doi: 10.22363/2521-442X-2021-5–1-57-67
rudn.tlcjournal.org

Original Research

Developing pre-service teachers' digital communication and competences through service learning for bilingual literacy

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Article history Received November 23, 2020 | Revised March 1, 2021 | Accepted March 10, 2021
Conflicts of interest The authors declared no conflicts of interest
Research funding No funding was reported for this research
doi 10.22363/2521-442X-2021-5-1-57-67
For citation Ahern, A., & López-Medina, B. (2021). Developing pre-service teachers' digital communication and competences through service learning for bilingual literacy. *Training, Language and Culture, 5*(1), 57-67.

Learning environments have become increasingly digital in recent decades, requiring teachers and students to develop general digital competences across all educational systems and stages. This also means that for future teachers, professional digital competencies are a valuable asset that enables them to work with the technologies already fully integrated in schools and embedded in most curricula. This paper describes the use of digital communication technology throughout the different stages of a Service Learning Project, involving 2nd and 3rd year students from the Degree in Primary Education at the Universidad Complutense, Madrid. Students and their teachers involved in the project use specific digital communication tools which favour the interaction and completion of the project goal: supporting literacy programmes in two languages for underprivileged students in two local schools. This paper analyses the tools used in the different stages of the project, the digital competencies they are related to and their suitability for similar Service Learning Projects.

KEYWORDS: *pre-service teacher, digital communication, digital tools, bilingual literacy, professional competence, underprivileged students, ALFAPS*

1. INTRODUCTION

The current higher education system is more concerned than ever with finding the most appropriate teaching methodologies in order to obtain the best learning outcomes. In this respect, active methodologies have been gaining ground recently, mainly because they move away from traditional teaching and promote learner-centred models instead, which involve more student participation in the construction of knowledge, cooperative work or increased interaction between students and teachers, among other practices (Crisol-Moya et al., 2020). In addition, the advent of multiple digital resources, together with the development of educational platforms and the widespread implementation of online educational programmes have

doi: 10.22363/2521-442X-2021-5-1-57-67
Volume 5 Issue 1, 2021, pp. 57-67
https://rudn.tlcjournal.org

also led to significant changes in the ways content is presented and learned (Lubovsky, 2020). This paper describes the digital communication tools used in the Service Learning (henceforth SL) Project *School Languages and Literacies: Competencies and Strategies, Reading and Writing in Spanish and English* (henceforth, ALFAPS, the initials for the project title in Spanish). The project, which involves 2nd and 3rd year students in Primary Education from the Complutense University, took place in two state schools in Madrid in the 2019-2020 academic year. Led by 10 teachers, the student participants (n=60) received training in *Reading to Learn* pedagogy (R2L) to help children from two disadvantaged schools in their process of acquiring literacy in English and Spanish.

Through the whole process, different digital communication tools were used to disseminate and exchange information, compile materials, train the participants and evaluate results, among other purposes. Simultaneously, the use of these tools became one of the sources of learning for all the participants involved, thereby responding to an often-voiced concern about the lack of integration of digital competencies in teacher education in our context. In this respect, Amhag et al. (2019, p. 204) observe *'digital competence for pedagogical purposes is still poorly integrated into teacher education programmes'*. In the same vein, Cuhadar (2018, p. 61) states that *'although there are many vital components of successful technology integration in education, perhaps the most important of them, as well as the least emphasised one, is the process of teacher education'*. Both studies, among others (Gabarda et al., 2020; Melash et al., 2020; Yehuda, 2020; Magdaléna & Ivanova, 2020), highlight the relevance of embedding technology naturally in daily activities, since the pre-service teachers will have to replicate this practice in the development of their future careers. Moreover, a high exposure to a wide range of activities in different areas would make students more competent digitally (Hřebačková, 2019). This paper provides an overview of the digital tools used in the ALFAPS Project to support the implementation of the project in all the stages. The sections below summarise the integration of the tools in the project stages, the purpose of each tool and the area(s) of the digital competence developed with their use.

2. BACKGROUND

2.1. Service learning and R2L

The quest for finding the best way to make learning meaningful is a common practice in any educational context. Since the early 70s, research exploring how to reach this goal has valued the role of learning by doing, and of experiential learning – *'a process through which a learner constructs knowledge, skill, and value from direct experience'* (Luckmann, 1996, p. 7), which offers opportunities to develop skills that cannot be put into practice in a traditional classroom.

