DIG4LIFE

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DIG4LIFE

Digital Skills for Literacy and Future Education

Manual

Final version

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Acknowledgements

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We also thank the DITES research centre at Link Campus University, which, as associated partners in the project, ensured the hosting of the online learning environment during the project and the final release of the serious game.

For three years, the DIG4LIFE project gathered 20 high schools and vocational institutions to build virtuous relationships between schools and universities to promote digital citizenship and digital culture through co-designing innovative self-assessment tools to be used at school.

The main results of this great work are summarised in this Manual. We want to thank all the schools, teachers and students who participated in the various phases of co-design, testing and dissemination for their trust, openness, and commitment to the project.

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1. INTRODUCTION TO THE MANUAL

Welcome to the DIG4LIFE manual. This user guide is designed to provide necessary information to everyone who would like to benefit from the intellectual outputs developed through the Dig4life project (https://dig4life.eu/). It is designed to be read and get equipped with knowledge about our project while, at the same time, providing you with all the tools you need to implement the gamification approach to your teaching environment. Moreover, it will give you an overview of the importance of digital skills development for education and literacy in the future while providing you with links to DIG4LIFE projects' research, where you can learn even more about it.

The Manual includes the description of the project, its goals, its partners, and different actions that were developed (frameworks, research, testing protocols, tools) to support the success of the leading project's output - Serious game, which tests digital skills and literacy of students.

DIG4LIFE is an action research project that aims to create better conditions for best practices exchange in digital skills teaching. It creates and disseminates innovative tools, such as simulators and teachers' editors, for digital gamification environments. With this, the project tries to lower the gap of the growing social inequality. The global pandemic recently aggravated this phenomenon and is resulting in a crisis of civil and democratic life participation.

Without any further ado, let’s begin!

2. CONTENTS OF THE TOOLKIT

The DIG4LIFE toolkit contains materials needed for accessing the DIG4LIFE Serious Game, such as game files, links to the free learning management system (LMS) platform and teachers' instructions for implementing the game in the classroom. Moreover, it includes promotional materials that everyone can use to promote: the Dig4Life project in general, the option to use the game for free in your teaching environment or your own experience of the trial on your institution's communication channels (social media, newsletters, internal news boards, etc.).

With the toolkit, teachers and other stakeholders can familiarise themselves with the game, plan how to use it to enhance students' learning experience and set up the game in their school's LMS. Furthermore, they can use promotional material also to promote the Serious Game in their work environments, for example, in schools or lectures.

The toolkit can be found in the annexes of this Manual. We have provided information on downloading the game for installation to your learning management system. Links are also provided for the promotional material.

3. THE DIG4LIFE PROJECT

3.1. Partnership

The DIG4LIFE partnership was made among universities, research centres, training institutions, and schools, including various approaches and experiences.

Partners of the project are

- Università degli Studi Roma Tre (E10208847) - Italy (applicant).
- Academia , izobraževanje in druge storitve d.o.o. (E10039332) - Slovenia.
- Fh Joanneum Gesellschaft Mbh (E10207256) - Austria.
- Klaipėdos Universitetas (E10209169) - Lithuania.
- Entropy Knowledge Network s.r.l. (E10147517) - Italy.
- Universidad de Cadiz (E10208753) - Spain.
- LAUREA-Ammattikorkeakoulu oy (E10183030) - Finland.

The DITES research centre (Link Campus University) participates as an associated partner.

3.2. Project Goals

The project's main goals are:

- to support opportunities for everyone to acquire and develop key skills, including basic skills, to improve employability, socio-educational and personal development, as well as participation in civil and social life;
- to develop skills in areas such as social skills, creativity and critical thinking, as well as learning how to learn;
- to support and evaluate new approaches aimed at reducing disparities in access and involvement in formal and non-formal education (social inclusion);
- to promote gender equality and address differences concerning access and use of technologies and activities by poorly represented groups.

The program also supports the adoption of European frameworks on digital skills of educators, citizens and organisations, including developing and using open educational resources, open textbooks, and Open Source educational software.

Priority in the project was given to actions that promote:

- innovative teaching, training and learning;
- assessment methods and tools used as engines for the improvement of lifelong learning.

3.3. Different Actions (IOs)

DIG4LIFE has provided five essential IOs (intellectual outputs) or project results that are strongly correlated with each other. They were developed following a stepwise approach.

The first step regarded the Teachers' Self Assessment testing and tools (IO1). In this output, research on the theoretical background of the topic was done, upgraded with methodology guidelines and tools, and then shared with all partners. The intellectual output, thus, includes:

- IO1.A1 - Research about the theoretical background for self-assessment resulted in a report titled *'Theoretical framework for self-assessment'*.
- IO1.A2 - A teachers' testing experience of the frameworks presented in the previous (IO1.A1.1) report resulted in a report titled *'Guideline for methodology and tools for self-assessment'*.
- IO1.A3 - *Developing a new free online self-assessment tool* for educators in primary or secondary education, including initial vocational education and training, which is available through the project website (https://dig4life.eu/) or the following link: https://eknsurvey.com/.

