisco, Intel & Microsoft (Binkley, et al., 2010)
T6	National Research Council - Washington (2011)
T7	UNESCO (2011)
T8	The Bill & Melinda Gates Foundation (Conley, 2007)
T9	Mc Graw Hill (Beers, 2011)
T10	OECD (2005)
T11	European Communities, 2007

Paper	Description
T12	OECD PISA (2013)
T13	European Commission (Ala-Mutka, 2011)
T14	European Union (Ferrari, 2012)

These competences, based on the literature review and skills that emerged in the open virtual environments (Table 2), were identified as those that co-learners presented for developing co-learning and co-inquiry of collective productions.

Table 3. Co-learning and co-inquiry key competences for the Digital Era

Skills		Competences			
(Analytical)	(Instrumental)	Digital Literacy	Collaboration-communication	Critical-creative thinking	scientific reasoning
Planning objectives	individual				
	collective				
Using various Technical interfaces	searching				
	hypermedia navigation				
	translating				
	Notification				
	Uploading/downloading				
	bookmarking/tagging				
	Aggregating				
	Application				
Sharing Contributions	questions				
	Links				
	Ideas				
	Comments				
	Annotations				
	Open content				
Interacting for co-construction	Networking				
	Support				
	Organisation				
	Constructive feedback				
	Interests				
	consensus				
	improvement				

Skills		Competences			
(Analytical)	(Instrumental)	Digital Literacy	Collaboration-communication	Critical-creative thinking	scientific reasoning
Elaborating Global and Individual vision	mapping				
	Interpretation				
	Analysis				
	Synthesis				
	Systematisation				
	self-reflection				
Developing Scientific co-inquiry	scientific questioning				
	methodology planning				
	literature review				
	Procedures/ data collection				
	Analytical discussion				
	Scientific production				
	peer review				
	Research dissemination				
Innovating through praxis	Theoretical principles				
	transformative practices				
	Significant methodologies				
	recommendations/policies				
	Impact/citations				
	Derived research				

Discussion of Results

Illustrative tables with colour codes, as showed in Table 3, were elaborated as a result of content analyses of the discussion forums at EDUCARED portal (table 4) and wiki pages at the inquiry environment at weSPOT (table 5). Results describe qualitative data evidenced according to their relevance and frequency.

Encuentro. EDUCARED Portal (Discussion Forum)

Table 4 is a result of the analysis of the forums and the web conferences at EDUCARED portal. It synthesises the skills that were more prominent in the environment.

At EDUCARED portal, the most active participants shared their interests, which allowed the community to identify common interests: exploring OER (text, forum, videoclip), increasing understanding on the topic through collaborative discussion. Participants did not present any questions related to technical difficulties with the EDUCARED portal. Participants not only shared multimedia files and several reference papers, but also discussed about content shared by other participants. Digital literacy was evidenced by co-learners who showed the following skills:

Table 4. Occurrence of competences and skills in EDUCARED forum

Encuentro.EDUCARED Portal COMPETENCES				
	Digital Literacy	Collaboration-communication	Critical-creative thinking	Ethical-scientific reasoning
SKILLS				
Planning objectives	■	■		
Using various Technical interfaces	■			
Sharing Contributions	■	■	■	
Interacting for co-construction		■	■	
Elaborating global and individual vision		■		
Developing Scientific co-inquiry				
Innovating through praxis				

1. **searching:** sharing open content that might be found using advanced search engines (e.g. Google, Creative Commons, etc.);
2. **using hypermedia navigation:** discussing multimedia content shared by other participants;
3. **translating:** communicating in other languages using translators to read and reply messages in other languages;
4. **using notification:** replying messages instantly after long period based on notifications;
5. **downloading files:** shared by other participants as well as tagging or bookmarking URLs;
6. **aggregating new content:** related to common interests using probably RRS feeds;
7. **using new applications:** developing concept maps, graphs or visualization by using applications such as cmap tools, wordle, and many eyes.

