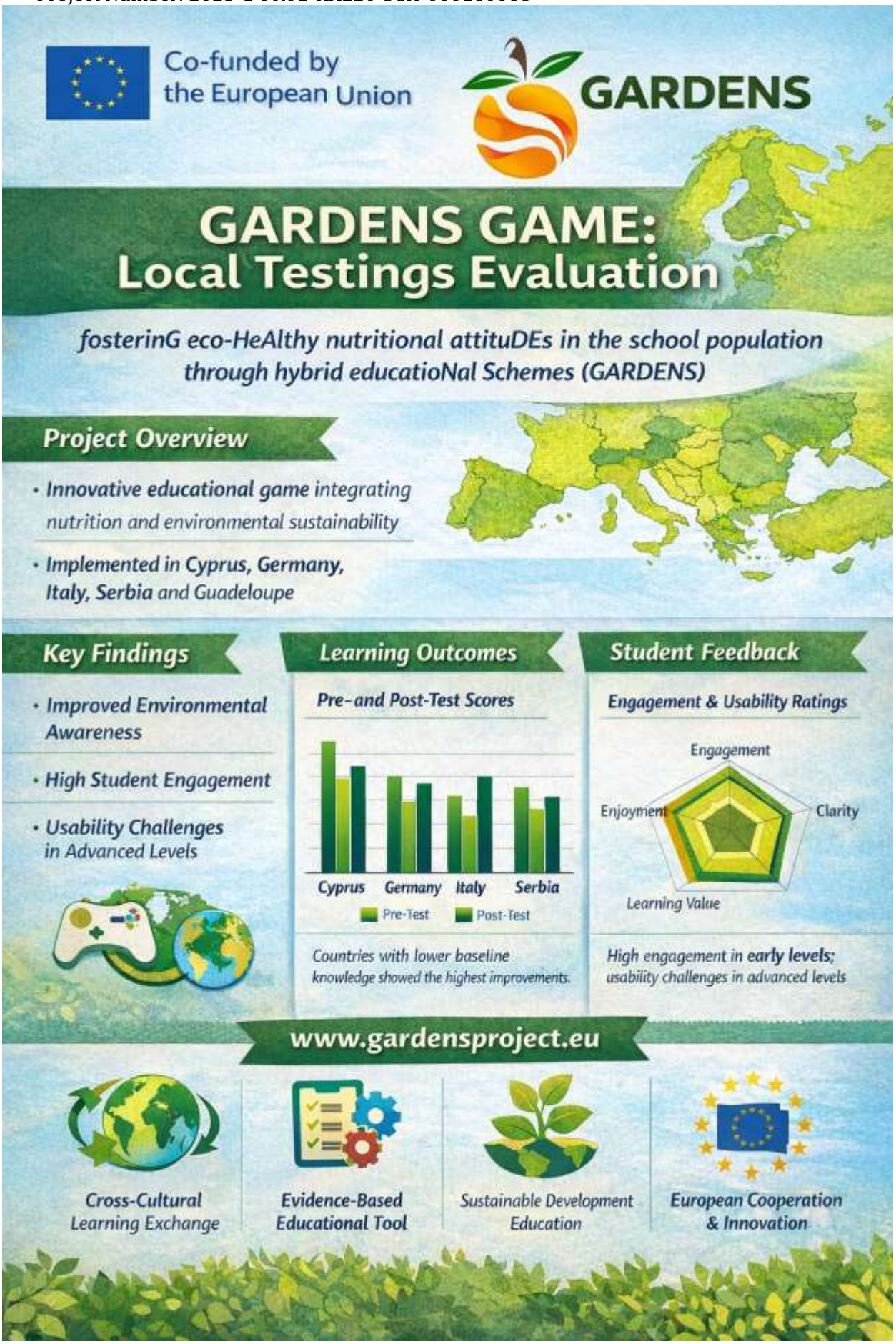

Co-funded by the European Union
GARDENS
GARDENS GAME:
Local Testings Evaluation
fosterinG eco-HeAlthy nutritional attituDEs in the school population through hybrid educatioNal Schemes (GARDENS)
Project Overview
• Innovative educational game integrating nutrition and environmental sustainability
• Implemented in Cyprus, Germany, Italy, Serbia and Guadeloupe
Key Findings
• Improved Environmental Awareness
• High Student Engagement
• Usability Challenges in Advanced Levels
Learning Outcomes
Pre-and Post-Test Scores
Cyprus
Germany
Italy
Serbia
Pre-Test
Post-Test
Countries with lower baseline knowledge showed the highest improvements.
Student Feedback
Engagement & Usability Ratings
Engagement
Clarity
Learning Value
Enjoyment
High engagement in early levels; usability challenges in advanced levels
www.gardensproject.eu
Cross-Cultural Learning Exchange
Evidence-Based Educational Tool
Sustainable Development Education
European Cooperation & Innovation

