Atollo Project

Breaking barriers through education

# D4.3 Set of optimised digital education content units, along with guidelines on their use

31/03/2026 | NOLA SANTINI

Co-funded by the European Union

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# About the Atollo project

The Atollo project aims to empower learners with disabilities by creating inclusive digital materials. Through a consortium of partners from Croatia, Bulgaria, Austria, Germany, Iceland, Norway, Ireland and Australia, including an EdTech company, universities, schools for children with SEN, public authorities, and NGO, we will analyse and compare existing programs, develop innovative digital tools and create high-quality digital educational content. We will pilot and test the digital materials and evaluate their implementation and then focus on the improvement of developed digital materials based on the feedback from the learners, teachers and experts. The result of the scientific evaluation of the use of digital materials will be an inclusive digital education toolkit that will contain advice and instructions for everyone who works with it, and uses digital educational materials for children SEN. We will use a user-centred design approach to ensure that the materials are accessible and inclusive for learners with various types of disabilities. This iterative process of improvement will help us create digital materials that are effective and engaging. Furthermore, the project will provide capacity building for teachers to use developed digital materials effectively. The expected results include a cutting-edge set of digital learning materials, capacity building for teachers and an inclusive digital education toolkit for policymakers and education institutions. We will share our findings and outcomes through various channels to reach a wider audience, including policymakers and education institutions, and create awareness about the importance of inclusive digital materials for learners with disabilities. The project will have a direct impact on the involved schools and their learners as well as a broader impact on the underrepresented group of children with disabilities, their educators and wider academic community through research paper derived from this project.

## The Atollo project Consortium

The Atollo project consortium is an Erasmus Partnership, bringing together 14 partners.

| | Partner | Acronym | Country |
|---|---|---|---|
| **1** | PROFIL KLETT D.O.O. | PK | HR |
| **2** | SVEUCILISTE U ZAGREBU | UNIZG ERF | HR |
| **3** | HOGSKOLEN I INNLANDET | INN UNI | NO |
| **4** | REGIONALEN TSENTAR ZA PODKREPA NA PROTSESA NA PRIOBSHTAVASHTO OBRAZOVANIE SOFIA GRAD | RCSIE | BG |
| **5** | SKOLA ZA ODGOJ I OBRAZOVANJE PULA | STE PULA | HR |
| **6** | HASKOLI ISLANDS | UI | IS |
| **7** | MATRIX INTERNET APPLICATIONS LIMITED | MATRIX | IE |
| **8** | PADAGOGISCHE HOCHSCHULE OBEROSTERREICH | PH OOE | AT |
| **9** | MINISTARSTVO RADA, MIROVINSKOGA SUSTAVA, OBITELJI I SOCIJALNE POLITIKE | MRSOP | HR |
| **10** | STADT FRANKFURT AM MAIN DER MAGISTRAT, CHARLES HALLGARTEN SCHULE IN GERMANY | CHS | DE |

| No | Associated Partner | Acronym | Country |
|---|---|---|---|
| **11** | CENTRAL QUEENSLAND UNIVERSITY | CQU | AU |
| **12** | NATSIONALNA ASOTSIATSIA NA RESURSNITE UCHITELI | NART | BG |
| **13** | DIGITAL TECHNOLOGY SKILLS LIMITED | DTSL | IE |
| **14** | TERAWE TECHNOLOGIES LIMITED | TERAWE | IE |

# Document Control Information

| Project | Atollo |
|---|---|
| **Project number** | 101132759 |
| **Document Title** | D4.3 Set of optimised digital education content units, along with guidelines on their use |
| **Work Package Number** | WP4 |
| **Deliverable Number** | D4.3 |
| **Lead Beneficiary** | Profil Klett d.o.o. |
| **Project Coordinator:** | Profil Klett d.o.o. |
| **Dissemination Level** | DEM - demostrator |
| **Authors** | Nola Santini |
| **Reviewers** | Eva Smrekar, Sonja Alimović |
| **Description** | Online digital learning materials ready to use in classrooms. (Electronic, EN and localised into other partner EU languages) |
| **Status** | **Final** |
| **Due date** | 31.03.2026 |

## Document history

| | Date | Modified by | Comments |
|---|---|---|---|
| **1** | 15.03.2026 | Nola Santini | First draft |
| **2** | 20.05.2026 | Eva Smrekar | QA review |
| **3** | 26.03.2026 | Sonja Alimović | Expert review |

# Introduction

## Purpose of the Deliverable

This deliverable, D4.3 – Set of Optimised Digital Education Content Units, along with Guidelines on Their Use, presents the finalised set of digital educational materials developed within the Atollo project and prepared for practical use in educational settings. It documents the outcome of the iterative development and evaluation process through which the digital materials were designed, piloted, reviewed, and improved in order to better support learners with learning difficulties and different educational needs in inclusive and special education contexts.

The primary purpose of this deliverable is threefold. First, it presents the final set of optimised digital education content units and modules made available through the Atollo IZZI platform. Second, it explains how the findings from the pilot phase and the evidence gathered through the evaluation process informed the revision and refinement of the materials. As stated in D4.1, the pilot findings were intended to be translated into concrete recommendations for improvement and to directly inform the finalisation of optimised learning units (D4.3). Third, this deliverable provides practical guidance for teachers and other education professionals on how to use the materials effectively in classroom practice, including differentiated and inclusive learning environments.

## Position of deliverable (D4.3) within WP4

Deliverable D4.3 is situated within Work Package 4 (WP4): Piloting and Evaluation of Digital Educational Content & Quality Assurance and represents a key output in the progression from evaluation to final optimisation of the Atollo digital learning resources. Within the internal logic of WP4, D4.3 builds directly on the preceding evaluation activities and functions as the practical outcome of the pilot-testing and quality-assurance cycle.