Even though the benefits of experiential learning have been highlighted by research in recent decades, its implementation in higher education is scarce (Rosenstein et al., 2012), and lectures – as opposed to active methods of learning – are still very widespread teaching methods at this level. University faculties indicate various reasons which prevent the implementation of activities involving active learning, for instance, lack of time and money, university bureaucracy, or departmental policies, among others, are frequently pointed out as difficulties or obstacles preventing progress towards more active approaches (Wurdinger & Allison, 2017).

Service learning – together with active learning, problem-based learning, project-based learning and place-based learning – is considered a teaching approach that leads to experiential learning (Wurdinger & Carslon, 2009), and has proven to be beneficial for students and communities alike. Service learning programmes are community-based and allow students to *'transfer knowledge and skills gained in the classroom into practical projects within their communities thus becoming more socially aware and active'* (Peric, 2012, p. 365). The mutual benefits, however, are highly dependent on the design of the project and on the integration of the service learning (SL) activities in the course curriculum.

At the higher education level, and despite its heterogeneous implementation in the different fields (Salem et al., 2019), research shows a positive impact of SL programmes on the learning outcomes, since students can better understand the contents of the curriculum while developing the practical skills required in the projects. The commitment to the project contributes to students' satisfaction and sense of achievement, as they come to understand their own contribution to the benefits obtained by the community.

In the case of the present study, ALFAPS participants put into practice their skills teaching literacy in Spanish and English in two bilingual state schools located in different neighbourhoods in Madrid. Participants (n=60), 2nd and 3rd year students in Primary Education, received training on the *Reading to Learn* (R2L) pedagogical model (Rose & Martin, 2012), which has proven to be successful in improving literacy levels with disadvantaged learners worldwide (Rose & Acevedo, 2017). The R2L pedagogy involves using a methodology which can help with the literacy learning needs of primary school pupils in both their first (usually Spanish) and additional languages (English). Through pedagogic intervention in reading and writing, focused on the genres of the different school curriculum areas, this systematic literacy instruction approach has been proven to be highly effective in developing pupils to become independent readers and writers (Rose & Martin, 2013). The approach was simplified in the training seminars addressed to the participant undergraduates, who learnt a range of scaffolding strategies required in the R2L model. In addition, they prepared specific materials to guide children at schools towards a comprehensive understanding of texts as well as to use the resources of a model text in their own writing within the same genre. In order to carry out this training and the implementation of lessons following the R2L model, different digital tools were used, mainly to communicate information to the different stakeholders, but also for other purposes, such as to collect feedback or create content for the training sessions and for the lessons at the target schools.

2.2. Framework for integration of ICT in initial teacher education and in the project

The articulation of the project integrated diverse digital tools in all the stages of the process with the following objective: use the best tools to convey content at all times and to facilitate the achievement of the goal involved in each stage of the project. Simultaneously, pre-service teachers developed their digital competences in the four key areas – information, communication, production and safety (Skov, 2016). The tasks required for the completion of the project integrated an array of digital tools which also covered the three dimensions which describe the teachers' professional competence: generic digital competence, didactic digital competence and professional oriented digital competence (Ottestad et al., 2014); i.e. they were enabled to go beyond the digital skills required to 'function' in the current society by learning the use and creation of tools they will have to use in their careers in the near future.

The articulation of the project includes the main features of the TPACK (Technology, Pedagogy and Content Knowledge) model (Mishra & Koehler, 2006). This model highlights that the integration of content knowledge and pedagogical knowledge, in addition to the ways in which teachers assess the content in terms of its 'teachability', should be what guides them in the selection and application of technological resources. As stated by Mishra and Koehler (2006), *'At the heart of pedagogical content knowledge is the manner in which subject matter is transformed for teaching. This occurs when the teacher interprets the subject matter and finds different ways to represent it and make it accessible to learners'* (Mishra & Koehler, 2006, p. 1021). Teachers analyse, in relation to their learners' needs, how the content that must be learnt can be structured and represented in order to be effectively understood and interiorised. This analysis provides criteria upon which the selection of adequate resources should be based, so that the integration of technology should respond to the specific goals, and proposals on how to reach those goals, that teachers have established.

doi: 10.22363/2521-442X-2021-5-1-57-67
Volume 5 Issue 1, 2021, pp. 57-67
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Another essential aspect of TPACK, as emphasised by Mishra and Koehler (2006), consists of the intersecting kinds of knowledge that teachers must access and apply in the effective integration of technologies into their pedagogical practices. The domains of knowledge of pedagogy, content (from across the curriculum and within the areas of knowledge that it establishes) and technology can be identified separately, but it is at the intersections of these domains that effective planning and implementation of teaching activities and the resources which they require takes place.