Active and engaged participants frequently contributed to the forum demonstrating initiative of sharing:

- **questions:** including issues according to the topic being discussed;
- **links:** presenting interesting videoclips, images and maps;
- **ideas:** replying the discussion with new suggestions or own thoughts;
- **comments:** providing useful feedback to colleagues and facilitators;
- **annotations:** including specific notes about content or ideas;
- **open content:** including open license image, videos or papers.

These actions not only contributed to develop Digital Literacy, but also communication-collaboration and critical-creative thinking skills.

In the extract below, a participant demonstrates his competence in communication-collaboration and also critical-creative thinking as a result of explicit contributions and interactions for co-construction, showing his aptitude to improve his own ideas and also the ideas of other participants. Participant 5 included reflections, suggested readings and registered new questions directed to Participant 2 in appropriate space in the forum allowing other participants to follow the content in a coherent way.

...it seems we are talking about communication & interaction with the same meaning but reading it, I understand that interaction is more communicational (...). We definitely can communicate and not interact! And now I reflect if we can interact without communicating? I don't think so.

I also reflect about (...) co-responsibility of inter-agents. I wonder if we can interact with those who only emit closed messages. (Participant 5 comments about Participant 2's reflections and shares it with the group).

Other examples, despite less frequent in the forum, refer to the systematization of both global and individual vision—a skill which relates to both collaboration-communication and critical-creative thinking.

In the following message, Participant 4 offers positive stimulus (“liked”, “loved”, “thanks a lot”) and includes a question as a scientific investigation proposal, which opens opportunities to new reflections. The participant also suggests collective integration of ideas with a mind map of the previous discussion (Figure 4), which allowed participants to observe his/her own comprehension of the theme and favoured the comprehension of the whole group with the visualization of the map that was later re-used by other participants.

Dear colleagues...

I liked all answers as they enabled real collective construction.