More specifically, the relationship between the core WP4 deliverables can be understood as follows:

D4.2 – Evaluation procedure and criteria for monitoring and evaluating digital educational content established the methodological and quality-assurance framework for assessing the developed digital materials. It defined the evaluation criteria, data collection methods, and indicators used to examine pedagogical quality, accessibility, usability, and implementation.

D4.1 – A report summarising the findings of the pilot testing documented the results of the pilot phase carried out in participating schools and educational settings. It synthesised evidence gathered through questionnaires, focus groups, classroom observations, technical monitoring, and other feedback methods, and translated these findings into recommendations for improvement.

D4.3 – Set of optimised digital education content units, along with guidelines on their use presents the revised and finalised version of the digital materials after the pilot findings were reviewed and incorporated into the optimisation process. As explicitly stated in D4.1, the findings from the pilot phase were expected to "directly inform the finalisation of optimised learning units (D4.3)," making this deliverable the direct continuation and applied outcome of the evaluation work.

D4.4 – Inclusive Digital Education Toolkit represents the next layer of project output, extending beyond the digital units themselves toward a broader, evidence-based toolkit intended to support educators, institutions, and policymakers in implementing inclusive digital education practices. In this sense, D4.3 provides a concrete pedagogical and content foundation on which D4.4 can build.

## Scope of the Deliverable

This deliverable covers the final set of 45 digital education content units developed on the Atollo IZZI platform for learners with learning difficulties and different educational needs in six partner languages. The materials are designed to support the development of mathematical and digital (ICT) competencies at lower primary level and in equivalent individualised learning pathways for chronologically older learners with intellectual or developmental difficulties, when suitable. The content was created to support differentiated learning in both inclusive classrooms and special education settings and is intended as a complementary teaching resource rather than a standalone curriculum.

The final set is organised across four learning levels, allowing teachers to select materials according to learners' individual needs, profiles, and expected learning outcomes. The platform consists of 45 units distributed across four levels, with mathematics content structured into four progressive levels and ICT content offered as a standalone publication covering all four levels. This structure enables flexible use of the materials with learners ranging from those with Profound and Complex educational needs to those with Moderate and Specific educational needs.

In linguistic terms, all units are available in six languages — Bulgarian, Croatian, English, German, Icelandic, and Norwegian with each language organised in a dedicated platform "bookshelf." This multilingual structure supports broader accessibility and relevance across participating countries and facilitates the use of the materials in different national educational contexts.

# The Final Set of Optimised Digital Education Content Units

## Overview of the Atollo IZZI Digital Materials

The Atollo IZZI digital materials represent the finalised set of digital educational resources developed within the Atollo project to support learners with learning difficulties in inclusive and special education contexts. The materials are hosted on the IZZI platform and were designed as accessible, interactive, and differentiated learning resources that help educators provide meaningful support in the areas of mathematics and digital learning (ICT). Their overall purpose is to strengthen foundational competencies while enabling flexible use across diverse learner profiles, educational settings, and levels of support.

The materials were developed for learners in special schools or students in lower primary school, including pupils in mainstream settings who require adapted support as well as chronologically older learners whose individualised learning pathways correspond to lower primary outcomes. The materials are intended to support students with a wide range of learning difficulties and educational needs and are offered at multiple levels to accommodate differences in cognitive profile, independence, pace of learning, and need for scaffolding. The resources are therefore suitable for use in both inclusive classrooms and special schools or specialised educational settings.

From a pedagogical perspective, the Atollo IZZI materials are conceived as complementary digital learning resources rather than as a standalone curriculum. They are aligned with relevant curricular learning objectives and are designed to be combined with other teaching materials, classroom strategies, and professional judgement. Digital units as an additional support tool that can be used to introduce concepts, reinforce prior learning, motivate learners, provide visualisation, or offer differentiated practice opportunities. This approach reflects the project's broader commitment to flexible, learner-centred, and inclusive pedagogy.

The platform offers a broad variety of interactive activity types chosen for their suitability for learners with difficulties and for their capacity to support engagement, repetition, concrete understanding, and accessible interaction. Across the units, learners encounter activities such as colouring tasks, drawing tools, memory games, image puzzles, labyrinths, pathfinder tasks, true/false quizzes, multiple-choice exercises, number line activities, scale-based tasks, step-by-step mathematical problem-solving activities, videos, and interactive videos. Each of the 45 units contains at least five digital activities, selected as appropriate for the level of difficulty and intended learning outcomes.

In addition to the pedagogical content itself, the Atollo IZZI platform includes accessibility-oriented design features that support inclusive use. These include alternative inclusive versions of the same content, audio recordings, accessible video elements, and a personalisation toolbar allowing learners to use bookmarks, notes, highlights, drawings, font adjustments, light and dark modes, and dyslexia-friendly display options. These features are central to the project's aim of making digital learning materials usable by learners with diverse needs and learning profiles.

## Structure of the Final Set

The final set of optimised Atollo IZZI materials consists of 45 digital education content units, organised in a clear and scalable structure that supports both curriculum alignment and differentiated use. Platform is organised around six language-specific bookshelves, each containing the same core set of publications and units. Within each bookshelf, users can access five publications: Mathematics Level 1, Mathematics Level 2, Mathematics Level 3, Mathematics Level 4, and one ICT publication that spans all four levels.

The numerical structure of the final set is as follows:

- 40 mathematics units, distributed across four levels
    - 10 units in Mathematics Level 1
    - 10 units in Mathematics Level 2
    - 10 units in Mathematics Level 3
    - 10 units in Mathematics Level 4
    - 5 ICT units, grouped in a standalone publication covering all four levels

This results in a total of 45 digital units translated into six partner languages.