This approach not only pertains to the articulation of the SL project reported on herein, since the university professors involved applied it to the project design and development (see next section). It is also highly relevant to the university student participants, who were required to become involved in the professional communication by means of technological resources throughout the training and the implementation of the project.

4. SERVICE LEARNING PROJECT IMPLEMENTATION PROCESS

4.1. Timeline and overview of the stages and activities of project implementation

Following previous good practices in Service learning projects, according to Copaci and Rusu (2016), a framework of four stages was adopted, including: planning/preparation, action, reflection, and finally, dissemination/demonstration. These stages took place on macro- and microlevels throughout the project, although the final step (dissemination) was developed in a distinct manner from the first three. On the macrolevel, the entire project implemented each stage; and on the microlevel, the participants put into practice the cycle of planning, action and reflection in a recurrent manner, as they engaged in the delivery of each one of the literacy learning sessions that the project involved.

The *planning/preparation* stage continued throughout the project over a number of months. It consisted, on the one hand, in the period during which the project was conceptualised and the university teachers decided to put together a proposal in response to the call announced by the university authorities in March, 2019. Within this stage, a pilot initiative was set up, in which the main components of the project were identified and two groups of students put into practice a smaller-scale, initial implementation of the SL activities. At this point, one of the first professional communication challenges was faced: conveying to the schools, in a quick and effective manner, what it was that the university team proposed to them. The stage continued as the decision was made to respond to the call for proposals for university-funded SL projects in April of 2019. A team of professors from the language Pedagogy department, as well as colleagues from the Fine Arts Pedagogy and the Educational Psychology departments, developed a written proposal for the project proposed for the 2019-2020 academic year.

The proposal was approved and put into *action* starting September, 2019. Presentations were made to the groups of students in Primary Education to recruit volunteers. The students developed their participation within the courses on Spanish, Language Teaching; English, EFL teaching, and the elective Teaching Literacy in EFL, from the specialisation in English. They firstly took part in a training seminar over the months of October and November. From late October, the action stage of the project took place: intervention to provide literacy learning support at the participating schools.

The stage of *reflection* was interwoven with the action stage, as after each intervention session at the schools, student teachers produced a written record in response to a set of reflection questions provided by the university professors, written texts that were considered in assessing the student teachers' learning process as part of their course evaluation and grading. This *action/reflection* stage continued until, as a result of the Covid-19 pandemic, all schools in Spain were closed in February, 2020. The premature end of the project due to this circumstance also meant that the final stages of *dissemination/demonstration* could not be implemented according to the initial plan and the students' participation became severely limited due to having to adjust to the pandemic situation,

and to the sudden switch to fully online study and exams. In the next section these stages are revisited and the use of digital communication that was carried out is explained in relation to each.

4.2. Digital communication practices in the initial project stages

Throughout these steps within stage one, the project participants used a range of digital resources to communicate. In order to face the first major challenge, an infographic was created (Figure 1), using the subscription-free version of *Easelly* (2021). This infographic was sent as an e-mail attachment to the headships of the two schools the project coordinator had identified as potential partners. The challenge mentioned consisted in conveying a quite complex set of facts and information in the most concise and synthesised manner possible, considering the heavy agendas that the school staff members must deal with every day. Once it had been agreed with the school, the formal proposal had to be written up and sent to compete for selection among those submitted to the university authorities in charge of the project selection and funding. The proposal required careful consideration of the selection criteria published by the university and had to be composed following the CFP's prescribed structure. It was originally composed by the project coordinator, then shared using Google Docs for the core group of participating professors to collaborate with suggestions to complete or correct the first draft.