Contents

International Final Assessment Report Local Pilot Testing of the GARDENS Educational Game

1. Executive Summary

This International Final Assessment Report presents the consolidated and comparative results of the local pilot testing activities implemented within the Erasmus+ KA220-SCH project *"fosterinG eco-heAlthy nutRitional attituDEs in the school population through hybrid educatioNal Schemes (GARDENS)"*. The pilot phase was carried out in **Cyprus, Germany, Italy, Serbia, and Guadeloupe**, engaging secondary school students aged **11 to 17** in structured gameplay and evaluation sessions conducted within formal educational settings.

The primary objective of the pilot testing was to assess the **educational effectiveness**, **level of student engagement**, and **technical usability** of the GARDENS digital game as a core component of a **hybrid educational approach** combining digital tools with school-based learning. Particular emphasis was placed on evaluating the game's capacity to support **nutrition education**, promote **healthy dietary behaviours**, and strengthen students' understanding of the **environmental and sustainability dimensions of food choices**.

The evaluation methodology combined quantitative and qualitative instruments, including pre- and post-test questionnaires, structured observation, and participant feedback, allowing for both measurable learning outcomes and in-depth analysis of user experience. This mixed-methods approach ensured a robust assessment of the game's pedagogical value across diverse educational and cultural contexts.

Overall, the consolidated results confirm the **strong educational potential of the GARDENS game**. Across all participating countries, the game proved especially effective in addressing **sustainability-related knowledge gaps**, which were consistently identified as weaker areas in baseline assessments. In several national contexts, the pilot testing demonstrated **clear learning gains**, particularly in relation to the environmental impact of food production and consumption. In others, the game stimulated **critical reflection and deeper conceptual understanding**, indicating its value not only as a knowledge-transfer tool but also as a catalyst for reflective learning.

At the same time, the pilot phase highlighted a number of **technical, usability, and methodological challenges**, including issues related to advanced game levels,

performance stability, and evaluation design. These findings provide **clear, evidence-based guidance** for further refinement of the game and its pedagogical integration. Overall, the pilot testing phase successfully fulfilled its purpose by validating the relevance of the GARDENS game while generating concrete recommendations to enhance its quality, effectiveness, and scalability within European school education systems.

The findings of this international pilot testing are relevant not only for the further development of the GARDENS game, but also for the broader design of digital and hybrid educational tools addressing sustainability in school education. The results provide transferable insights for educators and policymakers seeking to integrate environmental awareness into nutrition education through innovative, learner-centred approaches.

2. Methodology

2.1 Overall Evaluation Framework

The local pilot testing of the GARDENS digital educational game was conducted using a **shared international evaluation framework**, jointly developed and agreed upon by all project partners. The framework was designed to ensure **methodological coherence and comparability** across countries, while allowing sufficient flexibility to adapt the testing process to different national educational contexts, school structures, and age groups.

The evaluation approach was grounded in the principles of **formative and summative assessment**, aiming not only to measure learning outcomes but also to identify strengths, limitations, and improvement needs of the game during its early implementation phase. In this respect, the pilot testing served both as a **quality assurance mechanism** and as a **development-oriented evaluation**, providing actionable feedback for further refinement of the educational tool.

2.2 Pilot Testing Design and Implementation

Pilot testing activities were implemented in **formal school environments**, primarily within lower and upper secondary education. Each testing session followed a structured sequence consisting of:

1. **Introduction and briefing**, during which students were informed about the purpose of the activity and the basic mechanics of the game;
2. **Pre-test assessment**, aimed at capturing baseline knowledge and awareness related to nutrition, dietary habits, and sustainability;

3. **Guided gameplay sessions**, during which students interacted with the GARDENS game across multiple levels, either individually or in small groups, under the supervision of teachers or project facilitators;
4. **Post-test assessment**, measuring changes in knowledge, awareness, and understanding;
5. **Qualitative feedback collection**, including observation, discussion, and experience-based questionnaires where applicable.

This structured sequence ensured that gameplay was embedded within a **pedagogically meaningful learning process**, rather than treated as a standalone digital activity.