**The final set of optimised digital education units in six languages can be found on Atollo website in Resource Library here: Resource Library | The Atollo Project.**

The mathematics content is organised progressively across four levels and is aligned with lower-primary mathematical learning curricula from all partner countries. The mathematical units address a range of foundational domains, including numbers and counting, shapes and space, measurements, problem-solving, development of natural numbers, arithmetic operations, and geometry. This structure allows teachers to work with comparable conceptual areas across levels while adapting the degree of complexity, abstraction, and support according to learner needs.

The ICT publication is structured around five core thematic areas:

1. Information acquisition and processing
2. Technology and equipment
3. Digital skills
4. Creation and communication
5. Ethics and security

These thematic areas were selected to support the development of essential digital competencies for learners with difficulties in a way that is practical, age-appropriate, and relevant to everyday participation in digital

environments. This modular design allows educators to use the units flexibly: as full lesson sequences, as selected activities within a lesson, or as targeted interventions for reinforcement, revision, or independent practice.

# Pilot Testing as the Basis for Optimisation

The optimisation of the Atollo IZZI digital materials was grounded in a structured pilot-testing phase carried out as part of Work Package 4. As documented previously in Deliverable D4.1, the pilot phase served as the key empirical step between the initial development of the digital materials and their final refinement. Its purpose was to evaluate how the units functioned in authentic educational environments and to generate evidence-based recommendations for improvement prior to finalisation. In this sense, the pilot phase was not a standalone validation activity, but a core development mechanism directly supporting the preparation of the optimised final set presented in this deliverable.

Pilot implementation took place across three partner countries: Croatia, Bulgaria, and Germany and a total of 15 schools participated in the pilot activities: 11 schools in Croatia, 2 in Bulgaria, and 2 in Germany. The participating institutions represented a mix of special education settings and inclusive school environments, which was particularly important for testing the materials across different pedagogical and organisational contexts. Croatia had the largest representation and was primarily composed of special schools and education centres, Bulgaria included both a special educational support centre and a broader school setting, while Germany's pilot was conducted in inclusive school contexts. Together, these institutions involved approximately 120 teachers and 474 students in the broader pilot activities.

The pilot was designed to test the digital materials in real classroom conditions. This was essential because the Atollo materials are intended for use with learners with diverse cognitive, learning, and support needs, and their quality can only be meaningfully assessed in relation to the realities of classroom organisation, available devices, teacher mediation, internet stability, learner attention span, and the degree of adult support available. Effectiveness of the digital materials depends not only on their technical and pedagogical quality, but also on the broader learning environment in which they are implemented.

## Methods Used to Collect Feedback

The pilot testing of the Atollo IZZI digital materials was supported by a mixed-methods evaluation approach, as defined in D4.2 and implemented in D4.1. This approach combined quantitative and qualitative data sources in order to capture both measurable trends and deeper contextual insights related to usability, accessibility, pedagogical effectiveness, and implementation conditions. The use of multiple complementary methods was particularly important given the diversity of learner profiles and educational settings involved in the pilot.

Feedback was collected through several main channels:

- Pre-pilot questionnaires (Questionnaire 1) for teachers
- Post-pilot questionnaires (Questionnaire 2) for teachers
- Classroom observations during implementation of the digital units
- Focus group interviews with teachers and other educational stakeholders
- Usage and interaction data, including technical monitoring and platform analytics
- Supplementary reflections and process documentation, including letter-based reflections in some parts of the evaluation design

The pre-pilot questionnaire gathered baseline information on teachers' prior experience with digital materials, confidence in using digital tools, initial expectations, and intended use of the units. The post-pilot questionnaire focused on classroom implementation, examining usability, learning effectiveness, learner engagement, inclusion, technical issues, and suggestions for improvement. This two-phase structure allowed the consortium to compare initial expectations with real teaching experiences.

Classroom observations provided valuable insight into how the materials functioned in authentic learning environments, including teacher support strategies, student engagement, classroom organisation, and contextual factors affecting implementation. They also helped identify practical issues such as pace adjustment needs or occasional technical limitations.

Focus group interviews offered deeper qualitative reflections from teachers and other stakeholders, highlighting both strengths and barriers in practice. They were especially useful for identifying recurring themes such as text load, progression between levels, clarity of feedback, and the need for flexibility for learners with more complex needs.

In addition, usage and technical monitoring supported the analysis by showing patterns of engagement, navigation, and access, helping to identify interface or platform-related issues that could influence learning.

Overall, the use of multiple feedback channels created a strong and triangulated evidence base, allowing the consortium to compare teacher perceptions, classroom realities, and technical data. This strengthened the optimisation process and ensured that revisions to the final digital units were informed by both measurable trends and practical experience.

## Overall Pilot Findings

The pilot findings documented in D4.1 provide a clear and balanced basis for the optimisation of the Atollo IZZI digital materials. The results indicate that the digital units were positively received by teachers across the three pilot countries (Croatia, Bulgari and Germany) and were regarded as valuable for use in teaching mathematics and ICT to learners with intellectual disabilities and other learning difficulties. At the same time, the pilot also identified certain challenges related to accessibility, level differentiation, text load, classroom implementation, and technical conditions. These findings were treated not as limitations of the concept itself, but as concrete guidance for refining the final set of materials.

A major positive finding across countries was the high level of perceived intuitiveness and task quality. Most teachers were satisfied with the intuitiveness of the units and found them easy to navigate, which is particularly

important for learners with disabilities, as intuitive design can support greater independence and confidence. Teachers also rated the overall quality of the tasks positively, and translations into national languages were generally well received, with only minor variation between countries. These results confirmed that the platform architecture and the basic pedagogical concept were strong enough to support finalisation, while still leaving room for targeted improvements.