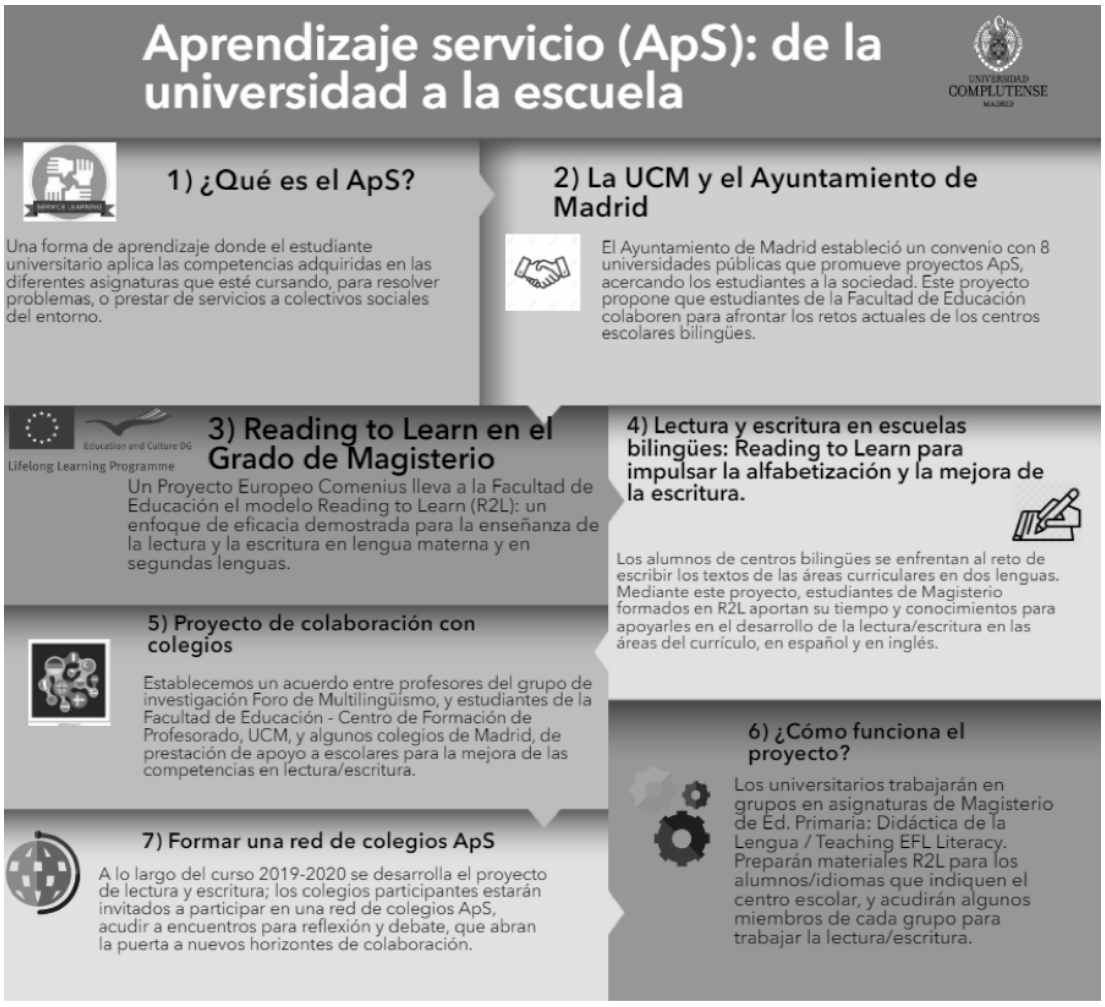

Figure 1. Infographic on ALFAPS Project

The project required providing the participating university students with enough knowledge and understanding of the R2L approach so as to put it into practice to support the participating school pupils' literacy learning. For this purpose, the *planning/preparation* stage also included a specialised training course for the student teachers. The training included an intensive introduction to the R2L approach in its application with pupils using the community language (Spanish, in our case), as well as with a foreign language, English. This bilingual implementation of both the specialised training and the literacy support lessons provided as the project's main action focus constituted an especially innovative aspect. It also required a series of decisions about how to most effectively deliver the training to the student teachers, including which digital communication tools were most appropriate. The complexity of the learning that was proposed for the short period of time in which the university students had to acquire the knowledge and skills required for use in providing literacy support at the schools required thoughtful design of the training. The professors needed all the technological resources within their reach so as to make it possible to have the students ready and ensure the intervention would be effective for the schoolchildren with whom it would be carried out.

