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Unlocking Learning

The use of education technology to support disadvantaged children's language learning and social inclusion in Italy

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The use of education technology to support disadvantaged children's language learning and social inclusion in Italy

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Acknowledgements

List of acronyms

ADHD	Attention Deficit Hyperactivity Disorder
AIPI	Agire Insieme Per l'Intercultura
Akelius	Akelius digital language learning course
CSO	Civil society organization
SEN	Special education needs

Contents

Executive summary

Foundational literacy skills are the gateway for children to thrive in school and beyond. In Italy, many children still find it challenging to attain the foundational Italian language skills they need to actively participate in school and to learn. This is particularly true for non-Italian students, who represent one in every ten students in public schools. Providing Italian language skills to children with a migration background, such as refugee and migrant children, is recognized as a national priority, as it is essential for guarantying these children's right to education and to facilitate their inclusion and participation in Italian society (MIUR, 2014a; MIUR, 2022b). This need is now critical; between 2014 and 2020 more than 700,000 asylum seekers and migrants travelled to Italy (IRC, 2022) and, as of November 2022, around 49,400 Ukrainian refugee children remain in Italy. Italy's post-COVID-19 recovery and resilience plan (Italian Government, 2021b) also makes it a priority to strengthen the English language skills of all children in Italy to provide children and young people with the skills they need for the global marketplace. To support both of these efforts, in 2021 the Akelius digital learning application for Italian and English language learning was introduced in eight schools in Bologna and Rome, as part of the UNICEF – Akelius foundation global partnership.

The Akelius digital learning application is a tool that helps students learn language in a fun way. It presents rich, interactive content in a gamified learning environment. Application users go through various types of activities, including thousands of micro-steps that provide instant feedback on their progress, which individualizes learning. The application is free, includes no advertising and requires no prior user information to access. It can be accessed online via a web browser or online and offline (when content is downloaded) through a mobile application on tablets or mobile phones. The application's content and features were developed through a co-creation approach involving frequent communication and feedback from teachers, based on their real-world use of the app with students. The digital learning application is implemented within classrooms in multiple countries with the support of UNICEF country offices, including those in Albania, Bosnia and Herzegovina, Cape Verde, Greece, Italy[1], Kazakhstan, Lebanon, Mauritania, Mexico, São Tomé and Príncipe and Serbia. The languages available for learning are English, German, French, Portuguese, Spanish, Italian, Russian, Swedish, Greek and Polish. Research on implementation and effectiveness of the digital learning application has been conducted in Bosnia and Herzegovina, Greece and Lebanon.

This report presents key findings from mixed-methods research embedded into the first year of implementation of the Akelius digital learning application in Italy. The digital learning application was used on tablets in English classes in primary and lower-secondary school and in Italian classes specifically for children with a migration background at both pre-primary and primary level. Qualitative methods included in-depth structured interviews, focus group discussions and structured classroom observations. Quantitative analysis was used to explore the application's effectiveness, using learning outcomes data gathered during implementation. The report's goal is to build evidence on the effectiveness of the digital learning application, plus related challenges and good practices, across different class settings to inform scale-up plans for digital learning in Italy and beyond.

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1. This support is provided by the Europe and Central Asia Regional Office in Italy.

Key findings and related recommendations

The use of the digital learning application in classrooms accelerated students' Italian and English learning, according to both qualitative and quantitative analysis. Teachers reported that, in class situations, the digital learning application was especially useful for personalizing learning and supporting children with diverse learning levels and needs, such as newly arrived students with no knowledge of Italian and children with disabilities.

Teachers, students and parents reported that the digital learning application improved students' motivation to learn, in large part due to the gamified content and instant feedback. The gamified nature of the application also prompted social interaction between students from different backgrounds. Virtual coins were earned for completing lessons, and students constantly compared the number of virtual coins they had earned through the application and supported each other to earn more.

The following are **recommendations for teachers**, based on good practices that have been identified for using the digital learning application in classrooms:

1. **Encourage peer-to-peer learning using the digital learning application in the classroom to increase engagement and inclusiveness, especially for children with disabilities.** Teachers used a strategy whereby they paired a student who had a higher level of Italian or English language with a student who had a lower level, so the student with more advanced language skills could support the other child by using the digital learning application. This approach was especially useful to integrate newly arrived children and children with disabilities in class activities and gave teachers more time to circle the class and provide tailored support to different students.

2. **Combine digital learning activities in the classroom with more traditional learning activities relating to the same content areas to reinforce learning with different methods.** Qualitative evidence found that it was particularly effective to use the digital learning application to reinforce topics which had been introduced in a traditional lesson without technology. It was also effective to combine digital learning activities with creative, non-digital activities like drawing.

3. **When connectivity is available, logging into the digital learning application enables more personalized learning and increases its value as a learning tool.** If students do not log in, several features that enable their experience of the application to be personalized are unavailable, teachers are less able to track their progress and students do not earn 'virtual coins', which were a large motivator for students.

4. **Using digital technology in the classroom introduced several new logistical factors for teachers to manage.** The use of the digital learning application was also a departure from teachers' regular teaching practices. These **challenges require teachers to be flexible, open-minded and willing to take time to adjust in order to properly prepare for classes.**

The following are **recommendations for teachers and school administrators** to ensure the effective use of digital learning in the classroom:

1. **Schools need to establish clear protocols for managing technology with distinct rules and responsibilities. The topics these protocols should cover include:**

   a. Scheduling when different classes will use the technology.

   b. The process of distributing devices before a class (including both tablets and headphones).

   c. Returning, securely storing and charging tablets after use.

   d. Scheduling periodic reviews to assess technology for damage, maintenance and replacement. Providing special attention to headphones, which are prone to damage with sustained use.

   e. Conducting software updates and ensuring that the content required for classes is downloaded (for use offline).

2. **Teachers' lesson plans need to account for both how digital learning content can enrich the class and how the technology will be managed in the classroom.** Building these lesson plans requires teachers to have significant practice in using the digital learning application and to be able to plan how the application's content will fit in with other classroom activities. Lesson plans need to incorporate how students interact with the technology at different stages (e.g. when it is introduced, turning on the tablets, logging in and finding the right content to use).

3. **Training for teachers on digital learning must be practical and move beyond traditional digital skills to focus more on how to integrate digital learning into classroom settings.** Teachers need to practice how to introduce digital learning into classrooms, how to prepare the technology and manage it in the classroom and how to blend the use of digital learning with more traditional classroom activities. Providing a platform where teachers can share good practices can make digital-learning training more practical and reduce time for other teachers who are facing similar challenges.

4. **Teachers should provide an initial tutorial for students on the use of the digital learning application. This tutorial should cover how to navigate the application and expectations of how it should be used in class.** Delivering this initial tutorial to students not only creates a baseline level of digital skills knowledge among students, resulting in them asking fewer technical questions, it also helps to set expectations on how students can troubleshoot and resolve issues on their own.

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Introduction

1.   Education for refugee and migrant children in Italy

From 2014 to 2020, more than 700,000 asylum seekers and migrants travelled to Italy (IRC, 2022). In 2022, 795,560 non-Italian students were enrolled in schools, accounting for 10.9 per cent of the total school population (MIUR, 2022a). Italy's northern regions have received the most migrant families, who seek employment opportunities and higher wages. In Lombardia, 25.5 per cent of students are non-Italian; the majority of these students are of primary school age (Ibid).