The qualitative findings also showed that the materials were effective in supporting student engagement and motivation. Classroom observations in Croatia, for example, noted that students were curious, happy, focused, and generally motivated to complete tasks, with many responding positively to praise and enjoying the interactive nature of the activities. Teachers reported that the materials could successfully stimulate participation, particularly when used with appropriate teacher mediation and when tasks were aligned to learners' functional levels. This confirmed that the digital units had strong potential as inclusive learning supports in both special education and inclusive classroom environments.

At the same time, several recurring improvement needs emerged consistently across the pilot data. One of the strongest themes was the need to reduce text load, especially in aims, instructions, and task explanations. Teachers reported that some learners were challenged by excessive written text and that clearer, shorter, and more visually supported instructions would improve accessibility. Another frequent recommendation was the need for more fine-grained differentiation, particularly at the lower end of the scale. Many teachers tended to select Levels 1 and 2 for their learners, while Levels 3 and 4 were used more frequently in Germany, and that some educators specifically suggested subdividing Level 1 into even simpler progression steps.

The pilot also identified important accessibility and usability gaps. Across the cross-national synthesis, challenges were found for non-readers and for students with motor or cognitive limitations. Teachers pointed to issues such as small interactive zones, cluttered layouts, missing or incomplete read-aloud functions, and interactions that were not always sufficiently intuitive for learners with more complex support needs. In some cases, teachers suggested improving how objects could be moved or selected on screen, simplifying visual layout, and strengthening audio support. These findings are especially relevant because they move beyond general satisfaction and identify the specific design refinements needed to improve universal usability.

Another major theme was implementation context and technical reliability. While most observations reported no major technical barriers, occasional problems with slow video loading, unstable internet connections, or dependence on Wi-Fi were noted. In addition, teachers emphasised that effective use of the materials depends heavily on classroom organisation, device access, and the possibility of individualised support. Several comments suggested that some units worked best when used in one-to-one or highly supported formats, particularly for learners with more complex educational needs.

Finally, the cross-national analysis highlighted the need for stronger pedagogical transparency, feedback, localisation, and teacher support. In the German context, teachers placed particular emphasis on didactic structure, monitoring of learner progress, and alignment with curriculum expectations. Croatian feedback more often focused on physical accessibility, classroom conditions, and practical implementation realities. These insights formed the basis for the optimisation categories addressed in the next chapter of this deliverable.

Taken together, the pilot findings confirm that the Atollo IZZI materials already offer a strong foundation in terms of engagement, usability, and inclusive potential, while also providing a clear roadmap for refinement. The final optimised set presented in D4.3 should therefore be understood as the result of an iterative, evidence-based

improvement process, in which the strengths identified during the pilot were retained and the most relevant barriers were systematically addressed, where possible.

# Optimisation Process and Revisions Following Pilot Testing

## Optimisation Approach

The optimisation of the Atollo digital units followed an iterative, user-centred process. Pilot findings from D4.1 were reviewed across pedagogical, accessibility, usability, technical and localisation dimensions. Revisions were prioritised based on frequency of feedback, relevance for learners with difficulties, and feasibility within the finalisation phase of the project.

The final set of Atollo IZZI digital materials presented in this deliverable reflects an iterative optimisation process carried out after the pilot-testing phase. The process was guided by the findings documented in D4.1 and focused on retaining the strengths of the materials such as curriculum relevance, learner engagement, and intuitive interaction, while addressing the main issues identified by teachers and other stakeholders during classroom use and filling in the surveys after each unit. The optimisation process therefore followed an evidence-based approach in which pilot feedback was translated into targeted revisions and practical implementation guidance.

The revisions were approached through several complementary dimensions: pedagogical refinement, accessibility and usability improvement, interface and navigation clarification, localisation and language adjustment, and implementation-readiness support. In some cases, the optimisation took the form of direct content and design improvements within the digital units; in other cases, it was addressed through clearer guidance for teachers on how to use the materials appropriately in diverse educational contexts.

### Pedagogical optimisation

The pilot findings confirmed that the Atollo IZZI materials are broadly aligned with curricular expectations and effective in supporting learner motivation. At the same time, D4.1 identified the need for clearer scaffolding, reduced cognitive load, and more differentiated progression. In response, guidelines for teachers and educators on how to integrate the materials in their classrooms were prepared with stronger emphasis on blended teaching methods. The final set of materials has been framed and presented as a complementary teaching resource, intended to be used flexibly alongside other classroom materials when this is suitable rather than as a standalone curriculum. Due to diverse learner profiles and individualised needs, additional scaffolding in some cases will need to be provided by teachers, learning support staff or parents, as not all learners can be expected to engage with

the materials fully independently. In some cases, further adaptations and targeted support will be necessary to ensure meaningful participation and learning

## Accessibility and usability optimisation

Accessibility and usability were among the most prominent themes in the pilot findings. Teachers appreciated the inclusive potential of the materials but also highlighted several barriers, including high text load, small interactive elements, inconsistent support for non-readers, and occasional visual overload. These findings informed both the optimisation of the materials and the guidance provided for their use. The platform supports accessibility through alternative versions of content, audio recordings for each task instruction to support non-readers, adjustable display options, and dyslexia-friendly personalisation features.These elements form an essential part of the final implementation model for the optimised units.

## Interface and navigation optimisation

The pilot phase also generated useful feedback related to interface behaviour and navigation. D4.1 notes that teachers valued intuitive design overall, but also reported issues such as small clickable zones, drag-and-drop demands for some learners, interruptions caused by navigation flow, and reduced autonomy when transitions between tasks were not sufficiently clear. These observations were particularly relevant for learners with fine motor, attention, or more complex cognitive support needs.