These three correlated and refined products aimed to clarify methodology, instruments, tools, output, etc., to address the second intellectual output (IO2). Training sessions for trainers and teachers were also conducted as additional support to all these products and connecting IO1 successfully with IO2.

In the second step, the DIG4LIFE team produced the co-designed proto-type of *Digital Environment for Literacy and Future Education:*

- *IO2 - a self-evaluation tool in the form of a serious game* through which students can test their digital skills

In the third and fourth steps, the DIG4LIFE team pilot-tested the prototype in real situations (real classrooms and from students' and teachers' perspectives), resulting in the following reports of the testing:

- *IO3 - Testing of the prototype on school students/pupils*
- *IO4 - Testing of the prototype on students involved in the dual vocational training system*

During the fifth step (IO5), we prepared guidelines and materials for product release. The main goal of the final step is to enable the use of the Prototype developed in the second step to the wider audience. The IO5 includes the development of the following:

- *IO5.P1 - This Manual gives a project overview and teachers' instructions on using the prototype - the serious game we have developed.*
- *IO5.P7 - The release of the game prototype in a digital format based on an open-source WEB APP LMS.*

In the next two chapters, the Manual will briefly describe the IO1, IO3 and IO4 to provide some background on all project phases while linking to the final reports (or outputs) for each. Then, it will mainly focus on the IO2 (within a separate chapter 4: The Game) to provide all the necessary information and links to understand and implement the game prototype developed during the DIG4LIFE project into their own teaching/learning environment.

3.4. IO1 Overview: Teachers' Self-Assessment Tests and Tools

The two correlated reports and tools produced as a part of the IO1 aim to clarify methodology, instruments, tools, output, etc., to address better and develop the second intellectual output (IO2).

3.4.1. The theoretical framework for self-assessment (IO1.A1)

This report focuses on the self-assessment theoretical framework, which supports the analysis and the teachers' professional development to promote digital literacy and quality in teaching and learning processes. In particular, it explores the:

- European vision

- the evolution from evaluation to self-evaluation perspective
- the value of Self-assessment in Teachers' Professionalisation
- the self-assessment as a connector between the teaching and learning process

In brief, the literature on issues such as:

- innovative practices in the digital age
- acquisition of digital technologies
- creative pedagogical activities in education and training
- new pedagogical approaches

helped us to understand the three main factors behind this counterintuitive phenomenon.

These factors are:

1. *Economic inequality*, which affects the possibility of accessing the best educational opportunities that ensure job integration and social mobility.
2. *Functional illiteracy*, which means reading a text aloud without understanding what they have read and extracting its meaning. These people will have problems with social inclusion and citizenship in a democratic society.
3. *Emotional illiteracy*, which is present when a person cannot recognise their emotions and correctly attribute the feelings of others. Galimberti (2009) argues that an overabundance of external stimuli and a lack of communication leads to emotional illiteracy.

As reported by The Digital Economy and Society Index (DESI, 2020), there is an urgent need to increase digital skills in Europe, considering that:

_ 37% of the EU's workforce has low digital skills or none.

_ Less than half of children are in highly digitally equipped schools.

_ Only 20 to 25% of children are taught by teachers who trust technology in the classroom.

_ 18% of primary and secondary schools in the EU are not connected to broadband.

On the other hand, self-assessment is considered a tool to determine and increase the teacher's quality if combined with other tools. With self-assessment tools, teachers judge their adequacy and effectiveness in teaching regarding their knowledge, performance and pedagogical skills.

Self-assessment increases teachers' awareness of their weaknesses and strengths, encourages them, and allows them to become more effective teachers. With self-assessment, teachers can monitor their professional growth and save time and costs of self-training.

In particular, the use of self-assessment tools integrated with other personal growth strategies can improve teaching practices by:

a) increasing the teacher's awareness of teaching excellence levels, sense of efficacy and performance;

b) helping the teacher in building improvement paths and in defining the necessary actions;

c) facilitating communication between peers and the construction of professional communities of practice;

d) stimulating constructive strategies to improve teaching effectiveness also through the influence of external change agents on teacher practice.

On the student side, self-assessment is a helpful tool for the student's development of motivation in participating in the learning process and empowering their own digital and soft skills (Dornyei, 2001); and self-direction. According to Self-Directed Learning approaches (Kerka, 1994; Mentz, 2016), students, having become aware of their strengths and weaknesses, would set realistic goals for reaching greater responsibility regarding their growth paths.