Thus, the preparation of the training course involved designing a number of presentations. The professors chose PowerPoint (PPT) as the readily accessible, familiar software for creating the presentations. In the PPTs, the students were shown the essential information about the theoretical basis of the R2L approach, and practical tasks were represented. The training sessions comprised mainly whole-group lectures that combined short practical exercises completed by pairs or small groups of students.

4.3. Integration of digital communication in training for literacy instruction

In order to work with the two project languages during these sessions, at certain points a tandem structure was applied so that the analysis of a text in one language could be immediately contrasted with another in the second language. Thus, it was observed how genres could have parallel structural features across the two languages, for which two screens in the classroom were implemented, each with a text from one of the languages, belonging to the same genre. In the training classroom, the hardware that was available included a desktop PC connected to an overhead projector, as well as a high-definition touchscreen monitor. In the dual language analysis exercise, both the projected screen and the touchscreen were used to display a text from the same genre (e.g. a Descriptive Report) in English on one screen and in Spanish on the other. To guide the students in checking their analyses, in turn, the two session instructors spoke and worked on the text in their own language, explaining the analysis developed with the projection of both texts on view. This enabled the participants to use the view of both texts and languages to deepen their understanding of the genres of the primary school curriculum and the texts that children use in those genres across the primary years, in their first and second languages.

The practical tasks assigned in the seminar consisted of the following.

1. Reading and analysing (identifying the genre and textual structure) a selection of text fragments, extracted by the teacher trainers from actual learning materials (mainly textbooks from Spanish affiliates of international publishers, such as Oxford University Press or Cambridge University Press, or Spanish publishers, including S.M. or Santillana), so that the student teachers would become as familiar as possible with the literacy demands the children face at school at the different levels of primary education.

2. Using an analysis of one of the aforementioned fragments, in which the genre and its stages had been identified, pinpointing some of its language features to establish as learning objectives for the primary pupils who would study the text.

3. Searching for a new text that would be adequate for the participating pupils, identifying its genre based on the R2L proposal for genre classification, and structure (the stages and phases of the text).

4. Formulating specific language and content learning objectives for lower primary pupils (2nd year, ages 6-7) based, firstly, on a text analysed with the teacher trainers, and later on texts selected by the trainees.

In addition, students completed an online revision quiz, created with Google Forms, intended to help them consolidate the knowledge acquired in the training sessions. The quiz provided photographs of the seminar sessions, showing the actual development of the teaching practices that had been demonstrated, in addition to diagrams conveying the theoretical fundamentals of the R2L approach, as visual expressions of the notions that had to be interiorised.

4.4. Digital communication in the action stage

Upon completion of the training sessions, students were organised into groups and a schedule for their interventions was established. Since they were grouped in different classes, each having distinct timetables, while their school interventions had to take place within the children's language lesson times, this process required intense coordination efforts. Again, the use of digital tools, namely from the Google educational suite, was also very helpful for this process. Timetables were displayed in a collaboratively-edited document into which the students entered their availability and were thereby assigned to specific groups of primary school pupils.

In the first sessions, student teachers developed a task to identify the learners' needs and the suitability of the previously prepared lesson plans. When required, tasks were adapted to the learners' L1 or L2 level, under the guidance of the teacher trainers, based on exchange of documents through Google Classroom. After these first sessions at the schools, a final university training session was held, which included time for focus group interviews with the professors. These interviews were recorded, in agreement with the students, using the professors' and/or students' own smartphones; the audios were stored online and transcribed later by project assistants using *Audacity* (2021) audio software. The resulting data ensured learning process and the possible need for face-to-face tutorials to provide further, more individualised guidance.

As the project moved forward, it formed part of the student' subjects within their course in Education, requiring integration into its academic calendar that ended in December, which led to an exam period after the Christmas break. At that point, project coordinators distributed a new PPT presentation to celebrate the project's interim results and to encourage student' interest to participate in the project as part of their second-semester courses (February to May). The interim achievements included a total of around 125 literacy support lesson hours provided across the two languages at the two participating schools. In the texts that they had produced during the lessons, the primary pupils had shown enthusiasm and joy at the involvement of the student teachers in supporting their learning, in classroom environments where they were able to receive individualised attention and help.