2.3 Participants and Educational Contexts

The pilot testing involved a **diverse sample of students** aged **11 to 17**, reflecting a range of educational stages, learning needs, and socio-cultural backgrounds. Testing was carried out in five different geographical contexts—Cyprus, Germany, Italy, Serbia, and Guadeloupe—thus strengthening the **international validity and transferability** of the findings. An overview of pilot testing contexts and participant profiles is provided in Table 1 (Annex I).

While the size of the student samples and the number of sessions varied across countries, all participating schools represented **mainstream educational settings**, ensuring that the results are relevant to typical European school environments. Teachers and facilitators played an active role in guiding the sessions, supporting students where necessary, and observing engagement and interaction patterns.

The diversity of contexts also enabled the identification of **context-specific factors** influencing outcomes, such as language comprehension, digital familiarity, classroom dynamics, and facilitation style, which were taken into account in the comparative analysis.

2.4 Evaluation Instruments and Data Collection

To ensure consistency in data collection, most partner countries employed a **standardised quantitative evaluation tool**, consisting of a **30-item multiple-choice questionnaire** structured around **17 thematic categories**. These categories covered key areas aligned with the project objectives, including:

- Nutrients and food groups
- Healthy and unhealthy dietary behaviours
- Ultra-processed foods
- Food labelling and informed consumer choices
- Environmental impact of food production and consumption

- Principles of sustainable food systems

The questionnaires were administered both before and after the gameplay sessions, allowing for direct comparison of baseline and post-intervention results.

In addition to quantitative data, **qualitative evaluation methods** were systematically used to capture aspects not fully measurable through questionnaires. These included:

- Direct observation of student engagement and interaction;
- Group discussions and oral feedback sessions;
- Quality of Experience (QoE) questionnaires focusing on usability, enjoyment, and perceived learning.

The combination of quantitative and qualitative instruments provided a **comprehensive understanding** of both learning outcomes and user experience. A comparative summary of evaluation instruments used across partner countries is presented in Table 2 (Annex I).

2.5 Data Analysis and Interpretation

Quantitative data were analysed at national level to identify changes in correct responses between pre- and post-tests, both overall and within specific thematic categories. These results were then synthesised at international level to identify **common trends, convergences, and divergences** across countries.

Qualitative data were analysed thematically, focusing on recurring patterns related to engagement, motivation, usability, and perceived educational value. Particular attention was paid to differences between age groups and to feedback related to specific game levels and mechanics.

The international analysis did not rely solely on numerical improvement but also considered **qualitative indicators of learning**, such as increased reflection, questioning of prior assumptions, and more nuanced understanding of sustainability concepts.

2.6 Methodological Limitations

Several methodological limitations were identified during the pilot phase and are transparently acknowledged in this assessment:

- **Partial completion of post-tests** in some contexts, which reduced the size of matched pre- and post-test samples;
- **Language barriers**, particularly where evaluation or QoE tools were available only in English, affecting comprehension for younger students;

- **Survey fatigue**, caused by the repetition of identical questionnaires before and after gameplay, potentially influencing response accuracy;
- **Short-term measurement focus**, as the pilot testing did not include long-term follow-up to assess retention or behavioural change.

These limitations were carefully considered when interpreting the findings. Rather than undermining the results, they provide important insights for improving both the **evaluation design** and the **pedagogical implementation** of the game in future phases.

2.7 Ethical Considerations and Data Protection

All pilot testing activities were conducted in full compliance with **ethical standards**, **data protection regulations**, and the fundamental principles of **respect, safety, and inclusiveness** when working with minors in formal educational settings.

Participation in the pilot testing was strictly **voluntary**, and students were informed in advance about the purpose of the activity, the nature of the game-based learning sessions, and the evaluation procedures. No form of coercion or negative consequence was associated with non-participation. Where required by national or school-level regulations, **teacher supervision and institutional consent** were ensured prior to implementation.

In line with the **General Data Protection Regulation (GDPR – Regulation (EU) 2016/679)**, no personally identifiable data were collected during the pilot testing. All questionnaires were completed **anonymously**, and responses were used exclusively for evaluation and research purposes within the framework of the GARDENS project. Data were aggregated at national and international level, ensuring that individual participants could not be identified either directly or indirectly.

Special attention was given to the **age-appropriateness** of the evaluation process. Questionnaires and feedback tools were designed to avoid sensitive or intrusive questions, focusing solely on educational content, user experience, and perceived learning. In cases where evaluation tools were provided in a non-native language, facilitators supported comprehension to avoid misunderstandings or discomfort among younger participants.