Moreover, several studies have highlighted the positive relationship between the self-assessment of teachers and their professional growth. Significantly, the use of self-assessment tools integrated with other personal growth strategies can improve teaching practices:

a) increasing the awareness of the teacher (Peterson, 2000);

b) defining the levels of excellence of teaching and the sense of the effectiveness of performance (Festinger, 1954);

c) stimulating constructive strategies to improve the effectiveness of education, also through the influence of external change agents (Festinger, 1954);

d) facilitating communication peer-to-peer and building professional practice communities (Clandinin & Connelly, 1988).

In support of this, there is strong evidence that the effectiveness of teaching practices substantially impacts student learning success; instead, teachers' evaluations have little to no effect on the quality of education or student learning (Peterson, 2000).

On the other side, Serious Games are tools that meet the formative needs of a society and work environments that are undergoing profound change: new generations of citizens and workers have grown up alongside new technologies used to view their options, communicate and decide. Because of this, they implicitly expect and demand innovative learning models and languages.

However, these new training tools should not be limited only to so-called digital natives. The development of new skills and new ways of solving problems concerns all generations of learners in our time. The real innovation of Serious Games is an essential contribution to make in these fields. Moreover, Serious Games have the added advantage of rediscovering and updating the learning potential of games, a capacity that has always been recognised in Western culture.

Learn more about the theoretical framework for self-assessment in the full report.

3.4.2. Guideline for Methodology and Tools for Self-Assessment (IO1.A2)

The report collects the experience of trainers and teachers in the testing of the following two existing self-assessment tools:

1. DIGCOMPEDU, valorising the survey tool realised by the DECODE project (2016-1- IT02-KA201-024234)
2. PIAAC (Programme for the International Assessment of Adult Competencies, OCSE) for literacy, numeracy and problem-solving.

The participants in the Dig4Life projects who were identified as "Trainers" and were subsequently training the "Teachers" as foreseen by the project have measured their digital skills according to the DigCompEdu reference framework for educators/trainers. Again, the goal of this self-assessment was twofold. Support teachers in understanding the multidimensionality of digital competence and its strategic value in education and help them reflect critically on the usefulness deriving from using digital resources in teaching/learning processes.

The knowledge and experimentation of PIAAC online within the DIG4LIFE project aimed to share innovative practices of self-assessment of competencies developed by OECD, which are considered strategic for the professional and personal growth of the adult population. These competencies, *literacy, numeracy* and *problem solving*, can be considered as the constructs of an articulated and composite network that are the result of decades of OECD studies and have formed the PIAAC Survey's structure. The trainers involved in this test aimed at preparing the training for teachers were around 18. The results of their responses are non-statistically

significant, but they were useful to implement into the prototype co-design stage: DIGital Environment for LIteracy and Future Education. In the framework of the DIG4LIFE project, a distance learning phase with all participating trainers was carried out prior to the administration of the tool. It was necessary to illustrate the features of Piaac online and its peculiarities. Immediately after this phase, all trainers carried out a self-training session, and the characteristics of the tool, its strengths and weaknesses, were directly verified. After the administration, the project team, first of all, started an asynchronous discussion by the online learning environment dedicated to the project with all the trainers involved in partner countries to highlight the strengths and development of the tool and then had them fill in a short satisfaction questionnaire. From the debate carried out by the online learning environment with the trainers, it is noted that as far as strengths are concerned, both the relevance and comprehensibility of the *numeracy* and *problem-solving* tests for the detection of proficiency in the field of logical-mathematical and digital skills and competencies were recognised; the trainers also confirmed the "usability" of the tool and its ability to provide useful information for the recognition of prior learning. The weaknesses that emerged mainly concerned the time needed to carry out the test, which requires, even for an expert user, a long time, about two hours, and the lack of feedback during administration. This last point has received the most criticism. It is because the trainers consider it necessary that the tool allows the user to understand where the error occurred and to be able to do so during the test administration. It was an opportunity to explain the difference between learning tools structured to offer reinforcement feedback and reality task simulators developed to photograph a skill's mastery level at a specific point in time. This second kind of assessment is essential for making the most of progress and defining new stages in learning development.[1].

Another element the trainers suggest to intervene is the score reports, a verification and self-assessment tool considered important but to improve both in its contents and graphics. Another element to improve is the graphics of the tool, considered outdated, even if this criticality is linked to the time of development of the tool, which dates back to more than ten years ago. The questionnaire results confirm the issues addressed during the debate developed in the online learning environment.

Learn more about the teachers' testing experience (and results) in the full report.

3.4.2.1. *Digital European Framework: DigComp and DigCompEdu*

To help 21st-century citizens become digitally competent, the "European Digital Competence Framework" reference tool, also known as DigComp, was created (Carretero et al., 2017).