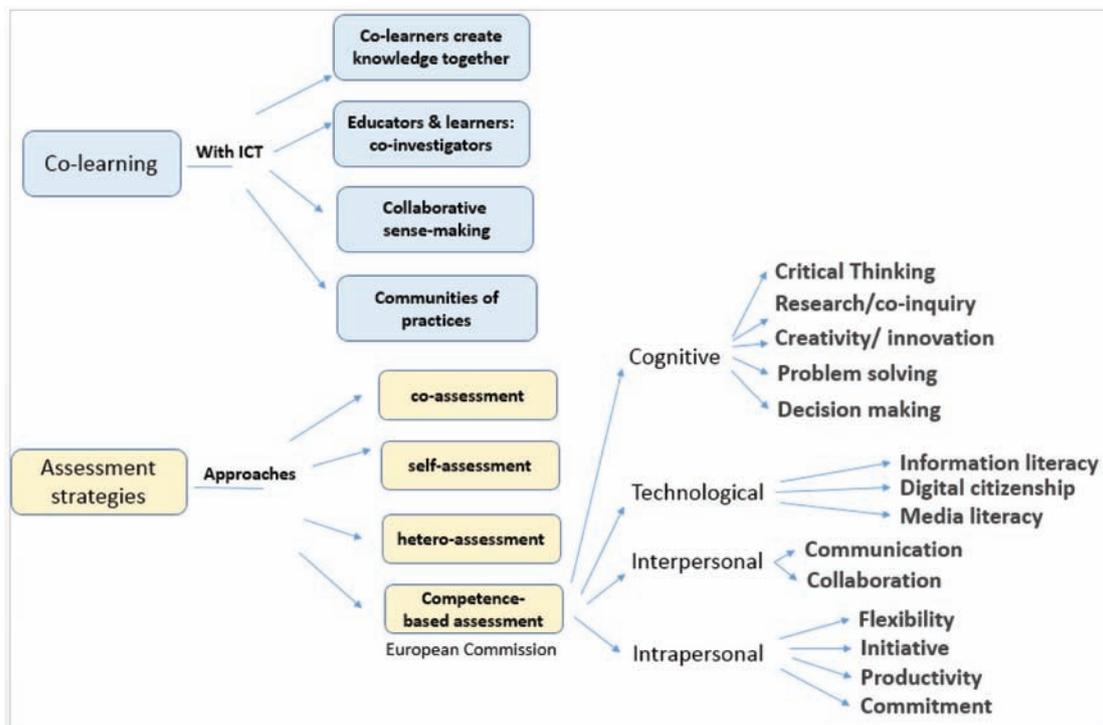


Figure 4: Mapping of the discussions in the forum made by participant 4

... I loved the video and all the proposals. Could we develop a document (OER) of collective authorship with your support about “New Approaches to Assessment through co-learning key competences”?

I can collaborate with a mind map in Portuguese during this activity to integrate our collective knowledge.

Deepening the approaches discussed here and bringing practical situations integrated with ICT will enrich this debate.

Thanks a lot for this rich debate and co-learning opportunity. (Participant 4)

weSPOT inquiry environment

During the analysis of the wiki page on weSPOT inquiry environment it was possible to highlight some registers and reflections of the individuals involved in this study that evidenced skills and competences that emerged from co-learning in inquiry environments. These competences are indicated on table 5.

In the inquiry environment, participants showed as their objective the development of critical-creative thinking and ethical-scientific reasoning for the production of a literature review table and a map of key skills according to the proposal made by Participant 4. In general, participants showed the same attitudes as the ones shown in EDUCARED Portal. Nevertheless, certain difficulty in appropriating all technical interfaces of the environment emerged particularly from the participants who were not used to social personalised platforms and co-authoring widgets. Some technical questions were shared in the discussion forum related to creating sub-wikis, embed hypermedia in the wiki, collecting and tagging information. Another observation was that some participants started

Table 5. Occurrence of competences and skills in the wiki page at weSPOT

weSPOT COMPETENCES				
	Digital Literacy	Collaboration-communication	Critical-creative thinking	Ethical-scientific reasoning
SKILLS				
Planning objectives				
Using various Technical interfaces				
Sharing Contributions				
Interacting for co-construction				
Elaborating global and individual vision				
Developing Scientific co-inquiry				
Innovating through praxis				

practicing different skills related to critical-creative thinking particularly related to organising and systematising global and individual contributions:

- **mapping:** participants created different visualization of key skills by using applications such as wordle, mindmeister and many eyes in separated wikis for aggregating comments;
- **interpretation:** reflective comments on multimedia resources and own thoughts particularly on collaborative discussion and production;
- **analysis/synthesis:** action of breaking texts in parts and integrating it to obtain a new and more meaningful overview;
- **systematisation:** integrating group contribution (collective knowledge) through narratives (paper, video, presentation, etc.);
- **self-reflection:** action of reflecting about one's own ideas, thinking, participation and individual or collective constructions.

Another group of skills related to scientific reasoning enabled co-learners to complete their research project or case studies as well as co-author publications through conference papers and posters. They were able to develop:

- **scientific questioning:** several questions to conduct collective or individual scientific research;
- **literature review:** action of conducting a wide study of literature related to the theme using technological resources (eg.: Mendeley);
- **methodology planning:** action of establishing methods, instruments and procedures for investigations such semi-structured questionnaires, qualitative interviews and focus groups;
- **data collection:** action of implementing interview in both environments, obtaining feedback through comments and online meetings;
- **analysis based on evidence:** action of analysing data and identifying evidences which were discussed among peers;
- **systematisation:** action of preparing scientific narrative with coherent arguments connected to sufficient evidence.
- **peer review:** action of obtaining feedback from experts in the topic;
- **dissemination:** action of communicating results, improving future steps through feedback.

The following extract presents evidence of collaboration-communication, critical-creative thinking and scientific reasoning competences. We can observe that Participant 9 describes his/her contribution with collective integration of ideas about collaboration, translates (language), improves his/her own ideas as well as the groups' with greater deepening of the term competence. The following images (Figures 5, 6 and 7) show the collaboration of this participant in several dimensions, according to the example below.