Children with a migration background need Italian language skills to learn and succeed in the national school system (MIUR, 2014a). Without foundational Italian language skills, students are unable to engage with the school curriculum and are unlikely to learn. The Ministry of Education, Universities and Research's *Guidelines on the reception and inclusion of foreign students* (MIUR, 2014a) highlights the fact that, in addition to newly arrived migrants, there are many children with Italian citizenship who still need support with social integration, including Italian language support. These include children living in non-Italian-speaking households, unaccompanied minors and Roma and Sinti students. Data from 2018 show that students with a migration background have less advanced Italian and mathematics skills than their Italian peers, but Italian students score worse in English than their peers with a migration background (INVALSI Open, 2019). The Italian Government's *The Recovery and Resilience Plan: Next Generation Italia* (Italian Government, 2021b) and its action plan for education, *Futura – Education for the Italian Future* (Italian Government, 2021a), acknowledge the importance of English language skills and formulate a national strategy to strengthen the internationalization and digitization of the Italian school system so that students become equipped with the linguistic and digital skills they need for the global marketplace.

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2. Introducing digital learning to pre-primary, primary and lower-secondary schools

In 2021, to improve the language skills of students in Italy, aligned with Italy's recovery and resilience plan (Italian Government, 2021b) and the *National Plan for Digital Schools* (MIUR, 2015), the UNICEF – Akelius foundation partnership began piloting the Akelius digital learning application for Italian and English learning in schools in Bologna and Rome. The pilot's goal was to use the Akelius digital learning application within classrooms on tablets to improve language (Italian and English) and digital skills in the public school system and to foster social inclusion. In the 2021/2022 academic year, the pilot was carried out in two comprehensive schools (where multiple pre-primary, primary and lower-secondary schools are managed by one school director). In total, 8 schools within the 2 comprehensive institutes were included in the pilot: 3 kindergartens (ages 4–5), 4 primary schools (ages 6–10) and one lower-secondary school (ages 11–12).

Box 1. The Akelius digital learning application

The Akelius digital learning application is a tool that helps students learn language in a fun way. It presents rich, interactive content in a gamified learning environment. Application users go through various types of activities, including thousands of micro-steps that provide instant feedback on their progress, which individualizes learning. The application is free, includes no advertising and requires no prior user information to access. It can be accessed online via a web browser or online and offline (when content is downloaded) through a mobile application on tablets or mobile phones. The application's content and features were developed through a co-creation approach involving frequent communication and feedback from teachers, based on their real-world use of the application with students. The digital learning application is implemented within classrooms in multiple countries with the support of UNICEF country offices, including those in Albania, Bosnia and Herzegovina, Cape Verde, Greece, Italy, Kazakhstan, Lebanon, Mauritania, Mexico, São Tomé and Príncipe and Serbia. The languages available for learning are English, German, French, Portuguese, Spanish, Italian, Russian, Swedish, Greek and Polish. Research on implementation and effectiveness of the digital learning application has been conducted in Bosnia and Herzegovina, Greece and Lebanon.

Bologna

In the Bologna comprehensive institute where the digital learning application was introduced, more than half of the students (52 per cent) have a migration background, 8 per cent are students with disabilities and the majority are from low-income families. The Municipality of Bologna relies on civil society organizations (CSOs) to develop the Italian language skills of students with a migration background by providing language learning support both in and out of school. In this case, the CSO Agire Insieme Per l'Intercultura (AIPI) supported the comprehensive institute that participated in the pilot. AIPI runs a course on Italian as a second language for migrant and refugee students in primary and lower-secondary school. In the summer of 2021, AIPI began introducing the digital learning application in its classes for non-Italian-speaking students. During the 2021/2022 school year, the organization also supported the comprehensive institute to implement the digital learning application in its own Italian classes for students with a migration background.

Rome

In Rome, the digital learning application was piloted in one primary school. The school is part of a comprehensive institute comprising of several kindergartens, primary schools and lower-secondary schools in northeast Rome. This is a large and densely populated municipality, and the comprehensive institute caters for students from various socioeconomic and cultural backgrounds. With the support of the Municipality of Rome, the comprehensive institute provides cultural linguistic mediators who support school staff to communicate with students and their families. The diverse needs of students motivated the school director to introduce a digital language learning course for Italian and English classes in one of the institute's primary schools.

This report outlines key findings from implementing the digital learning application within these two comprehensive institutes (eight schools in total) during the 2021/2022 school year. Its aim is to inform the continued expansion and use of the digital learning course in Italy, and to add to the global evidence base on the challenges and best practices of introducing digital learning through a blended learning approach.

Implementation research methodology

Research was embedded into the introduction of the Akelius digital learning application in schools to inform decision making, make rapid adjustments and improve implementation efforts. The research upon which this report is based used a mix of quantitative and qualitative data collection methods. The following research questions guided the implementation research process:

1. How was the digital learning application used in classrooms, and how did this use vary between different locations and types of classes?

2. What challenges did students, teachers and administrators face when introducing digital learning into classrooms, and what actions were taken to resolve them?

3. What was the impact of using the digital learning application on students' educational outcomes (including learning outcomes in Italian and English and students' motivation and confidence)?

Qualitative data were collected from class observations, focus group discussions with students, teachers and parents and interviews with school directors in Rome and Bologna. Qualitative analysis was used to identify the main differences between the various implementation settings, the best practices that teachers developed and the main challenges they experienced. Qualitative data were also used to understand key barriers and the necessary steps needed to introduce the digital learning application within classes in formal education systems.

As part of this process, all interviews were audio recorded, transcribed, managed, coded and analysed in NVivo qualitative data analysis software along with classroom observations reports, field notes, photographic data, reflexive journal entries, minutes of research team discussions and policy documents related to digitization and inclusive education in Italian schools. In total, 130 participants were involved in the qualitative data collection, which occurred from 22 April to 29 June 2022.

To complement the qualitative evidence, quantitative analysis was used to understand the impact of using the digital learning application on learning outcomes. To conduct the quantitative analysis, learning and monitoring data from AIPI, the CSO that supported implementation in Bologna, was used. Quantitative data included information on student demographics (age, gender, nationality, mother tongue), class attendance data and learning assessments.

Ethics

Research instruments and fieldwork protocols used to generate evidence in other countries participating in the UNICEF – Akelius partnership were revised by the UNICEF research team and adapted for the Italian context and approved by the Health Media Lab and the Institutional Review Board of the Office for Human Research Protections in the US.[2] The fieldwork and data collection ensured that research activities were in line with ethical principles and practices, which include respecting the dignity of participants, abiding by just and equitable treatment, preventing potential risks of harm, gaining informed and ongoing consent and maintaining confidentiality. Focus group discussions with children were organized through a participatory methodological approach, which acknowledges children's agency and positions children as active participants who have their own perspectives and experiences.

2. Both organizations provide ethical assurance to protect human subjects in international social and behavioural science research relating to children, COVID-19, education, refugees, migration populations categorized as 'vulnerable' or 'high-risk' and other areas. Both institutions regularly provide ethical review support to research studies undertaken within the global UNICEF – Akelius partnership.