## Localisation and language optimisation

Cross-national piloting confirmed that localisation is essential for effective classroom use. Although the materials were positively received overall, teachers occasionally identified terminology, mathematical procedures, and isolated language elements that did not fully match national classroom conventions. These issues were not systemic, but they were important enough to justify targeted adjustment and explicit guidance. The final set therefore incorporates the principle of language and curriculum-sensitive implementation across the six available languages: English, Norwegian, Icelandic, Croatian, Bulgarian, and German. In practice, this means that the materials are intended to be used with awareness of local curricular expectations, national terminology, and age-appropriate classroom language. Units are flexible resources that should be selected and mediated by teachers in line with local teaching practice.

## Implementation-readiness optimisation

The pilot findings made clear that the successful use of the Atollo IZZI materials depends not only on the quality of the digital units themselves, but also on the conditions of implementation. Technical infrastructure, device availability, internet stability, classroom organisation, and adult support all significantly affect how effectively the materials can be used in practice. The final set of optimised units is accompanied not only by revised materials, but also by practical guidance for teachers, especially regarding blended use with other teaching materials, selection of appropriate learning levels, deciding when learners can work independently and when support is needed, choosing between whole-class, small-group, paired, or individual use and making use of platform accessibility features.

# Revisions to Digital Learning Materials Based on Pilot Feedback

## Revisions to Level 1

The pilot implementation of the Level 1 digital educational materials across 45 units provided highly valuable feedback from teachers, expert reviewers, and the editorial/content team. Overall, the feedback confirmed that the materials are pedagogically relevant and well aligned with the target group, while also highlighting several opportunities to improve clarity, accessibility, and ease of use for learners with diverse educational needs. Based on this input, a number of targeted revisions were introduced to strengthen the usability and inclusiveness of the materials.

A key area of improvement concerned the visual design and selection of images. Pilot feedback showed that some visuals were too abstract, overly detailed, or not sufficiently intuitive for the intended learners, which occasionally created confusion and reduced task independence. In response, several images were replaced or simplified to ensure clearer recognition and more direct alignment with the concept being taught. Visuals were also made more consistent in style, with a stronger emphasis on recognisable, everyday objects and reduced distracting detail. In several tasks, misleading or overly complex objects were removed or substituted, and visual groupings were adjusted to support more accurate interpretation of quantities, categories, and comparisons.

Another major set of revisions focused on instructional language and task wording. The pilot demonstrated that some instructions were linguistically too complex, too abstract, or insufficiently aligned with the learners' receptive language level. As a result, those instructions were simplified, reformulated into shorter and clearer sentences, and made more explicit where needed. Terminology was standardised across units, and several words or phrases were replaced with more familiar or developmentally appropriate alternatives. In addition, unit titles and task labels were adjusted where necessary to better reflect the concepts being taught and to avoid confusion between similar terms.

The pilot also highlighted the importance of multimodal support, particularly for learners who are not yet independent readers or who require additional scaffolding. To address this, audio support was added across tasks and instructional segments, enabling learners to access instructions more independently. This significantly improves accessibility for students who benefit from auditory reinforcement and reduced the need for constant teacher mediation. In several places, verbal instructions were complemented by clearer visual cues or animations to support comprehension, especially in tasks involving directional concepts, comparisons, or multi-step actions.

A further important group of changes related to task interaction and accessibility. Feedback showed that certain interaction patterns, especially tasks requiring precise dragging from a specific edge or manipulating small clickable areas were unnecessarily demanding for learners with motor, visual, or attention-related difficulties. In response, interactive elements were revised to make them more intuitive and accessible, including adjustments to object behaviour, clickable areas, and task structures. Some tasks were redesigned to reduce fine-motor demands, and specific components were replaced where this improved ease of interaction. In addition, some visual symbols were supplemented with clearer cues, such as added symbols for abstract concepts (e.g. possible/impossible), to increase learner independence.

The pilot also led to content-level pedagogical refinements in individual activities. In several units, specific examples, comparisons, or visual scenarios were revised because they unintentionally introduced cognitive

overload. For example, tasks involving classification, quantities, comparison of more/less, and descriptive vocabulary were adjusted so that the visual logic of the task more clearly matched the intended learning outcome. Some sequences were simplified, some misleading contrasts were removed, and certain illustrations were modified to better support conceptual understanding. In mathematics-related tasks, number visibility was improved, visual representations of sets were clarified, and incorrect feedback or answer logic in a small number of tasks was corrected.

Pilot confirmed the need for greater consistency and predictability across the learning experience. Revisions therefore also included improved alignment between narration, visuals, and expected responses; correction of isolated mismatches between text and image; clearer sequencing in certain activities; and the addition of supportive cues in videos and animations. These refinements help reduce cognitive load and support more confident navigation through the materials.

The resulting updates make the digital educational materials more intuitive, more inclusive, and better suited to the learning profiles of the target group, while preserving alignment with the intended curriculum outcomes.

## Revisions to Level 2

The pilot implementation of Level 2 digital educational materials within the Atollo project highlighted several areas where content refinements were necessary to improve clarity, usability, and pedagogical effectiveness. Based on feedback from teachers and expert reviewers, a series of targeted revisions have been implemented across the materials.

Firstly, visual elements were revised to enhance comprehension and reduce cognitive load. In several units, images that were previously unclear, overly complex, or insufficiently aligned with the learning objectives were replaced with more intuitive and context-appropriate visuals. These changes were particularly important in activities involving abstract concepts or multi-step processes, where clearer visual support significantly improved student understanding.