[1] Capogna S., Costa C. (Eds). 2023. Self-evaluations based on DigCompEdu and PIAAC for teachers. DIG4LIFE Consortium. Available at: http://dig4life.eu/outputs/

The tool's purpose, developed by JRC, is to help European citizens improve their digital skills in all areas envisaged. The report called DigComp 2.0 contains an updated list of 21 digital skills. In contrast, in the model called DigComp 2.1, the skills are divided into eight levels (Dimension 3, which is discussed below), each of which examples of use are reported.

The latter is depicted with infographics that explain the eight levels of competence using the metaphor of "Learning to swim in the digital ocean".

Since it was presented in 2013, the DigComp has become a precise point of reference for the development and strategic planning of initiatives on digital skills, both at the European level and in individual member states of the UE. DigComp, through self-assessment, can help define learning objectives, identify training opportunities and facilitate job search. In addition, indicators can be defined by monitoring citizens' digital skills to support policymakers in planning and designing education and training offers, as already done in some EU countries.

The DigComp framework is divided into five dimensions:

Dimension 1: Areas of competence identified as forming part of digital competencies
Dimension 2: Descriptors of competencies and titles relevant to each area
Dimension 3: 8 levels of mastery for each skill
Dimension 4: Knowledge, skills and attitudes applicable to each competence
Dimension 5: Examples of use on the applicability of the competence for different purposes

In a context in which technologies are increasingly the protagonists of our daily life, it becomes essential to acquire those technical skills that can allow us to relate to the technologies themselves or digital skills. In acquiring and developing these skills, the education sector is called to a role of great responsibility, as it must train the citizens and the future political class. Educators at all levels, from early childhood to higher and adult education, including general and vocational training, special needs education and contexts of non-formal learning, need to develop a wider range of skills than a few years ago, dedicating particular care and attention to the acquisition of digital skills, which must be learned and then transmitted to learners.

DigCompEdu was born from the analysis and grouping of numerous frameworks, self-assessments and training programs developed internationally and nationally to describe and self-assess the digital skills of educators. DigCompEdu is a reference framework with a scientifically validated common language and approach, aiming to favour political choices, improve regional and national training tools and programs, and exchange best practices at the transnational level.

The proposed DigCompEdu framework aims to reflect on the digital skills of educators in order to create a coherent starting model common to teachers of all levels of education to evaluate and identify a path to develop satisfactory pedagogical digital competence. Surely, DigCompEdu does not oppose the various national, regional and local initiatives to acquire educators' digital competence but completes them as it seeks to put together the various diversities attributable to various national contexts.

Furthermore, DigCompEdu intends to refrain from asserting itself on other models. However, in this case, it also integrates them to encourage reflection and debate on a fundamental topic for the present and especially for the future, which concerns the digital skills of educators.

3.4.2.2. *PIAAC (Programme for the International Assessment of Adult Competencies, OCSE)*

One of the conclusions from the research is that the PIAAC Survey aims to study the distribution of *literacy, numeracy* and *problem-solving* domains among the population of the participating countries. Therefore, we present (through the table below) a description of these domains. The table is extracted directly from the "National Report on Adult Competencies" of 2014.

Table 1: Definition of competence domains evaluated in OECD-PIAAC

Domains	Literacy	Numeracy	Problem-Solving in Technology-Rich Environments
Definition	Literacy is the ability to understand, evaluate, use and be engaged in reading written texts to participate in social life, achieve one's goals, and develop knowledge and potential. Literacy includes a range of skills, from decoding written words and phrases to understanding the interpretation and assessment of complex texts. (Production of a written text is not included). Information on the skills of adults with low levels of competence is provided by an assessment of reading components covering the vocabulary of a text and a fluent understanding of its passages.	Numeracy is the ability to access, use, interpret and communicate mathematical information and ideas to involve and manage the mathematical needs of various adult life situations. To this end, Numeracy involves managing a situation or resolving a problem in a real context by responding to mathematical content/information/ideas represented in multiple ways.	Problem-Solving in Technology-Rich Environments is the ability to use digital technology, communication tools and networks to acquire and evaluate information, communicate with others and perform practical tasks. The assessment focuses on the ability to solve problems for personal, work and civic purposes through establishing appropriate goals and plans and accessing and using information through computers and networks.
Contents	Different types of text. Texts are characterised by their medium (print or digital based) and format: - texts contained or in prose -non-continuous texts or documents - mixed texts -multiple texts	Contents, information and mathematical ideas: - quantity and number of data - size and shape -model, relations and changes Representations of mathematical information: -objects and images - numbers and symbols -visual displays (e.g. diagrams, maps, graphs, tables) texts -technology enough on display	Technology - hardware devices - software applications -controls and functions -Representations (e.g. text, graphics, video) Tasks: - intrinsic complexity - explanation of the problems

Source: ISFOL, 2014a

The methodology of the PIAAC survey is based on the collection of data on the level of competence of adults that are quantitative and qualitative (ISFOL, 2014b: 58). We can define it as a mixed type methodology, highly complex, which in turn refers to further methods of tool construction and data analysis.