Research findings

Research results are organized in three sections. The first section explores the different implementation settings of the digital learning application in classrooms. Section two explores key challenges found across these implementation settings and good practices that were adopted to address them. The third section explores the effectiveness of the digital learning application when used in classrooms. This includes how effective the digital learning application was at improving learning outcomes and other educational outcomes, such as students' motivation or learning autonomy. The analysis also examines how effective the digital learning application was for two groups of children with specific learning barriers; namely, newly arrived students and children with disabilities[3].

1. Implementation settings

Teachers in Bologna and Rome introduced the digital learning application within classrooms, using individual tablets for children or in computer laboratories. Based on different types of learner profiles, the digital learning application was implemented in the following settings:

- **Italian catch-up classes in pre-primary and primary school:** The Italian language version of the application was used in Italian language catch-up classes in primary and pre-primary levels. These classes were taught in smaller groups and included children with a migration background and children with disabilities.

- **English curricular classes in primary school:** The English language version of the application was used during English classes in primary school, which start from the first grade in Bologna and the second grade in Rome. These classes were taught to all students as part of the regular school curriculum. The classes included native Italian speakers, children with a migration background and children with disabilities.

- **Smaller classes for children with disabilities (lower-secondary level):** In Bologna, special education needs (SEN) teachers used the digital learning application in classes for children with disabilities. These classes were taught in smaller groups to provide more tailored instruction at the lower-secondary level.

This section explores each distinct use of the digital learning application, identifying key factors that facilitated or were challenging for implementation in that specific setting. Table 1 describes key variations in the use of the digital application between settings.

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3. In this report, disabilities refer to severe physical or intellectual impairments diagnosed by local health units in line with Law 104/1992 and learning difficulties in line with Law 70/2010.

Table 1. Implementation settings for the use of the Akelius digital learning application in Bologna and Rome

Implementation setting	Level	Language course used	Location	Teachers	Target groups
Italian catch-up classes in pre-primary and primary school	Pre-primary	Italian	Bologna	Pre-primary teachers	5-year-old children with a migration background and their Italian peers
	Primary	Italian	Bologna	AIPI educators and some Italian schoolteachers	6 to 10-year-old Italian native speakers, children with a migration background and children with various disabilities
			Rome	SEN teachers and Italian schoolteachers	
English curricular classes	Primary	English	Bologna	English schoolteachers, often supported by SEN teachers	6 to 10-year-old children with a migration background and their Italian peers
			Rome		
Smaller classes for children with disabilities (lower-secondary level)	Secondary	Italian, English and French	Bologna	SEN teachers	11 to 12-year-old children with disabilities

1.1   Italian catch-up classes in pre-primary and primary school

The digital learning application was used in catch-up classes to support Italian language learning for children with a migration background and children with disabilities in both Rome and Bologna. Children with a migration background included newly arrived students and students who had been in Italy for longer but live in communities where Italian is not commonly used. Italian catch-up classes took place during school hours, one hour per week. When possible, the classes were supported by cultural mediators who helped school staff communicate with students and their families. In Bologna, Italian catch-up classes were conducted by the CSO AIPI as part of its partnership with the school. In Rome, classes were led by SEN teachers and other available teachers. In both Bologna and Rome, the digital learning application was implemented differently in different Italian catch-up classes due to variations in the implementation contexts, as explained below.

1.1.1   Classes led by AIPI language-teaching specialists in primary school

The AIPI teachers who led Italian catch-up classes in Bologna were experienced in inclusive and student-centred instruction. In these classes, AIPI teachers selected the content and topics introduced in class based on students' individual learning levels, rather than their age or grade level.

> "Obviously, when I follow a group, I make a didactic plan which is my own with respect to the needs that I highlighted in the initial assessment. Most of the material I develop is based on what I see in class. My group was so heterogeneous that I had to create three different paths for each of them because they really had different needs."
> – AIPI teacher, Bologna

AIPI teachers introduced the digital learning application in class on tablets through a blended approach, matching content on the digital learning application with other materials that they produce or curate. To structure the class, AIPI teachers divided their lessons into two halves. The first half of the lesson focused on grammatical structures, writing and reading skills, oral production and comprehension. The materials used were developed by AIPI teachers and included manuals on language learning and handouts containing grammar and vocabulary exercises. The second half of the lesson was devoted to using the digital learning application to practice, enhance and reinforce the topics that had been introduced in the first section. Children were given time and space for individual learning, or in some cases teachers put students in groups to work together.

1.1.2   Classes led by SEN teachers in primary school

In Rome, SEN teachers and curricular teachers, when available, taught English catch-up classes. SEN teachers provide remedial learning support for children with diverse learning needs, including children with different types of disabilities and children with a migration background. Given the wide scope of school support they need to provide, most SEN teachers are not specialized in language teaching, nor in cultural mediation. As a result, SEN teachers often had fewer strategies for integrating the digital learning application with other activities in the classroom compared to the language-teaching specialists in Bologna. For catch-up classes, teachers typically used a strategy of peer-to-peer tutoring, whereby students with the same linguistic background were put in pairs to navigate the digital learning application together. In this approach, one student with a higher level of Italian acted as a tutor, supporting the student with a lower level of Italian. Teachers frequently gave students more time to use self-paced learning when using the digital learning application. This allowed the teachers to circle the class and provide support individually, based on students' learning levels, as illustrated in the following observation:

> After receiving the tablet, the students started to work with the Akelius course independently. The girls were sitting opposite to each other while the SEN teacher monitored their work, going from one to the other. Considering the girls' different levels of Italian, the teacher differentiated the tasks and activities.
> – Classroom observation

1.1.3   Catch-up Italian classes for children in pre-primary school

In Bologna, the Italian language version of the application was also used in kindergartens for students with a migration background who come from families where Italian is not spoken at home, as well as for their Italian peers. Students selected by the teachers were invited to a separate room to have 15 to 20-minute sessions using the digital learning application.

> The three children sat down and, with the support of the teacher, put on the headphones, turned on the tablets and logged in. The teacher indicated the procedure to follow then each child began working independently on the tablet. From time to time, children required supervision of their work by the teacher or clarifications and guidance on how they could move forward with other activities once they finished the previous ones.
> – Classroom observation

1.2   English classes in primary school

In Rome and Bologna, the digital learning application was implemented in curricular English classes in primary school. English teachers taught these classes, often supported by SEN teachers in the classroom. Akelius English classes are taught in the first grade in Bologna, and from the second to fifth grades in Rome. In primary school, per week there is only one hour (60 minutes) for English in the first grade, two hours in the second grade and three hours in the third, fourth and fifth grades (MIUR, 2014b). Classes included around 20 students; a mix of Italian native speakers, children with a migration background and children with various disabilities.

In Bologna, English teachers used a structured, blended learning approach which combined the use of the digital learning application with more traditional classroom practices. English teachers first explained the lesson's topic to the whole group by using textbooks, presentations on the blackboard, printed materials and different activities, such as reading aloud. After introducing key concepts, teachers distributed the tablets and indicated which lessons to open in the application. Children then continued autonomously using headphones, while teachers helped resolve students' questions on English plus any issues they were experiencing with the technology.