Digital tools and devices used during the pilot testing complied with school regulations and did not require students to create personal accounts or provide personal data. All collected data were stored securely by partner organisations and accessed only by authorised project staff for the purposes of analysis and reporting.

Overall, the ethical framework ensured that the pilot testing process was **safe, inclusive, transparent, and respectful**, reinforcing trust among students, educators, and institutions while safeguarding the rights and well-being of all participants.

Together, these methodological elements ensured a balanced, ethical, and context-sensitive evaluation framework, capable of generating reliable and meaningful evidence on both learning outcomes and user experience.

3. Consolidated Findings from Local Pilot Testings

This section presents a consolidated analysis of the findings emerging from the local pilot testing activities conducted across all participating countries. The analysis integrates quantitative and qualitative evidence to identify common trends, learning patterns, and user experience insights, while also acknowledging contextual variations between national settings.

3.1 Baseline Knowledge and Initial Learning Gaps

Baseline assessments conducted prior to gameplay revealed a **consistent pattern across all participating countries**. Students generally demonstrated an adequate understanding of **basic nutrition concepts**, such as the distinction between healthy and unhealthy foods, the negative effects of excessive sugar intake, and the risks associated with frequent consumption of fast or ultra-processed foods.

In contrast, baseline knowledge related to the **environmental and sustainability dimensions of food systems** was noticeably weaker. Many students showed limited awareness of:

- the environmental footprint of food production and consumption,
- the relationship between dietary choices and climate or resource use,
- the broader concept of sustainable food systems and responsible consumption.

This gap was observed irrespective of national context and age group, indicating that sustainability-related nutrition education remains underrepresented in traditional school curricula. The consistency of this finding across countries confirms the **relevance and necessity** of the GARDENS educational approach, which explicitly integrates environmental sustainability into nutrition education.

3.2 Learning Outcomes and Knowledge Development

Post-test assessments demonstrated **overall positive learning outcomes** following interaction with the GARDENS digital game. In most participating countries, students showed measurable improvement in post-test scores, particularly in thematic areas related to **environmental awareness and sustainable food choices**.

A key finding emerging from the consolidated analysis is that **countries with lower baseline knowledge exhibited the strongest learning gains**. This pattern suggests that the game is particularly effective in addressing initial knowledge gaps and introducing complex sustainability concepts in an accessible and engaging way. Where students already possessed basic nutritional knowledge, the game contributed to **deepening understanding** rather than merely reinforcing existing information.

In some contexts, learning gains were not expressed exclusively through higher post-test scores but through **more reflective and critical engagement** with the content. In these cases, students demonstrated greater caution in answering questions, reduced reliance on guessing, and increased awareness of the complexity of sustainability-related topics. This outcome aligns with the project's educational objectives, which emphasise **critical thinking and informed decision-making** rather than rote memorisation.

Overall, the learning outcomes confirm that the GARDENS game functions effectively both as:

- a **knowledge-building tool**, especially for sustainability-related topics; and
- a **catalyst for reflective learning**, encouraging students to reconsider assumptions about food, health, and environmental responsibility.

"These patterns are further illustrated in Figure 1 (Section 4), which visually summarises pre- and post-test trends across countries."

3.3 Engagement, Motivation, and User Experience

Across all pilot testing contexts, students reported **high levels of engagement and motivation** during gameplay. The interactive and game-based format was consistently perceived as more appealing than traditional classroom instruction, contributing to increased attention, curiosity, and willingness to participate.

The **initial levels of the game** were widely described as intuitive and accessible, enabling students to familiarise themselves quickly with the mechanics and objectives. This positive first experience played a crucial role in fostering motivation and supporting early learning outcomes.

However, the pilot testing also revealed **recurring usability challenges** in more advanced game levels. Students and facilitators reported issues related to:

- reduced player control and agency,
- automatic gameplay sequences that limited decision-making,
- technical performance problems, including movement mechanics, scoring inconsistencies, and loading delays.

These challenges occasionally led to frustration and a temporary decline in motivation, particularly among older students or more experienced gamers. Nevertheless, it is noteworthy that **perceived learning value remained relatively high**, even when usability issues were encountered. Students continued to recognise the educational relevance of the content, indicating that pedagogical value was not negated by technical limitations.