Secondly, instructional content was refined to ensure greater clarity and consistency. Instructions that were previously ambiguous, overly dense, or linguistically challenging were simplified and restructured. This included breaking down complex tasks into clearer step-by-step guidance, improving wording for better accessibility, and aligning terminology across units. Language adjustments were also made to ensure that translations accurately reflect the intended meaning and are appropriate for the target learner group.

In addition, pedagogical adjustments were introduced to better support diverse learners and inclusive teaching practices. Certain activities were modified to provide clearer scaffolding, reduce unnecessary complexity, and improve alignment with students' cognitive and developmental levels. Where needed, examples were clarified or adapted to be more relevant and meaningful, and task structures were improved to support independent learning and teacher facilitation.

Furthermore, specific content elements, such as videos and contextual references were revised to ensure coherence and relevance. In cases where explanations or references were potentially confusing or insufficiently contextualized, content was updated to provide clearer connections to the learning objectives and to avoid misunderstandings.

## Revisions to Level 3

A primary area of refinement involved visual elements. Certain images and visual supports were replaced or redesigned to improve clarity, relevance, and alignment with the learning objectives. In cases where visuals were perceived as ambiguous, overly complex, or insufficiently supportive of the task, more intuitive and pedagogically appropriate alternatives were introduced. These updates contributed to reducing cognitive load and facilitating better understanding, particularly in more demanding Level 3 activities.

Instructional clarity was also significantly improved. Feedback indicated that some instructions required simplification or restructuring to ensure they were easily understandable and actionable. As a result, instructions were revised to be more concise, logically sequenced, and consistent in terminology. Complex tasks were broken down into clearer steps, and wording was adapted to better suit the target group, ensuring accessibility while maintaining the intended level of challenge.

In addition, content adjustments were made to strengthen pedagogical coherence and alignment. Certain activities were refined to better match learners' cognitive abilities and to provide more effective scaffolding where needed. Examples and task contexts were clarified and, where necessary, adapted to be more meaningful and relatable, supporting both independent student work and guided instruction.

Further improvements addressed the overall consistency and usability of the materials. Terminology, phrasing, and structural elements were harmonized across units to create a more cohesive learning experience. Where minor inconsistencies or potential sources of confusion were identified, content was revised to ensure smoother navigation and clearer expectations for both teachers and students.

## Revisions to Level 4

One of the key areas of revision concerned visual elements. Several images and graphical supports were replaced or redesigned to ensure they more effectively support the intended learning outcomes. In instances where visuals were identified as unclear, overly abstract, or not sufficiently aligned with task requirements, they were updated with more precise and contextually relevant alternatives. These changes enhanced learners' ability to interpret information independently and reduced potential misunderstandings in more complex Level 4 tasks.

Instructional content was also substantially improved. Feedback indicated that certain instructions required greater precision and clarity, particularly in tasks involving multi-step reasoning or higher-order thinking. As a result, instructions were refined to be more explicit, better structured, and consistent across units. Complex activities were reorganized into clearer sequences, and language was adjusted to ensure that expectations are unambiguous while maintaining the appropriate level of cognitive challenge.

Pedagogical adjustments were introduced to strengthen alignment with learners' needs at this level. Tasks were refined to improve logical progression and coherence, and additional scaffolding was incorporated where necessary to support comprehension without reducing task complexity. Examples and contextual elements were clarified and adapted to better reflect meaningful and relatable scenarios, facilitating deeper engagement and understanding.

Further revisions focused on improving overall consistency and usability. Terminology, phrasing, and structural elements were harmonized across materials to create a more cohesive learning experience. Identified

inconsistencies and potential sources of confusion were addressed, resulting in clearer navigation and more intuitive use for both teachers and students.

## Revisions to ICT

One of the key improvements involved simplifying and clarifying language throughout the units. Complex or ambiguous phrasing was adjusted to ensure that instructions and content are easier to understand, particularly for students who may experience language or learning difficulties. In several cases, terminology was refined and sentence structures were shortened to improve readability and reduce cognitive load.

Additionally, instructions and task formulations were revised to eliminate confusion. Tasks that were previously unclear or overly complex were reworded, and guidance was made more explicit. Special attention was given to improving the clarity of feedback messages within interactive elements, ensuring that students can better understand both correct and incorrect responses.

The pilot also revealed the need for adjustments to visual elements. Certain images and visual pairings were replaced or modified to better support understanding and avoid misinterpretation. In some activities, inappropriate or unclear visual associations were removed, and more intuitive visuals were introduced to strengthen the connection between content and expected responses.

Furthermore, task structures were optimized by removing redundant or potentially confusing activities and refining interaction types. For example, some matching tasks were simplified or removed where they did not effectively support learning outcomes. Minor textual and formatting issues, such as unnecessary punctuation or distracting elements, were also corrected to improve the overall user experience.


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# Guidelines for the Use of Atollo IZZI Digital Materials

The final set of the units along with the guidelines on their use can be found on Atollo website in Resource Library here: Resource Library | The Atollo Project. Additionally, the resources section includes a Teachers´ Corner and a Parents' Corner with a section for Frequently Asked Questions to support navigation and use of digital education materials.

## Purpose of the Guidelines

The purpose of these guidelines is to support teachers, teaching assistants, and other education professionals in the effective use of the Atollo IZZI digital materials in inclusive and special education settings. While the digital units themselves provide structured, accessible, and differentiated learning opportunities, their impact depends greatly on how they are introduced, selected, and integrated into the wider teaching process.

These guidelines therefore complement the final set of optimised units by translating the project's development and pilot experience into practical recommendations for classroom implementation. They aim to help educators use the materials as flexible support resources rather than as standalone teaching tools.