> The teacher showed some pictures of food and asked the students to say if they like or don't like it and the class responded, "Yes I like!" or "No, I don't like". The teacher showed the images on the digital blackboard, named them all in English and asked the class to repeat the words, showing the images. Once the introduction of new words and their learning through the association sound-image was finished, the teacher passed to the second phase of the lesson, the Akelius digital course.
> – Classroom observation

In Rome, the digital learning application was not blended as fully with other activities during all English classes. Instead, teachers would dedicate one of their weekly classes to using the digital learning application. In this approach, after a short introduction, teachers got students to use the application for the remaining class time. This way, teachers provided initial learning guidance, indicating the topics to study and asking students to write down unfamiliar words in notebooks. To help manage the classroom, students were also asked to help the teacher distribute the tablets and headphones to their peers. Children then put on their headphones and worked on tablets autonomously, continuing their learning path from where they had left it the previous lesson. Teachers then used the time to circle the room and provide support to students, checking if the tasks were understood, paying particular attention to children with disabilities. After focusing one class on the digital learning application, the teachers dedicated the other English classes during the week to consolidating the learned materials and covering new topics, using traditional front-facing lectures.

> The children were engaged, passionate, confident, spontaneous and independent when using the digital learning application. Few children asked teacher for support. Probably because immediate and continuous feedback provided by the Akelius application was useful for students to gain understanding of difficult concepts, as well as to activate recovery mechanisms and correct misconceptions in an autonomous way.
> – Classroom observation

1.3   Language catch-up classes for children with disabilities in lower-secondary school

In Bologna, SEN teachers in the lower-secondary school organized a common class to provide language support for students with disabilities. In these classes, SEN teachers used the digital learning application to teach Italian, English and French, depending on the student they were supporting. These classes were held in a computer room, where each student worked autonomously with headphones. The whole class was dedicated to the digital learning application, while teachers provided students with differentiated support according to differences in language skills and types of disabilities. In these classes, teachers' prime focus was on supporting students' motivation and learning autonomy.

2. Challenges to implementation and good practices to resolve them

While qualitative and quantitative analyses found using the digital learning application was successful in supporting children's learning *(see Section 3)*, there were challenges in implementation across the different settings that needed to be addressed. This section explores the challenges that arose from introducing the digital learning application to the classroom and the different strategies that teachers used to overcome them.

The major challenges are categorized into two broad categories: classroom management issues and introducing new teaching practices.

2.1 Classroom management issues

Introducing digital technologies into the classroom adds several logistical factors that teachers must manage within their classroom environment. In preparation for the class, devices (tablets in the case of the digital learning application in Italy) need to be charged and in good condition and headphones also need to be kept in good condition. The digital learning application needs to be kept up to date and, if implemented in a classroom without strong connectivity, content needs to be pre-downloaded on each device. When digital learning is introduced within a lesson, the tablets and headphones need to be distributed to each student, after which students need to access the digital learning application and log-in. If not successfully completed, each of these steps can disrupt a class and cause issues for both students and teachers.

2.1.1 Preparing technology for use before the lesson

In both Bologna and Rome, getting the tablets, headphones and the application ready to be used was easier among smaller groups of students in the Italian catch-up classes than in the larger English classes. English teachers who used the digital learning application reported that the significant time required to distribute tablets and headphones then support students to use the technology was a key challenge. Both students and teachers reported that occasional disruptions occurred in the class when tablets were opened and some were not properly charged.

As further described in Section 3, the application's audio component is critical, especially to practice speaking and conversation. The use of headphones in classrooms is also important for class dynamics, as having headphones enables students to focus. However, multiple teachers and students reported that headphones break or get worn out much quicker than tablets, which are more resilient. Therefore, it is necessary that protocols for device management include headphones, and ensure there are replacement headphones that can be used when current headphones become worn. Developing protocols within the classroom to store, charge and collect the technology, including tablets and headphones, each day is critical. It is important that the protocols assign a responsible party the task of safely storing the tablets and checking that the headphones are working.

2.1.2 Connectivity challenges at the beginning of a lesson

The challenge of disruptions occurring when a technology is introduced in a lesson is further complicated when there are challenges with connectivity. A lack of strong connectivity in the classroom can cause software to lag and for content to be slow to appear, it can also make logging into the digital learning application a challenge. For this reason, the digital learning application can be used offline when content is pre-downloaded on tablets. This challenge was especially salient in Rome where, due to poor connectivity, the application's content was downloaded and used offline.

2.1.3   Logging into the application to ensure personalization

The challenge of connectivity has a knock-on effect on the overall use of the application because it is not possible to log into the course when using the application offline. When students are unable to log in, teachers are less able to track their progress, and students do not earn 'virtual coins' which are a large motivator for students, as noted in Section 3.

An additional challenge to logging in is the need to use a username and password which students, especially younger students, frequently forget. To address this, and based on experience from multiple countries, the Akelius software developers introduced a feature within the application that allows teachers to generate QR codes, which students can scan to log in more easily. While this is a much simpler process than signing in with a username and password it does require additional logistics, such as where and how to store the QR codes. One English teacher described a frustrating situation in which tablets were shared with other teachers but the QR codes were not put where they were supposed to be. One solution taken by multiple teachers is to paste the QR code onto the notebooks that students use in the class to ensure the QR codes are not lost.

> "So what happened? … the QR code was no longer there, so despite me putting all 23 tablets with attached QR codes one by one in a charging station, next time I don't find them like this."
> – Teacher, Bologna

These challenges, which relate to classroom management and logistical preparation, have implications for how well a classroom functions while using the digital learning application. If significant time is needed to distribute devices and address technical issues at the beginning of a class, it reduces time for learning. In addition, when there are issues with accessing the digital learning application, using the login function or connectivity, it disrupts the class flow and students lose interest. These challenges are particularly visible in larger classes, in classes with younger students who have less ability to troubleshoot issues or when teachers have lower digital skills.

GOOD PRACTICE
Developing a technical tutorial for students

When digital technologies are used in the classroom, teachers need to explain to others how to use technology. They also need to be able to troubleshoot challenges when they occur. Even with protocols on the use and management of technology in the classroom, teachers with lower digital skills often feel uncomfortable with these tasks, and this limits their desire to use digital learning as a tool in the classroom. To overcome this hurdle, in an example of good practice identified during the qualitative fieldwork, a teacher developed an introductory technical tutorial for her students before the first class in which the application was due to be used. First, the teacher took the tablet home to familiarize herself with the device and the application, then she prepared a very simple tutorial with a step-by-step guide on how to use the tablet and navigate the course. She then presented the tutorial to the students. Providing this introduction helped to create a common foundation of basic digital skills among students and set expectations on how they could resolve simple issues on their own. QR codes, which students used to log in, were pasted on their notebooks to ensure they had a simple way to login during the class. This reduced the overall number of technical questions students ask during the lesson, allowing the teacher to dedicate more time to learning.