From an evaluative perspective, these findings highlight the importance of aligning **user experience design with educational objectives**, ensuring that technical performance and gameplay mechanics actively support, rather than hinder, learning processes.

User experience patterns identified here are explored in greater detail through visual analysis in Figure 2 (Section 4).

3.4 Cross-Cutting Observations

When analysed collectively, the findings from baseline assessments, learning outcomes, and user experience feedback demonstrate that the GARDENS game successfully addresses a **critical gap in school-based nutrition education** by integrating sustainability perspectives into an engaging digital format.

At the same time, the pilot testing phase provided valuable evidence that:

- learning impact is maximised when gameplay is combined with facilitation and reflection;
- engagement is closely linked to usability and player agency; and
- further technical refinement will significantly enhance both motivation and educational effectiveness.

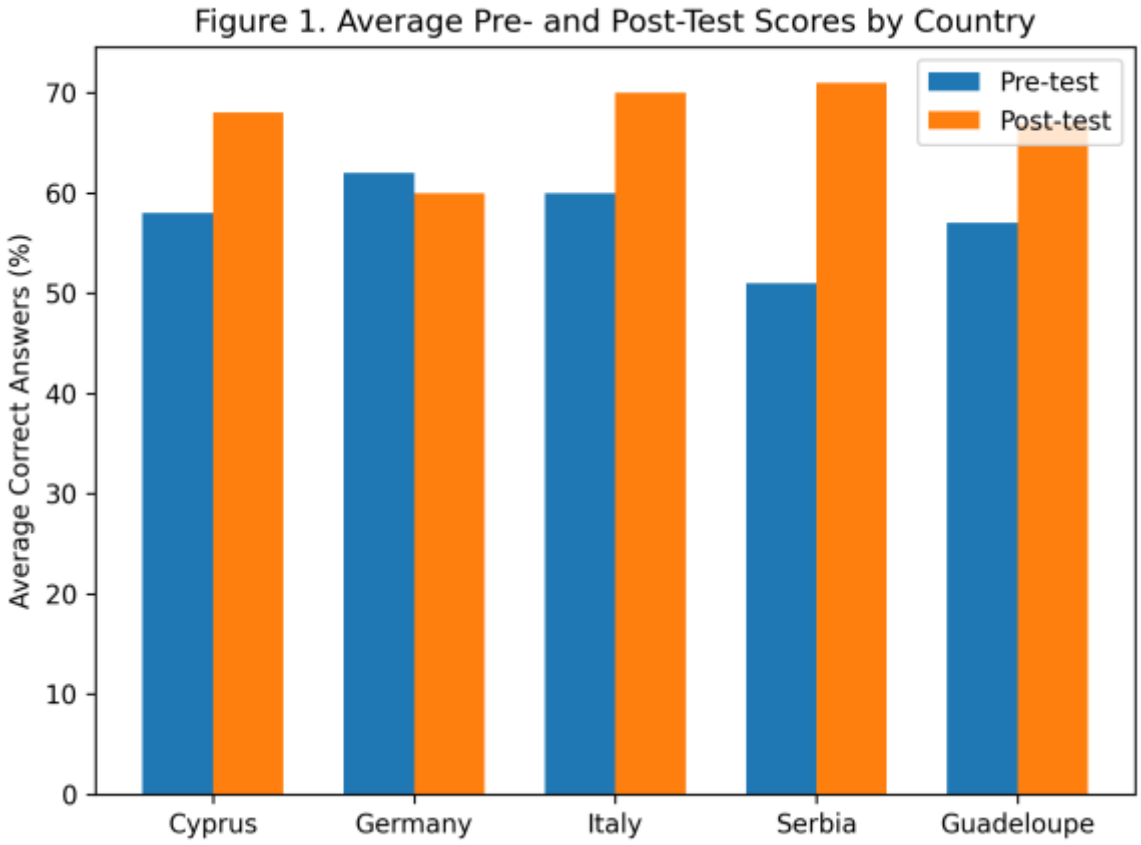
These insights form a solid empirical foundation for the conclusions and recommendations presented in subsequent sections of this report.

4. Visual Analysis of Learning Outcomes and User Experience

This chapter provides an analytical interpretation of the visual evidence presented in **Figure 1** and **Figure 2**, supporting and complementing the quantitative and qualitative findings of the local pilot testing activities. The figures serve as synthesis tools, illustrating cross-country trends and reinforcing the conclusions drawn from national reports. The figures presented in this section are based on aggregated trends and average values derived from national pilot testing reports and are intended to support comparative interpretation rather than represent exact statistical measurements.