> "With the methodology of the OECD PIAAC survey, it is possible, therefore, to obtain an interpretation of the level of competence of adults that is not only quantitative but also qualitative. In fact, not only do we have information on the tests that adults are more or less likely to carry out, but we can also see in detail the characteristics of the competencies of the adults themselves" (ISFOL, 2014b: 58).

The weight of statistics and digital technology (computer-assisted) are therefore very strong in the overall methodology adopted and the whole project. Statistics cover the whole field, from the construction of the sample to the activity reports of the surveyors, passing through all aspects of the analysis and the whole research that has extensively used advanced technological tools (ISFOL, 2014b: 67).

3.4.3. Development of a New Self-Assessment Tool (IO1.A3)

IO1.A1 and IO1.A2 have allowed us to analyse the needs of teachers and set up a free online self-assessment (IO1.A3) available on the project website and at this link (https://eknsurvey.com/).

The tool is based on the DigCompEdu framework and gives valuable feedback on the use of digital technologies for teaching and learning. It consists of 22 questions and is available in 7 different languages (English, Italian, Finnish, Spanish, Lithuanian, German, Slovenian). The target audience for this tool is educators in:

- primary education field
- secondary education fields
- vocational education
- vocational education training

By going through this self-evaluation, the user - the teacher - can learn about:

- personal strengths
- areas to enhance
- self-reflection

in connection to their use of digital tools in the classroom.

In the end, the user receives:

- detailed feedback on the skills
- useful tips to innovate teaching
- their roadmap to do so with key milestones to reach

3.4.4. Training Sessions

As support to all research and tool development made in IO1 and to convert findings from IO1 successfully into IO2, two training sessions were organised to *Co-design the prototype: DIGital Environment for LIteracy and Future Education*:

- Training for Trainers
- Training for Teachers

3.4.4.1. *Training for Trainers*

The Training for Trainers involved 21 participants, and it was set up as a pilot for later sessions carried out in the partner countries.

We used the methodology Flipped Classroom, discovery-peer learning. During the training, participants referred to:

- the PIAAC tool, the performance of the PIAAC test and the feedback of experience through a self-observation quiz
- the DigCompEdu self-assessment tool
- the serious-game co-design

It consisted of:

- 12 hours of simultaneous training (webinars)
- 12 serial activities in the Moodle platform
- 8 modules

The objective of this module was to co-design and co-build the training path with all the trainers involved in the project and develop the serious game for self-assessment that would be implemented in the following pilot test phase with the teachers. In fact, at the end of the training, each country partner has been entrusted to focus their Training for Teachers on one of the DIGICOMP competencies later included in the serious game (IO2): Digital Safety (Italy); Digital Collaboration (Spain); Digital Numeracy (Lithuania); Digital Literacy (Austria); Problem-Solving (Slovenia); Digital Creativity (Finland).

3.4.4.2. *Training for Teachers*

Training for Teachers consisted of:

- 80 hours of training for each national group

- 10 modules

We involved 80 participants in total (15 teachers per partner).

The Italian pilot training for teachers ended in October, and the first episode of the serious game (on Digital Safety) was ready at the end of October 2021. The training for teachers in other countries started in November 2021, based on the experience and guidance of Italy (A+EKN).

Their aim of the training sessions was to have teachers help us co-design the serious game we were developing for the IO2. In the sessions, teachers were led through co-creation activities.

3.5. IO3 and IO4 Overview: Testing of the Prototype

The game prototype realised during the IO2 *Co-design of the prototype: DIGital Environment for LIteracy and Future Education* was tested in two different environments:

- On school students

The target population for trials involved secondary schools that project partners involved in the trials and include schools from Italy, Slovenia, Finland and Lithuania. Trials were carried out between May 2022 and February 2023. The final number of students who answered the questionnaire for students was 432, and the number of teachers who answered the questionnaire for teachers was 83, which surpasses the initial plan and proves the interest attracted by the project in the target population.

- Students from dual bachelor and dual master programs

The target population involved master's and bachelor's students from Austria. Trials were conducted in November 2022, and we have included 99 students.

The protocol for testing was based on an empirical research process, which means that all the participants played with the Dig4Life game first and then completed a post-game questionnaire. Two questionnaires were specially developed for this purpose in the first phase of the work package IO3 and used in both testing environments:

a. A questionnaire for the students participating in the testing experience.

b. A questionnaire for their teachers.

With the questionnaire, we could test and evaluate the effects and results of the Dig4Life game trial on the students. We were also able to generate evidence of the impact of the Dig4Life game on the tester and, consequently, evaluate the effectiveness of the project overall.

All gathered data is presented in the reports by each country. A joint report was also prepared to show and give an overview of the gathered data and results.