2.2   Introducing new teaching practices

The second category of challenges teachers faced when introducing the digital learning application to their classes was the need to adopt a new teaching approach. The digital learning application is based on a holistic language learning approach which resembles natural language learning and prioritizes real-life communication tasks and situations (British Council, 2022; UNICEF, 2019). Grammar is taught through these situations reactively, rather than pre-emptively and in isolation. In Italian schools, the language curriculum for English prioritizes sequential acquisition of carefully selected thematic and grammar areas. Teachers who used the digital learning application perceived the holistic approach to be a major shift compared to the learning approaches they were used to, and so they took time to adjust to it.

> "I present the lexical block and at the end I have a suitable, rich, captivating multimedia tool that makes the child play, which enriches him with content.
> But no ... I presented the lexical block, for example, about the school objects and on Akelius there was no lesson that exclusively dealt with this topic. So it was always all my research, so I obviously went through all the lessons to see which games, which words, maybe presented first to give the children the opportunity to play."
> – Teacher, Bologna

Due to this difference, teachers had challenges in developing lesson plans and needed to spend significant time searching for words and topics that matched where they were in their curriculum.

However, both teachers and school directors reported that stepping out of familiar routines was useful for stimulating critical reflection and discussion on digital and inclusive teaching practices, and this contributed to teachers' professional growth.

GOOD PRACTICE

Structured blended learning: Using the digital application with non-digital, creative activities

Several teachers reported taking a 'laboratory approach' to language teaching by giving students various creative tasks, including drawing, painting and modelling in plasticine or paper. During the pilot, they experimented with matching *manualità* (manual dexterity tasks) with digital learning. For example, in one lesson an AIPI teacher introduced a blended learning pair-work activity by asking students to work together in twos and listen to Jack London's story *The Call of the Wild* in the digital course. The pairs were then asked to draw comics based on the story on a sheet prepared by the teacher and to re-tell the story through images. During this activity, as the classroom observation reports, children were fully engaged, motivated and enthusiastic while shaping their ideas using visual language. It is worth noting that creating 'meeting points between dexterity, craftsmanship, creativity and technologies' was among the recommendations supported by the *National Plan for Digital School* (MIUR, 2015). Positive experiences of combining digital learning with creative activities, such as signing, poetry recitation, dance and theatre, were also reported by teachers and students in Bosnia and Herzegovina (Poleschuk et al., 2022).

GOOD PRACTICE

Peer-to-peer tutoring

In classes taught by SEN teachers in primary school, peer-to-peer tutoring was practiced as an additional resource for language acquisition *(see Section A.2)*. Both in Bologna and Rome, teachers experimented with different arrangements of collaborative learning. Examples include an Italian student (a native Italian speaker) with disabilities being paired with a recently arrived foreign student, or students with the same native language who have different levels of Italian being paired (for example, one student might have arrived in Italy a year ago and the other might have recently arrived but both are the same nationality). Teachers reported that peer-to-peer tutoring helped boost students' social interaction, their motivation to learn languages and their confidence in their skills. When students are engaged in collaborative learning, teachers can allocate more time for observation, facilitation and differentiated instruction.

3. Programme effectiveness

3.1 Learning outcomes

Qualitative evidence from teachers and students demonstrated that students had positive experiences using the application across the various types of classes. During focus group discussions, students highlighted their achievements in vocabulary acquisition, reading, mathematics and digital skills. Teachers, students and parents confirmed that the speed at which new words were memorized accelerated. These positive changes were noted in both Italian and English classes where the digital learning application was used.

> "Akelius has speeded up the assimilation of concepts and contents. I noticed that children learned and memorized faster."
> – Teacher, Rome

> "Dad often asks me words in English, and I can name them because with Akelius I can recognize so many words."
> – Student, Rome

> "Once she arrived home with new words, she tried to create sentences to show that she had learned new things."
> – Migrant parent, Bologna

The digital learning application had an especially large impact on children's ability to speak and pronounce words. The application has a strong focus on audio content, speech, songs and exercises, which encourage students to practice speaking words out loud. These features offer students considerable support with improving pronunciation, which was observed for both Italian and English languages. Improving pronunciation in English language classes is especially important in Italy as classes are rarely taught by native English speakers or language specialists. But there are also other examples of the application improving students' pronunciation. For example, a SEN teacher reported that a student with a migration background who had a hearing impairment significantly improved his Italian pronunciation when he started using the digital course with headphones.

Improvements in reading, comprehension and writing were also reported. While students do not practice handwriting within the application, it contains exercises where jumbled letters need to be placed to make a word. Frequently, teachers would instruct students to pair these exercises with writing down new words in a notebook, transitioning understanding from the use of the digital learning application into real world use. Teachers reported that combining these exercises, which take students through multiple different methods to repeat, write and spell a word, helped them to memorize new vocabulary quickly.

Quantitative data, though only available for Italian language outcomes, corroborate the qualitative results. These data show a strong association between the use of the digital learning application in class and improved Italian skills. Quantitative analysis was undertaken by comparing learning outcomes in Italian classes run by AIPI in which the digital learning application was used *(see Section A.1)* and similar language classes taught by AIPI where the digital learning application was not used.

Figure 1 presents the students' learning progress in both types of classes against how long students had been in Italy for. The initial and final level of Italian summarizes four core language competencies: listening, reading, writing and speaking. As expected, the initial level of Italian was higher among students who had spent a longer time in Italy. And although the initial level of Italian was lower, on average, among students in classes that used the digital learning application, these students progressed more during the same period.

Figure 1. Learning progress among students in the digital and non-digital learning classes by year of arrival in Italy
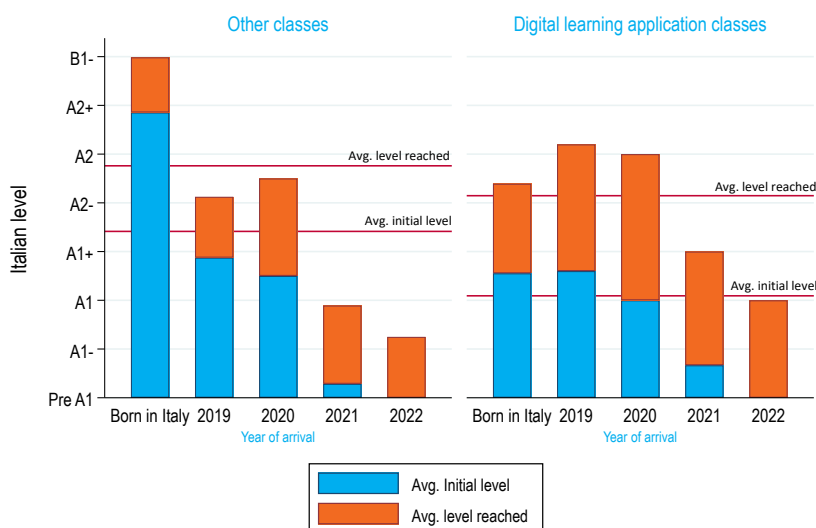
Sample other classes = 26 students
Sample digital course classes = 25 students

Figure 2 describes differences in learning progress associated with the use of the digital learning application for each language competency after controlling for students' initial level of Italian, teacher effects, demographic characteristics, school level and year of arrival in Italy.[4] For all four competencies, the use of the digital learning application was associated with greater learning among students when compared with students in non-digital learning classes.