As part of the midway project data collection tasks, questionnaires were circulated among the participating university students and the schools' teaching staff involved, in January, 2019. These were created and distributed using Google Forms, allowing for immediate feedback and the creation of spreadsheet databases with the responses. Finally, the student teams who had agreed to continue with the SL began the second semester intervention, but after two classroom sessions, the project ended abruptly as Spain entered full lockdown in February of 2019 and all educational institutions were forced to suddenly transition to online distance learning formats.

5. DEVELOPING TRAINEE TEACHERS' PROFESSIONAL COMMUNICATION IN THE DIGITAL AGE

Thus far, it has been seen how the design and implementation of the SL project described herein integrated a range of digital technologies to support communication that made this project possible. As teacher educators, the university professors attempted to engage their students in practices which they may eventually design and implement

doi: 10.22363/2521-442X-2021-5-1-57-67
Volume 5 Issue 1, 2021, pp. 57-67
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themselves, as professionals. In the project, this engagement can be seen as multi-layered. The students learned in an explicit way about how to teach literacy following a specific, systematic R2L approach (Rose & Martin, 2012); in the process of this learning, they were required to implement a range of digital technologies, as shown in the previous section. They also applied the knowledge of literacy instruction in the real-world context of primary school classrooms with at-risk pupils; in order to do so, they were required to communicate with the different collectives that participated, including the professors and the primary school staff members. Thus, the students faced challenges of various kinds, including learning the contents of the training seminar, applying it to developing teaching plans and implementing those plans, as well as presenting themselves and projecting an appropriate image as capable literacy support instructors in the professional context of providing a relevant service to the school communities.

In keeping with the concepts and framework of the TPACK theoretical model, the teacher education activities put into practice throughout the project were considered in terms of the knowledge that had to be developed for the purposes established, the ways to represent that knowledge, and the affordances of the technologies available to the participants. A range of purposes were established over time, while for each purpose or goal the most appropriate communication technologies were applied. Table 1 reflects the range of communication tools put to use in connection with each stage and the range of goals that were pursued.

Table 1
Correspondence tool-stage-goal of the ALFAPS project

TOOL	STAGE	GOAL
Infographic	Preparation: dissemination of proposal to potential participants	Provide an overview of the project so as to establish university-school collaboration
Video	Planning/preparation	Recruit university students/volunteers to participate (student testimonial)
PowerPoint presentation	Planning/preparation	Convey project terms and development to potential participants; present the project, develop awareness
Split view monitoring using parallel texts in Spanish and English	Action: face-to-face, specialised training sessions	Collaboratively guide student teachers in bi-literacy instruction
Google Classroom and e-mail for trainee-professor correspondence, Google Docs for concept revision quiz	Action: online training in bi- literacy instruction	Assign/submit training tasks, student planning and supervision by professors
Templates	Action: face-to-face and online training on teaching practices	Guide the students in the lessons
Audio recordings	Reflection: face-to-face sharing of information on the teaching process in focus groups	Gather information on teaching practices
Google Forms questionnaires	Reflection: evaluation	Gather information on students' pre-existing knowledge, motivation, feedback and engagement; teachers' views on the process

In the use of the technologies for digital communication, summed up in Table 1, it was mainly the teacher trainers/professors who designed and created the resources using these communicative tools. The role of the students, on the other hand, was to learn the content for the literacy instruction approach, and to put it into practice using the digital media provided: at the training sessions, following the professors' presentations, and checking their own work against the analyses explained and illustrated with the onscreen projected texts; and during their own study time, completing the questionnaires, lesson-planning templates, quizzes and reflection worksheets provided, uploading them to the Google Classroom, accessing the feedback provided through the Classroom app or by way of e-mail, searching for appropriate texts for teaching literacy to the intended age-groups, and working out the logistics of locating the schools and classrooms, attending the sessions at the correct times and dates and conveying any difficulties or needs to the teacher trainers by e-mail.

Pre-service teachers participating in the project have also covered the key areas of digital competence, namely the following (Skov, 2016).

Information. Ability to identify, locate, retrieve, store, organise and analyse digital information and evaluate relevance and purpose.

Communication. Ability to communicate, collaborate, interact with and participate in virtual teams and networks as well as make use of appropriate media, tone and behaviour.

Production. Ability to create, configure, and edit digital content, solve digital problems and explore new ways to take advantage of technology.

Safety. Ability to use digital technology safely and sustainably in relation to data, identity and work injuries and to pay attention to legal consequences, rights and duties.