Learn more about the *results of the testing in the joint country report.*

Moreover, in the questionnaire preparation phase, to test the document IO3.A1.1. Research Protocol for Testing Dig4Life in Schools formally described the research protocol's theoretical background, the phases involved, the quality factors, their dimensions and measures, and the measurement instruments. It included guidelines for the partners to implement the trials in the schools. Moreover, the document IO3.A1.2. Guidelines for School Teachers was created to serve as a guide for teachers, tutors and school mediators in their use of the Dig4Life serious game in class, supporting them to plan and carry out the class sessions in which the students will use the serious game to assess their level of proficiency in digital competences.

Learn more in the two full reports:

- *Research Protocol for Testing Dig4Life in Schools*
- *Guidelines for School Teachers*

4. THE GAME

The DIG4LIFE Serious Game has been developed as the IO2 (intellectual output) of the DIG4LIFE project. The game's goal was to serve as a self-evaluation tool for students that enables them an evaluation of their digital competencies. The Digital Competence Framework for Citizens (DigComp), which supports the development of individuals' digital competence in Europe, is a reference framework for this game.

Serious Game was chosen for evaluating students' digital competencies because games are familiar to students and part of their daily lives. They can give instant feedback to the players, and players can view their progress and development. Furthermore, games allow students to overcome real-life challenges in a safe environment while having fun. Students actively participate and learn skills while playing, and the game encourages them to be involved in their learning process.

The game includes episodes that allow students to evaluate their digital competencies in DigComp's five competence areas, which are information and data literacy, communication and collaboration, digital content creation, safety and problem-solving, as well as a sixth competence area of digital numeracy, which is not included in the DigComp. However, young people need to learn and understand. Information and data literacy includes issues such as searching, filtering, evaluating, and managing information and data; communication and collaboration include interacting, sharing, engaging and collaborating through digital technologies, digital content creation includes developing digital content, programming and copyright issues; safety includes issues such as protecting environment, personal data, health and devices, and problem-solving includes solving technical problems. Digital numeracy, which is not part of DigComp, includes skills related to mathematics, such as reading maps and charts, logical thinking and problem-solving.

The DIG4LIFE Serious Game features a world of the future, a place where society has become modern and technological. Schools differ from what one might know now: no classrooms or lecturers teach. Students live on the school campus and face real-life challenges that they have to solve. The main characters need to solve challenges and complete missions to advance their story, and the player is invited to help them while learning new skills.

The main characters include Paul and Francis, teenagers and students whose daily life the player follows. Michela is a young woman and an ethical hacker who helps Paul and Francis with their troubles. Archi (nickname from Archimede) is a drone that Paul owns. The Mentor, who looks after the students, also provides the player with feedback on how they did with their skills. Other characters help the main characters on their journey, and the player can use their knowledge while solving problems.

The DIG4LIFE Serious Game includes six episodes or days, which can be played in any order the player wants:

- Episode 1: Digital Safety
- Episode 2: Digital Communication and Collaboration
- Episode 3: Digital Creativity
- Episode 4: Digital Literacy
- Episode 5: Digital Numeracy
- Episode 6: Digital Problem Solving

The game features regular dialogues, interactive dialogues (the player decides how the characters reply) and actions/decisions (the player has to perform a specific task, for example, choose items from a list). After completing the episode, the player is given feedback about their digital skills in that episode's digital competence.

Students can self-evaluate their knowledge of each digital skill and later replay the episodes and compare the previous results to see if there is an improvement. Teachers can use the game to evaluate their students' digital skills and plan their classroom teaching accordingly.

4.1. Goals of the Game

The DIG4LIFE Serious Game was made to self-evaluate students' digital competence level, according to the Digital Competence Framework for Citizens (DigComp). This game aims to promote digital culture to young people and, through simulating real-life situations in a game environment, enhance learning and develop digital skills.

Digital skills are essential skills that must be learned to function in current and future society fully. Students can learn digital skills in a safe environment while they play. Serious Games are made to be educational; through playing, students can learn while having fun. Games facilitate learning, encourage students to learn and stimulate the imagination.

The game contains several goals, which are based on the DigComp framework. Each episode features one competence and includes tasks that students need to complete before getting feedback and evaluating their skills.

Table 2: Episodes and goals/behaviour to learn

Episode	Digital competence	Goals/behaviour to learn
Monday	Digital Safety	Understanding privacy settings, two-factor authentication, passwords and saving files to multiple platforms. Protection of personal data and understanding privacy. Protecting self and others from cyberbullying. Understanding netiquette. Environmental issues related to the digital world.
Tuesday	Digital Communication and Collaboration	Tools of appropriate communication and sharing of content. Technologies to interact with services. Collaborating through digital technologies, netiquette of digital communication. Benefits and protection of digital identity.