More specifically, the guidelines are intended to:

- support appropriate selection of units and learning levels,
- encourage blended and differentiated use,
- clarify when learners may work independently and when adult support is needed,
- promote effective use of accessibility features,
- help teachers integrate digital activities into meaningful classroom practice.

In this sense, the guidelines are an essential part of the optimisation process, ensuring that the finalised materials are not only improved in design but also ready for pedagogically sound use in real educational environments.

## General Principles for Use

The Atollo IZZI digital materials are designed to function as flexible and complementary educational resources. The materials are intended to be used alongside textbooks, manipulatives, oral explanation, and other teaching strategies, rather than as the sole source of instruction. One digital unit may be used across more than one lesson, and activities may be selected for introduction, practice, consolidation, or review.

Several general principles should guide their use:

- Use the materials as part of blended learning.

  The units work best when combined with discussion, demonstration, hands-on activities, and follow-up tasks beyond the screen.

- Select activities according to learning goals, not only by age.

  The materials are aimed at learners working at lower primary learning levels, but they may also be suitable for chronologically older learners with intellectual disabilities when aligned with their individual learning outcomes.

- Use professional judgement to choose the most appropriate level.

  The four learning levels should be treated as guidance rather than rigid placement categories. Teachers should select levels according to the learner's profile, the intended objective, and the amount of support available.

- Adapt the use of the materials to the learner's support needs.

  Some learners may work independently on selected tasks, while others will need teacher, assistant, or peer support throughout the activity. The pilot findings repeatedly confirmed that adult mediation remains important, especially for learners with higher support needs.

  It is not necessary to use all activities in a unit. Teachers may select individual tasks and use only the most relevant sections of accompanying videos, depending on their learners' needs.

- Keep classroom use predictable and low in cognitive load.

  The pilot findings suggest that learners benefit most when tasks are introduced clearly, navigation is supported, and activities are presented in a structured sequence.

These principles should be understood as a practical framework for inclusive implementation across mainstream classrooms, special schools, and specialised support centres.

# Practical Instructions for Teachers

## Before the Lesson

Before using the Atollo IZZI materials, teachers are encouraged to prepare both the pedagogical and the technical conditions for successful use.

Recommended preparation steps include:

- identify the learning objective of the lesson,
- select the most appropriate unit, activity, and learning level, as well as the right assignment,
- teachers do not need to complete the entire unit and may select individual tasks based on their learners' needs,
- videos can also be used selectively, and only the most relevant sections need to be shown.
- review the activity in advance to check language, pacing, and suitability for the specific learner group,
- decide whether the activity will be used as a starter, main task, reinforcement activity, or review,
- prepare any additional non-digital materials (e.g. manipulatives, worksheets, real-life objects),
- test devices, internet connection, audio, and projection options in advance where relevant.

This preparation is particularly important because the pilot findings showed that technical interruptions, unclear instructions, or an unsuitable level can quickly reduce learner focus and autonomy.

Teachers in all pilot contexts also demonstrated that outcomes improved when digital tasks were embedded into broader lesson structures rather than used in isolation. Units, as well as the videos can be used partially; there is no need to present the whole unit (or whole video) to one learner because the pilot showed that even one assignment from unit can be enough for some learners. The intention is not to overload learners' capacity.

Good preparation in advance is first step towards successful implementation in classroom.

## During the Lesson

During the lesson, the teacher's role is to mediate access, support understanding, and adapt the pace according to learner response.

Good practice during implementation includes:

- introduce the activity clearly and explain what students are expected to do (support guidance),
- model the first step if needed,
- simplify or rephrase instructions, when necessary,
- monitor whether learners understand the task goal rather than only the interface,

- provide support with navigation, touch interaction, or task transitions where needed,
- if increased visibility is required, the teacher can enlarge the assignment display by pressing *Ctrl* and *+* simultaneously,
- when using the *matching component*, items can be selected by clicking on one option and then the corresponding option (*click-click*), without the need to *drag and drop*. This provides an alternative for students who may find dragging difficult,
- combine digital work with verbal prompts, gestures, peer support, or physical materials,
- use the digital activity flexibly (whole-class, small-group, paired, or individual format).

The pilot observations showed that teachers often achieved the best results when they actively interpreted instructions, adjusted language, and combined the digital units with real-world actions or objects. This was especially effective in inclusive classrooms and specialised support settings where students benefited from multimodal reinforcement and adult scaffolding.

### After the Lesson

After the lesson, teachers should use the activity as a basis for reflection, consolidation, and future planning.

Recommended follow-up actions include:

- briefly review what learners completed or understood,
- note which activities supported engagement and which created barriers,
- observe whether the selected level was appropriate,
- identify which learners managed independently and which needed additional support,
- connect the digital activity to follow-up tasks off-screen,
- adjust future use of the units based on observed learner response.

Because the Atollo materials are designed for flexible and repeated use, reflection after implementation is important. A single unit may be reused in a later lesson for reinforcement, revision, or progression to a higher level.

## Recommended Use Scenarios

The Atollo IZZI digital materials can be used in a range of instructional formats depending on learner needs, classroom organisation, and device availability. The materials as suitable for whole-class use, individual use, and blended learning, while the pilot findings further confirm their adaptability across mainstream, inclusive, and special education contexts.

Recommended use scenarios include:

- Whole-class introduction

The teacher projects an activity on a screen or interactive board to introduce a concept, activate prior knowledge, or demonstrate a task before guided practice.

- Small-group supported learning

  A teacher, assistant, or support professional uses the activity with a small group of learners who benefit from additional scaffolding, repeated explanation, or shared discussion.