Figure 2. Differences in learning progress associated with the digital learning application
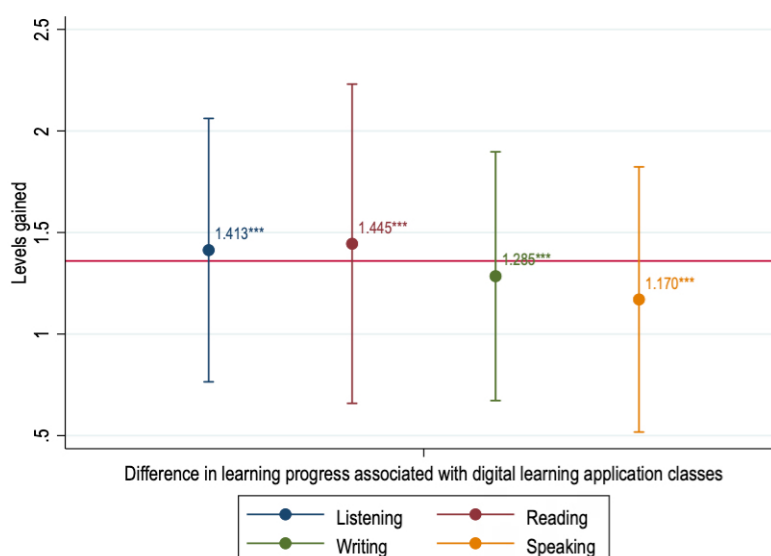
4. Multivariate regression analysis was used to estimate associated effects of using the digital learning application on language competencies.

On average, students using the digital learning application progressed more than one level (+1.3) during the course, compared with students who did not use the application.[5] Using the digital learning application is associated with greater gains in reading and listening compared with other competencies. But these quantitative results should be read with caution due to pre-existing differences between the treatment and comparison groups. On average, students in the classes that used the digital learning application were slightly younger than students in classes that did not use the application (8 vs. 9 years old). Table 2 in the Annex shows that students in classes where the digital learning application was used had spent the same time in Italy as students in other classes but were younger on average. Moreover, the initial level of Italian among students using the digital learning application was slightly lower when compared with the other group (A1 vs. A1+). Analysis was done to check if the initial difference in learning outcomes was driving the results. Figure 3 in the Annex shows that, on average, students who used the digital application progressed further in their learning than students who did not, even when controlling for students' initial level of Italian. Due to the availability of data, the total sample of students included in the analysis is small, as it consists of 25 students who used the digital learning application and 26 students who did not. This limits our capacity to accurately assess the effects of the digital learning application on learning outcomes.

Regarding non-learning outcomes, initial results from quantitative student assessments do not show any meaningful differences between students who did and did not use the digital learning application in classes, in terms of teacher-student relations, organization in learning, participation or relations with other students.[6]

Qualitative evidence, however, indicates that increased motivation, confidence and autonomy in learning are potential factors that drive improvements in language learning. The following section dives into improvements in learning practices associated with the use of the digital learning application.

3.2   Pathways to learning – motivation, confidence and autonomy in learning

In addition to improving language learning, the use of the digital learning application also improved other learning practices, according to qualitative evidence gathered from teachers, students and parents. Interviews highlighted that the use of the digital learning application in classes improved students' autonomy and self-reliance to learn, increased their motivation to learn and improved their confidence. These findings confirm results from previous studies on the use of the Akelius digital learning application in Greece for Greek language learning (Karamperidou et al., 2020), in Lebanon for French and English language learning (Dreesen et al., 2021) and in Bosnia and Herzegovina for English language learning (Poleschuk et al, 2022).

> **"They were all enthusiastic, it was a moment of peace in that class because everyone was silent and working."**
> – Teacher, Rome

Students' great enthusiasm and engagement is observed by teachers across the different implementation settings. Utilizing the digital learning application on tablets was a new learning experience for students, who had previously only used the smartboard as a digital device in a classroom. The digital learning application's gamified content helped increase students' engagement and enabled them to acquire new knowledge by having fun.

> **"It is an application to learn many languages while having a lot of fun and perhaps to do something that has never been done in an Italian school."**
> – Student, Rome

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5.   Learning progress was organized around the following eight levels: 0: Pre-A1, 1: A1-, 2: A1, 3: A1+, 4: A2-, 5: A2, 6: A2+, 7: B1-, 8: B1.
6.   Non-learning outcomes were reported by teachers for students on the digital and non-digital language courses. These were graded as part of students' final assessments, using a 4-point scale of progress (1 = minimum, 2 = enough, 3 = good, 4 = great).

The application's gamified nature also prompted social interaction between students from different backgrounds. Students constantly compared the number of virtual coins they had earned through the application, which are provided as points for completing lessons. Likewise, students were also observed frequently supporting other students to earn more coins. This peer support organically emerged among students; students with stronger digital skills were very quick to help their peers when challenges happened with the application or the tablet itself.

> "We learn English, we work hard, we have fun."
> – Student, Rome

Students appreciated immediate feedback on their performance and visible progress indicators. As the activities are divided into small steps the learning process became tangible, and rewards for every achievement encouraged students to move forward. Teachers highlighted how these features support students' metacognitive skills by allowing learners to self-assess and reflect. A SEN teacher reported that the application's reward system worked particularly well for two of her supervisees who had learning disabilities. After the study sessions, the students felt happy that they had earned rewards for their progress. They self-assessed by saying things like "We worked very well, we did a good job", and they wanted the teachers to communicate these achievements to their parents at the end of the school day.

Various qualitative evidence generated by piloting the digital learning application in schools suggests it was particularly useful for two groups of students with specific learning barriers: newly arrived students with a migration background and children with disabilities.

3.3   Newly arrived students

Reports from teachers show that the digital learning application was especially useful for newly arrived students. The need for tools to support newly arrived students is great, particularly since large numbers of Ukrainian children have been arriving in Italy. Cultural mediators for each language background are not always available, or they are unavailable for the full school schedule. As a result, curricular and SEN teachers often find it challenging to teach Italian to newly arrived children as they do not share a common language with their students.

> "The little girl, being from Latin America, was able to catch something in Italian, while the Ukrainian girl ... we were two worlds. I taught Arabic for her and she spoke Ostrogothic for me, and therefore going to teach Italian was really a [difficult] situation ... mathematics, for example, perhaps through a mediation – the operation, the logic – we could get somewhere, but since I'm teaching Italian, I didn't know where to start with her."
> – Teacher, Rome

Several teachers reported that, in such challenging situations, the digital learning application was particularly effective. First, the course is user-friendly and does not require advanced digital skills, so the students can start using it immediately and proceed with learning in an autonomous way. Second, the students do not need support with the translation, as the content has a visual and audio focus. Third, the course helps students and teachers by providing a productive and autonomous activity that a newly arrived student can do while he or she is waiting for a SEN teacher, who may be busy helping other students. The small learning steps and visible progress indicators help students demonstrate and understand their progress in tangible ways. Teachers reported that this positively affects students' self-esteem and confidence and their communication with teachers and peers. This gain in confidence is especially important for newly arrived students. Evidence of teachers using the digital learning application to better manage a class of students from various linguistic backgrounds and provide tailored support was also reported in Greece (Karamperidou et al., 2020) and Bosnia and Herzegovina (Poleschuk et al., 2022) in classes with refugee and migrant children.