I synthesised our discussions on collaboration competence and substituted the previous text that was originally in English. I added my contributions (...), translated and already adapted so that we can continue our studies and start the construction of the dictionary. It is a new starting point for this competence.
(Participant 9)

Conclusion

This research evidenced that the competences that emerged from the analysis were developed through co-constructed knowledge in both intrinsic and extrinsic manners in cyberspace as a result of participants' skills and attitudes. On the other hand, skills and abilities were established through the analysis of online environments from their experiences in the field and from a practical-theoretical reflexive perspective.

The screenshot shows a wiki page on the weSPOT inquiry platform. The page title is "Claudia Machado". It features a navigation bar with "Home", "Inquiries", "Members", "Activity", and "Help". The breadcrumb trail is "Inquiries > colearners21 > colearners21's pages > 01 - Researchers and Projects > Claudia Machado". The page content includes:

- Title:** Aplicações online e os media sociais para o desenvolvimento dos professores do Programa Aprendizagem do SENAC
- Research Question:** Quais as competências que os professores devem ter relativamente à utilização das aplicações online e os media sociais?
- Methodology:** Não há como negar o vínculo entre a educação e as TIC, nomeadamente as aplicações online e os medias sociais, e que esta relação modifica a forma como se dá o processo educacional face à necessidade de promover o desenvolvimento das competências requeridas para atuar na sociedade da informação e comunicação. Ao inserir as as aplicações online e o social média no contexto educativo estamos a possibilitar aos alunos e, porque não dizer também, aos professores o desenvolvimento das competências em TIC. (Machado, Oliveira, & Almeida, 2011, s/p).
- Research Objectives:**
 - Identificar as competências necessárias que os professores devem ter relativamente à utilização das TIC.
 - Investigar se depois da frequência ao curso de formação "Integrar as TIC na sala de aula" (CF-ITICSA) os professores estão a utilizar as aplicações online e o social média e com que finalidade.
- Comments:**
 - How can competence-based assessment be developed through technologies and social media?
 - This reference might be useful: NRC (2011). Assessing 21st century skills.
 - See also: Social networks and OER [<http://oer.kmi.open.ac.uk>]
- Leave a comment:** A comment editor with options for "Embed content" and "Remove editor", and a toolbar with icons for link, image, video, audio, and text, along with dropdown menus for "Formats", "Font Family", and "Font Sizes".

Figure 7. Wiki page with Participant 8's scientific inquiry project commented by various other participants

but in a systematized way according to their individual and collective interests once the environment allows the organisation of information in the wiki, which are presented according to inquiry, theme and chronological order.

Another result of this investigation was that the portal enabled the more explicit development of digital literacies, which may be related to the fact that it comprises a more popular and simpler interface (forum). In the co-inquiry environment, participants who showed more familiarity with digital technologies had greater opportunities to develop other competences related to scientific literacy.

Besides twelve individual inquiry projects and one collective research in weSPOT platform, four conference papers, six students' research posters, five conference presentations and three doctoral theses in Brazil and Portugal were produced. The community also developed a research questionnaire and, a report that was shared in the final event promoted by Telefónica Foundation which was extended as a chapter of the OER & Social Networks book (Okada, 2012; Okada, Meister & Barros, 2013) as well as a book published in Portugal (Okada, 2014).

Aiming at more scientific rigor for this study at the weSPOT environment, the community developed an instrument of analysis denominated model C (Figure 1), which has been used in various research publications (Calonego, Serra & Okada, 2014; Correa, Rabello & Okada, 2014; Souza, Okada &

Silva, 2014; Rabello & Okada, 2014) both collective and individual systematizations of the interactions and collaborative participations were carried out through the integration of ideas, different mapping and argumentative reflection.

Future work will provide a continuation of this research observing how the co-learning and co-inquiry network allows co-learners to use model C for planning, analysing and developing or practicing key skills for collaborative learning in the digital age.

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