ALFAPS involves a wide range of activities (training, development of teaching units, evaluation of materials, etc.) combined with management of different groups (students from three university classes, teachers from two schools, activities in small groups within eight primary school classes). This complex structure calls for appropriate tools able to facilitate connection between groups (Communication), and instruct students on the steps to be followed (Information). In addition, it also calls for instruments capable of creating didactic materials on bilingual literacy adapted to different educational levels (Production), always preserving the children's identity (Safety). The digital tools and the areas covered are represented in Figure 2, and the overlapping between areas is shown when appropriate.

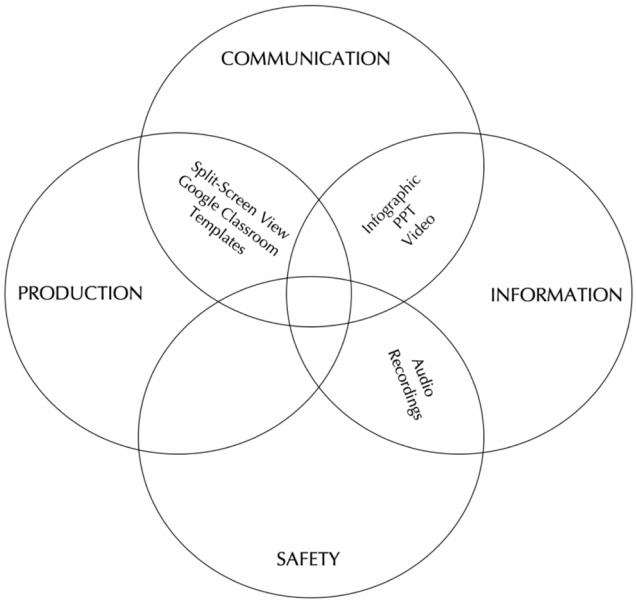

Figure 2. Digital tools and areas of digital competence in ALFAPS

6. DISCUSSION

Throughout the implementation of the project, the students met with difficulties, evidencing the learning process by which they came to eventual success in communicating the various messages to the diverse addressees with whom they were required to interact. A few of the difficulties the students encountered included the following.

1. Using templates for planning. In some cases, students misunderstood information provided on the literacy lesson planning template documents with which they needed to practise applying learning of the R2L approach.

2. Accessing Google Classroom, participating in collectively-edited forms or documents. This required signing out of all other e-mail accounts except the university one. Some students found it difficult, leading to delays in engaging in the different communication or learning activities.

3. Taking initiative to convey needs for guidance. Despite the trainers' reiterated invitations to do so, few of the participants who worked together in small groups requested tutorial sessions to review the lesson plans that they had drafted. Their perceptions of having lacked sufficient supervision in this respect were identified at the end of the first *action* cycle of the school intervention, by means of a survey exploring their experiences up to then and their satisfaction with the project. In the survey, numerous students mentioned having felt they needed more help from the teacher trainers, in contrast with the low numbers of students who had requested tutorials or guidance.

4. Communication breakdowns among the project stakeholders. At a couple of points, the participating schools failed to convey the cancellation of class sessions, which led to students attending the schools without being able to do the interventions. The effect on the students was problematic, as they expressed later how frustrated they had felt wasting time in preparing and travelling to the schools only to discover the cancellations. This also affected their perceptions (as shown by the follow-up questionnaires) of the project organisation, as they felt the miscommunication showed the coordinators' neglectful attitudes or lack of preparation.

7. CONCLUSION

This study analyses the suitability of different digital tools to carry out a Service Learning project in the area of bilingual literacy. A description of the goals linked to each tool and the embedding into each stage of the process show the potential of combining different tools to facilitate the running of the activities. Upon completion of the project, the most substantial difficulties encountered by the students were unrelated to the use of technologies for professional communication; rather, they pertained to some of the obstacles they face in communication overall, whether in the context of their studies or in a professional one. Mainly, these difficulties can be summed up as omitting communication when needed, or lack of initiative in conveying important needs or information within the development of either learning, in the educational setting, or providing services in a more professional situation. In addition, the digital tools promote the development of all areas making up the digital competence. The overall result in relation to the integration of digital communication into the project shows a very positive balance in our view. The communication tools employed tended to serve their intended purpose successfully, quickly and effectively, and in addition, provided the student teachers with worthwhile examples and models of how to implement the wide range of technologies available depending on the immediate purposes and goals at hand.

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