- Individual guided work

  A learner works on a tablet or other device with adult support. This is particularly suitable for learners at Levels 1 and 2 or for learners who need help with instructions, navigation, or regulation.

- Independent or semi-independent work

  Learners at Levels 3 and 4 may be able to complete selected activities independently or with minimal support, especially when the task structure is familiar and the digital interaction is simple.

- Blended learning sequence

  A digital activity is used as one part of a larger lesson sequence, for example:

  - introduction through discussion,
  - digital exploration,
  - hands-on practice,
  - reflection or transfer task.

- Home-supported practice

  Where appropriate, selected activities may also be used outside the classroom with parent or caregiver support, particularly for repetition and consolidation. The platform can also be used at home with adult assistance.

Across all scenarios, the most effective use is not determined by a single "correct" format, but by the match between:

- the learning objective,
- the learner's profile and learner's interests,
- the selected level,
- the available adult support,
- and the technical conditions of the learning environment.

# Guidance on Selecting Levels and Support

## Choosing the Right Level

The Atollo IZZI digital materials are organised across four learning levels, designed to support learners with different profiles of cognitive development and learning needs. The levels should be understood as flexible guidance rather than rigid progression stages, and teachers are encouraged to select the most appropriate level based on their professional judgement and knowledge of individual learners.

The four levels broadly correspond to different degrees of learning difficulty and support needs. Level 1 is intended for learners with profound and complex educational needs, who typically require extensive support and highly structured activities. Level 2 is suitable for learners with severe educational needs, while Level 3 targets learners with moderate educational needs who can engage with slightly more complex instructions and interactions. Level 4 is designed for learners approaching lower primary learning outcomes, including those who may be able to work with greater independence.

In practice, level selection should be based not only on diagnostic categories but also on factors such as:

- the learner's current learning goals,
- attention span and ability to follow instructions,
- familiarity with digital interaction,
- language comprehension,
- ability to work independently or with support.
- the learner's profile and learner's interests.

Teachers may also choose to use units from different levels within the same learning sequence. For example, a lesson might begin with a Level 2 activity to introduce a concept and progress to a Level 3 activity for reinforcement or practice. This flexible use supports differentiated instruction and allows teachers to adapt the materials to heterogeneous classrooms.

## Independence and Adult Support

An important consideration when using the Atollo digital materials is determining when learners can work independently and when adult support is needed. The pilot findings emphasised that although some learners can navigate the activities autonomously, many benefit from varying degrees of teacher, assistant, or peer support.

Learners working at Levels 1 and 2 will often require continuous adult mediation. This may include reading instructions aloud, demonstrating how to complete an activity, guiding navigation, or helping learners maintain attention and motivation. For these learners, the digital materials are most effective when used as shared activities between the learner and the supporting adult.

Learners working at Levels 3 and 4 may be able to complete selected tasks independently or semi-independently, particularly if they are already familiar with the platform interface and task structure. However, even at these levels, teacher monitoring remains important in order to:

- clarify instructions,
- ensure that the learner understands the task objective,
- support transitions between activities,
- encourage reflection on completed work.

In all cases, the most effective approach is to gradually increase learner autonomy while maintaining appropriate scaffolding, allowing students to build confidence and digital competence at their own pace.

## Use of Accessibility Features

The Atollo IZZI platform incorporates several accessibility and personalisation features designed to support learners with different needs, including those with reading difficulties, sensory sensitivities, or attention challenges. These features can help reduce barriers and improve engagement when the materials are used in inclusive or special education contexts.

Among the key accessibility options available are:

- audio support, allowing learners to listen to instructions or text content,
- adjustable display settings, including contrast or layout adaptations,
- dyslexia-friendly personalisation options,
- simplified visual presentation within the digital activities.

Teachers are encouraged to familiarise themselves with these features before introducing the materials to learners. In many cases, activating appropriate accessibility options can significantly increase learner independence and reduce the amount of direct support required during the activity.

If increased visibility is required, the teacher can enlarge the assignment display by pressing *Ctrl* and *+* simultaneously.

The pilot experience also highlighted that accessibility features are most effective when combined with clear teacher guidance and structured lesson organisation. Digital accessibility should therefore be seen as part of a broader inclusive teaching approach that combines technology, pedagogy, and supportive classroom interaction.

# Conclusion

This deliverable has presented the final set of optimised Atollo IZZI digital education content units, together with guidance for their effective use in educational practice. The materials represent the outcome of a structured development and evaluation process carried out so far, which included the creation of digital units, the establishment of an evaluation framework, pilot testing in participating countries, and the subsequent optimisation of the materials based on the collected feedback.

The pilot phase conducted in Croatia, Bulgaria, and Germany provided valuable insights into how the digital units function in real teaching and learning environments. Feedback from teachers, learners, and other stakeholders confirmed the strong potential of the materials to support engagement, differentiated learning, and accessible digital interaction, while also highlighting areas where improvements and additional guidance were needed. These findings directly informed the optimisation process presented in this deliverable.

The final set of 45 digital units covering mathematics and ICT content across four learning levels and six languages is therefore not only a collection of digital learning resources, but also a refined pedagogical tool designed to support inclusive education. When used flexibly and in combination with other teaching strategies, the materials can contribute to more accessible and engaging learning opportunities for students with learning difficulties.

By combining the optimised materials with practical implementation guidance, D4.3 supports teachers and education professionals in integrating the Atollo resources into everyday classroom practice. At the same time, the results of this work provide an important foundation for the next project output, the Inclusive Digital Education Toolkit (D4.4), which will further expand the project's recommendations for inclusive digital learning environments.

Atollo Project

Breaking barriers through education

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Project: 101132759 — Atollo — ERASMUS-EDU-2023-PI-FORWARD-LOT1


Co-funded by the European Union