3.4   Children with disabilities

SEN teachers in Bologna and Rome reported that children with disabilities who used the digital learning application experienced positive, tangible learning and non-learning outcomes. Teachers observed that the application's visual, clear, down-to-earth tasks and repetitions were particularly useful for children with disabilities. Teachers reported improvements in students' vocabulary acquisition, writing, speaking and pronunciation as well as increased enthusiasm and motivation to learn. Students with disabilities became more autonomous, calm and confident when using the digital learning application. In English classes, teachers noted that, by working on the same device as other students, students with disabilities felt more included in the class.

> "The girl, once she has internalized some words, some sentences, now she is opening up more, she is coming out; maybe she does it more with those she is familiar with, with those she has entered into a relationship with. The other day I was shocked because she turned towards me and said, 'Let's go to eat!', I thought 'She speaks! She understands!'. I wanted to cry. I said, 'Yes my dear let's go'. So it means that, little by little, they acquire something. Perhaps she needs to feel more secure in order to make herself understood."
> – Teacher, Bologna

Teachers reported different uses for the digital learning application, based on students' different abilities and challenges. Teachers remarked that students with attention deficit hyperactivity disorder (ADHD) could become frustrated in larger classroom settings when there were technical issues which delayed the use of the application, for instance, when students experience issues logging in etc. *(see Section 2.1.3)*. However, when there were no technical issues, teachers described using the digital learning application as 'therapeutic' for students with ADHD; one teacher remarked that it "calmed down ADHD symptoms". SEN teachers working with autistic students observed that the students initially seemed impatient when trying to use the application, but later, when the students learned how to use the tablet and the digital learning application, they became enthusiastic and engaged. A teacher remarked that one autistic student greatly improved his level of English, moving up to the B1 level, and became a more autonomous learner due to the use of the digital learning application.

> "He was very enthusiastic about using the tablet and concentrated above all on the use of the memory and listened to many songs. Sometimes, obviously with his problem, he wasn't very focused and sometimes he got tired, while there were [other] days when, after we did some work, he really asked for the tablet by saying 'Teacher, the tablet'. So anyway I made him use it even outside the hours."
> – Teacher, Rome

The benefits of the digital learning application for children with disabilities observed by SEN teachers in Bologna prompted them to develop additional, small group sessions for children with disabilities so these students could use the digital learning application outside regular classes. While more research is needed on the use of the digital learning application for children of various abilities, several SEN teachers reported that, based on initial use during the pilot, they have adopted the digital learning application as a compensative tool for their students, even if it has not yet been officially included in personalized teaching plans for students with special needs.

Conclusion and recommendations

Children need foundational language skills to successfully participate in school and society. In Italy, strengthening the language skills of children with a migration background is recognized as a national priority to support these children's social inclusion and their right to education (MIUR, 2014a; MIUR, 2022b). Acknowledging this priority, the UNICEF – Akelius foundation partnership began testing the use of the Akelius digital learning application in Italian and English language classes in Bologna and Rome. Mixed-methods research was embedded in the pilot to identify challenges and opportunities in the implementation process, which will be used to inform adaptations as the programme continues. Understanding the impact of this initial pilot implementation is critical because in the 2022/23 school year implementation of the Akelius digital learning application will be significantly scaled up as part of the Ukrainian emergency response. In Italy, as of November 2022, around 173,2300 refugees from Ukraine had entered Italy of which 49,400 were children, according to Ministry of Interior figures. An analysis of the evidence shows that the use of the digital learning application within classes supported children's learning. Qualitative evidence suggests that using the digital learning application increased students' engagement in class and strengthened their motivation. The digital learning application was found to be especially useful to support the learning of newly arrived students with no prior knowledge of Italian and children with disabilities.

While the digital learning application was found to improve outcomes for children, teachers experienced challenges in introducing the digital learning application into their classrooms and found solutions by adapting the way they used the application to suit different students' needs.

Below are key recommendations to improve the implementation and use of digital learning in schools. The recommendations are split into three categories: 1. teachers training and professional development, 2. school-level action, 3. classroom level actions.

Recommendations for teacher training and professional development

- **Training for teachers on digital learning must be practical and move beyond traditional digital skills to focus more on how to integrate digital learning into classroom settings.** Teachers need to practice how to introduce digital learning into classrooms, how to prepare the technology and manage it in the classroom, and how to blend the use of digital learning with more traditional classroom activities.

- **Provide teachers with a platform and encourage them to share the best practices and tools they develop in relation to using the digital learning application in classrooms.** Teachers developed different good practices for using the digital learning application in their classrooms and also developed different tools and tutorials to guide their work. A system whereby teachers share best practices from real-life classrooms with each other would reduce the amount of work that each individual teacher needs to do to begin using digital learning in the classroom.

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Recommendations for school-level actions

- **Establish clear protocols for managing technology across classrooms with distinct rules and responsibilities. The topics these protocols should cover include:**
  - Scheduling when different classes will use the technology.
  - The process for collecting devices before a class (including both tablets and headphones).
  - Returning, securely storing and charging tablets after a class.
  - Scheduling periodic reviews of the technology to assess for damage, maintenance and replacement, providing special attention to headphones which are prone to damage with sustained use.
  - Conducting software updates and ensuring that the content required for classes is downloaded (for use offline).

- **Work in partnerships with CSOs to support specialized Italian language classes in Italian schools for children with a migration background.** SEN teachers play a large role in schools in supporting all types of learners with different needs. Often, this includes children with a migration background, but SEN teachers have limited time and experience in teaching languages. Increasing resources to support children with a migration background would be in line with Italy's *National Action Plan for The Implementation of The Child Guarantee* (Italian Government, 2022), particularly Action 3 (Education and school-based activities: tackling school drop-out), which commits to increased teaching support and mediation for students from migrant and ethnic minority backgrounds, children from disadvantaged family backgrounds and students with disabilities.

Recommendations for classroom-level actions

- **Lesson plans need to account for how digital learning content can enrich the class but also for how technology will be managed in the classroom.** This requires teachers to undertake significant practice in using the digital learning application. It also requires significant planning on how to fit the application's content with other classroom activities. These plans should consider how students interact with the technology at each step, from turning the tablets on, to logging in and finding the right content to use.

- **Teachers should provide an initial tutorial for students on using the digital learning application, which should cover how to navigate the application and expectations of how it should be used in class.** Delivering this initial tutorial to students will not only create a baseline-level of digital skills knowledge among students, resulting in fewer technical questions, it will also set expectations on how students can troubleshoot and resolve issues on their own.

- **When connectivity is available, logging into the digital learning application enables more personalized learning and increases its value as a learning tool.** If students do not log in, several features that personalize the experience for students are unavailable. Teachers are also less able to track students' progress and students cannot earn 'virtual coins', which was seen as a large motivator for students.

- **Blend digital learning activities in the classroom with more traditional learning activities around the same subject areas to reinforce learning with different methods.** Qualitative evidence indicates that it is particularly effective to combine digital learning activities using the application with manual dexterity creative tasks like drawing.