Wednesday	Digital Creativity	Creating and editing digital content, integrating and re-elaborating digital content and understanding licenses and copyright issues. Understanding the thinking behind programming.
Thursday	Digital Literacy	Understanding how to search and filter data, evaluate data and information, and manage data.
Friday	Digital Numeracy	Includes different levels of general arithmetic behaviours, from understanding simple arithmetic operations to more complex understanding.
Saturday	Digital Problem-solving	Solving technical problems, identifying and selecting digital technologies to solve problems, using digital technologies creatively and supporting others in developing their digital skills and competency.

Each episode contains multiple goals or behaviours to learn, and thus, it is recommended to play the game episode by episode and take the appropriate time to learn the competencies each episode provides fully. Teachers can also add their own goals in each classroom session, and students can have their own goals, for example, different reasons to learn these competencies. However, it is important to understand the goals and objectives of the game so it can be used as intended.

4.2. Manual for Teachers

Teachers can use the DIG4LIFE Serious Game as a whole or choose specific episodes to be played in the classroom. It is recommended that the teacher tests the game before they start using it in the classroom so that they can plan the sessions accordingly. The DIG4LIFE Serious Game episodes can be played in any order, as they are all individual episodes. Teachers can choose the relevant episode to be played with the students based on the digital competence they want to be addressed. The players can play the game on the free learning management system or in the school's LMS by accessing the game page. Each episode takes approximately 20 minutes to complete.

Before starting to play the game, the teacher should introduce the game to students: this includes the background story, characters, episodes, how to play the game and technical requirements. Before starting the session, teachers can also familiarise the class with the chosen digital competency. The ideal situation would be to play the first episode in the classroom, and after the students know how to play the game, they can also

play it independently at home, and further discussion can be conducted in the next class. The following structure for a class session is a recommendation that the teacher can use when planning:

1. Summarise the main points in the chosen digital competence area according to the DigComp framework and the goals and behaviours to learn when playing the game. The episode's story can also briefly be summarised.
2. After that, the link to the game episode can be shared with the students.
3. Students play the game.
4. Students get to the end of the game and receive feedback, which they can look through, and if needed, the teacher can help students to interpret the results and give feedback.
5. Finally, a debriefing session can be held with the students, in which they can go through the experience and have additional activities, for example, discussions in groups or creating posters. More ideas can be found in the Teacher's Handbook; the link can be found at the end of this section.

The game consists of different types of dialogue and activities. Regular dialogues are fixed, and the player does not need to choose anything. These are carried out with voice lines and text. Interactive dialogues require the player to choose an answer to questions or certain situations. There are usually 3 to 5 options, and each option counts a different amount toward the final score. Actions or decisions are activities in which the player needs to perform a specific task, for example, choosing items from a list or putting items in a specific order. Points are given to the final score based on the player's performance. If the player wishes to hear the dialogue again, they can click the characters to hear the dialogue again.

The player gets immediate feedback after their decision and will get the final feedback from the Mentor after playing the game. The feedback and evaluation depend on the point percentage the player has achieved. The final feedback of each digital competence includes the maximum score, the points the player acquired and the percentage of the points the player achieved compared to the maximum score, the maximum being 100 points. To get a description of each competence, the player needs to click on the specific competence shown on the final feedback.

When students start playing the game, it is important to let them know that in order for the game tracks to work in the LMS, the platform window should always be open when playing the game, as well as the game window itself. If the player wants to pause the game, the game should be closed from the "x" at the bottom of the game window or by clicking the red "x" in the game window, and only after that, the LMS window can be closed. The system will mark the point where the player paused the game and will start from that point when the game

window is opened again. The game window should be closed briefly, as the LMS might timeout, and the tracking might be lost. The player cannot go backwards in the story, and should they wish to go back, the game must be replayed. The player needs to see the scores and the credits to record the final score in the LMS; thus, the player should only exit the game after the credits.

The game is playable in the classroom while students are there or if students are remotely participating. Teachers and students should take into consideration the following technical requirements in order to get the best experience:

- A PC or tablet is needed. However, a PC is suggested for the best user experience
- An Internet connection is needed for playing
- Supported browsers: Google Chrome, Mozilla Firefox and Microsoft Edge
- Pop-ups need to be allowed to play
- It is also recommended that the browser cache is cleared for every new play session

A *Handbook for Teachers* has been developed to help teachers plan and carry out playing sessions of the game in the classroom.

4.3. Playing/Installing The Game

The institutions or individuals can freely access, play or only try out the game or use it in their classrooms. To do so, the Dig4Life project enabled three different access options (http://dig4life.eu/play-the-game/):

- The Individual Play via the project website

- Access to the game through The Moodle platform (of Link Campus University)

A free LMS course has been set up for those who do not have their own LMS and are thus not able to install the game. The game has been installed in two languages, English and Italian, in the free LMS. The course includes playable game files and instructions on briefing and debriefing. Students can monitor their progress in the LMS and view their points. The game can be played as many times as the students want, and they can also check how they have improved if they decide to play the game several times.