- **Encourage peer-to-peer learning using the digital learning application to encourage engagement and inclusiveness, especially for children with disabilities.** Teachers used a strategies of pair-work and peer-to-peer learning to support students with lower language levels and children with disabilities to engage more in the classroom. This approach also gave teachers more time to circle the class and provide tailored support to different students, which is particularly important in classrooms with diverse learning levels.

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Annex 1

Implementation settings

Location	School/age	# of teachers	# of students		
			ITALIAN	ENGLISH	Subtotal per location
BOLOGNA	3 kindergartens (ages: 4–5)	4	70	-	**260** students in Bologna
	3 primary schools (ages: 6–10)	12	44	137	
	1 lower-sec. school (ages: 11–12)	3	-	9	
ROME	1 primary school (ages: 6–10)	9	66	61	**148** students in Rome
			+ 21 students using Italian and English		
TOTAL	**8 public schools**	**28 teachers**	**408 students**		

Qualitative data and analysis

The implementation research for the Akelius digital learning course in Italy comprises two rounds of data collection across two years. During the 2021/2022 school year, the following data were collected:

Data collection technique	Data source / respondents	Location	Date	Number of participants
Classroom observation	Akelius English class for Italians + with migrant background, 9–10 years old	Rome	22/04/2022	22
Classroom observation	Akelius English class for Italians + with migrant background, 9-–10 years old	Rome	22/04/2022	16
Classroom observation	Akelius Italian class for children with migrant background, 10–11 years old	Rome	02/05/2022	2
Focus group discussion	Teachers and digital animators	Rome	15/06/2022	6
Focus group discussion	SEN teachers	Rome	09/05/2022	4
Focus group discussion	Primary school local children	Rome	28/04/2022	9
Focus group discussion	Primary school children with migration background	Rome	02/05/2022	8
Focus group discussion	Parents of local students	Rome	17/06/2022	6
Key informant interview	School director	Rome	06/07/2022	1
Key informant interview	Parent of a student with migration background	Rome	17/06/2022	1
Classroom observation	Akelius English class for children with migrant background, 10–11 years old	Bologna	18/05/2022	5
Classroom observation	Akelius English class for children with migrant background, 5 years old	Bologna	19/05/2022	5
Classroom observation	Akelius English class for Italians + with migrant background, 6–7 years old	Bologna	19/05/2022	20
Focus group discussion	Teachers and digital animators	Bologna	29/06/2022	5
Focus group discussion	SEN teachers	Bologna	20/05/22	3

Data collection technique	Data source / respondents	Location	Date	Number of participants
Focus group discussion	Primary school local children	Bologna	19/05/2022	6
Focus group discussion	Primary school children with migration background	Bologna	18/05/2022	5
Focus group discussion	Implementing partner educators	Bologna	29/06/2022	4
Key informant interview	School director	Bologna	04/05/2022	1
Key informant interview	Parent of a student with migration background	Bologna	31/05/2022	1

Total:

6 classroom observations

10 focus group discussions

4 key informant interviews

130 participants involved

All interviews were audio recorded, transcribed, managed, coded and analysed in NVivo qualitative data analysis software along with classroom observations reports, field notes, photographic data, reflexive journal entries, minutes of research team discussions and policy documents related to digitization and inclusive education in Italian schools.

Quantitative data

Data collection technique	Data source / respondents	Location	Date	Number of participants
Online questionnaire	Teachers completing initial teacher training for the Akelius digital language course	Rome and Bologna	Dec 2021–Jan 2022	28
Online questionnaire	Teachers using the Akelius digital language course in class	Rome and Bologna	March–April 2022	19
AIPI teacher records	Students in classes taught by AIPI teachers, including in classes using Akelius digital language course and other classes	Bologna	June 2022	51

Annex 2

Figure 3. Learning progress of students in digital learning application classes and other classes
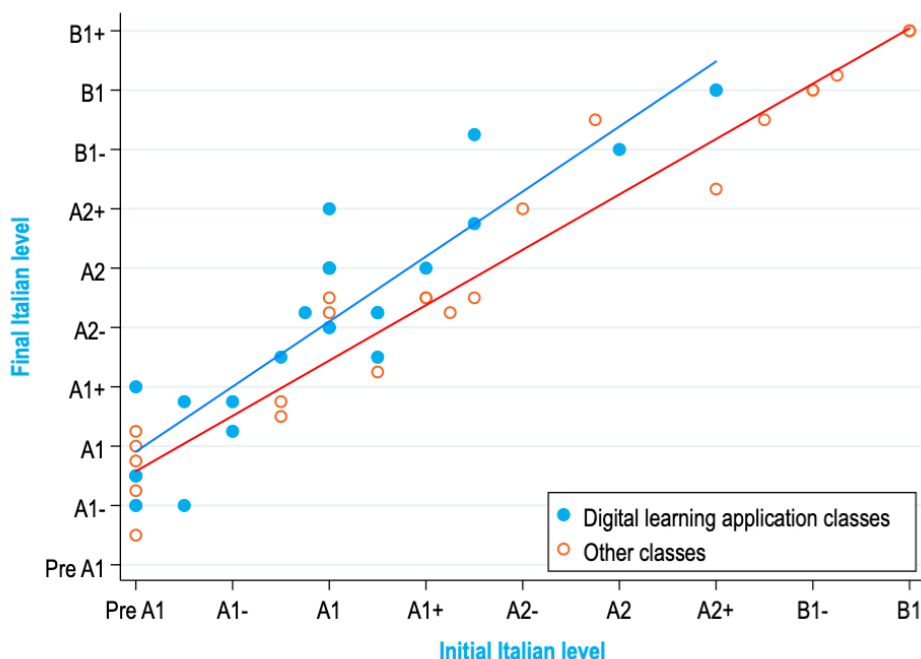

Table 2 and Table 3 summarize the average initial and final levels of Italian among students in the digital and non-digital learning application classes, focusing on each competency of interest. On average, students in digital learning application classes had a lower initial level of Italian in listening, reading, writing and speaking.

Table 2. Initial levels of language learning in classes where the digital learning application was introduced and other classes

	Listening		Reading		Writing		Speaking	
	Initial level	Level reached	Initial level	Level reached	Initial level	Level reached	Initial level	Level reached
Digital learning application course classes	A1	A2	A1	A2-	A1	A2-	A1	A2-
Other classes	A2-	A2+	A1+	A2-	A1+	A2-	A2-	A2

Table 3. Balance statistics of students in digital learning application classes and other classes

		Other classes		Digital learning application classes	Difference
		(1)		(2)	(3)
	N	Mean (SE)	N	Mean (SE)	(1)-(2)
Age	26	8.96	25	7.88	1.08**
		[0.26]		[0.37]	
Years in Italy	26	5.30	25	4.92	0.38
		[0.81]		[0.63]	
Reading (initial level)	25	2.92	25	1.60	1.32*
		[0.59]		[0.40]	
Writing (initial level)	26	2.65	25	1.52	1.13*
		[0.51]		[0.38]	
Listening (initial level)	26	4.00	22	2.54	1.45*
		[0.65]		[0.37]	
Speaking (initial level)	26	3.92	22	2.13	1.78**
		[0.63]		[0.36]	

The value displayed for t-tests are the differences in the means across the groups.

***, **, and * indicate significance at the 1, 5, and 10 per cent critical level.

for every child, answers

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