- Installing the Game on the Institution LMS platform

The DIG4LIFE Serious Game can be played in a learning management system (LMS). The game is downloadable as SCORM files, which allows students and teachers to track progress.

Further instructions on all three ways to access the game can be found in Chapter 5.3. The Access to the Game.

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6. ANNEXES

The information provided in this chapter may serve anyone who would like to share information about the DIG4LIFE project, project results or free access to the Serious Game developed on their communication channels (newsletters, internal news boards, etc.). Please use elements of our projects' visual identity (logo, colours) according to the rules presented in point 5.1. Some draft promotional materials were developed for easier dissemination, which you can find under point 5.2.

6.1. Visual Identity and Promotional Material

6.1.1. Logo

You can download the logotypes on the project website https://dig4life.eu/ or by following this link.

Figure 1: Logo layout: Isotype and Imagotype

Figure 2: Logo layout: Black & White

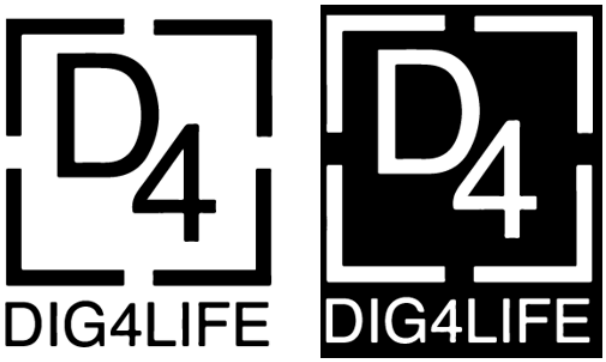

Figure 3: Logo layout: Other versions and grayscale

6.1.2. Corporate colours

rgb (235,169,56)
cmyk (0,28,76,8)
#EBA938

rgb (119,186,81)
cmyk (36,0,56,27)
#77ba51

rgb (228,80,55)
cmyk (0,65,76,11)
#E45037

rgb (45,177,209)
cmyk (78,15,0,18)
#2DB1D1

rgb (113,193,166)
cmyk (41,0,14,24)
#71C1A6

6.1.3. Typography

Arial Narrow

ABCDEFGHIJKLMN
OPQRSTUVWXYZÀÅ
ÉÎÕØÜabcdefghijklmn
opqrstuvwxyzàåéîõøü
&1234567890($£.,!?)

Arial Narrow Regular

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
a b c d e f g h i j k l m n o p q r s t u v w x y z

Arial Narrow Bold

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z
a b c d e f g h i j k l m n o p q r s t u v w x y z

6.2. Promotional material from the game and project

In order to promote the game, drafts of promotional materials from the game and project have been created. These materials are intended to be used for the following examples in institutions:

- promoting or informing the stakeholders (school pupils, staff, general public) about the use/implementation of the Serious Game in their institution classroom (teachers to their leadership and other stakeholders)
- promoting the project among their stakeholders (everyone in order to get more public involvement)
- promoting the option to implement the Serious Game in their classroom (leadership, headteachers to their teachers)

The promo pack includes:

- 1 Banner Example
- 4 Flyer Examples
- 1 Social Media Example

Banner, Flyer and Social Media examples are available in .png format with text to be used immediately and .ai format to be used as your draft and adjusted (text, design) according to your preferences and needs. You can do so in Adobe Illustrator.

It also includes:

- 3 Background Examples (to be used for your designs) - .png format; in sizes applicable for banners, flyers and social media posts
- 1 Video Promo
- 15 Game Assets - pictures from the Serious Game

All of you are welcome to use your designs for promotional purposes.

Get the promo files here:

6.3. The Access to The Game

6.3.1. The Individual Play

Individuals can try the game on the project website http://dig4life.eu/play-the-game/ and get individual results.

6.3.2. The Game on Moodle Platform

Teachers (individually or in teams) or institutions can get access to the Link Campus University Moodle platform, which they can use to play the game (have students play the game in the classroom). In order to request access, teachers should download and fill out the following:

- the letter of request for access to the Moodle platform (available here)
- an Excel sheet to indicate the students/teachers that will test the game (available here)

When both documents are filled out, please send them to dites.progetti@unilink.it to gain access to the Moodle platform.

6.3.3. Installing the Game on the institution's own LMS platform

The game is playable in Learning Management Systems, which support SCORM files. The files need to be downloaded first and then installed in the LMS. Each LMS has instructions on adding SCORM files to courses, so it is important to follow those instructions when installing the game.

Institutions can access a Google Drive folder to download a **SCORM zip file** (and a summary of how to install it on **any other LMS platform**) by requesting it via this online form: please add the link.

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