4.1 Analysis of Learning Outcomes: Pre- and Post-Test Comparison

Figure 1 presents a comparative overview of average pre- and post-test scores across the participating countries, offering a visual representation of learning progression following interaction with the GARDENS educational game.



The data illustrate a **general upward trend in post-test performance**, particularly in Cyprus, Italy, Serbia, and Guadeloupe. These improvements confirm that the game contributed positively to students' understanding of nutrition-related topics, with the most significant gains observed in thematic areas linked to **environmental sustainability and the ecological impact of food choices**.

A key analytical insight emerging from Figure 1 is the **inverse relationship between baseline knowledge and learning gain**. Countries where students demonstrated lower initial awareness—especially regarding sustainability-related concepts—showed proportionally higher post-test improvement. This pattern confirms the **pedagogical relevance of the GARDENS game** in addressing identified knowledge gaps and supports its targeted use in contexts where sustainability education requires reinforcement.

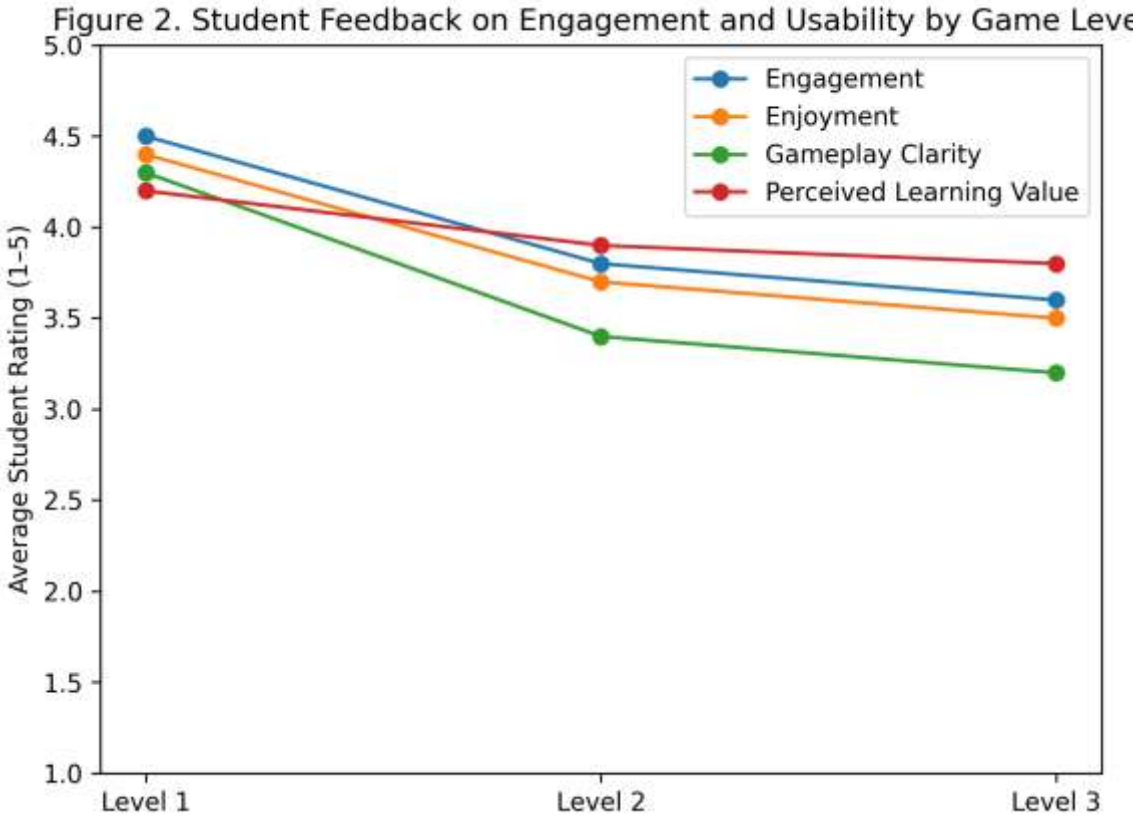
The German case, where a slight decrease in overall post-test scores is observed, requires contextual interpretation rather than a purely quantitative reading. As documented in the national report, this outcome is associated with **increased critical reflection, reduced guessing behaviour, and evaluation fatigue**, rather than a decline in learning. Importantly, improvements were still recorded in environmental impact questions, indicating alignment with the core objectives of the project.

Overall, Figure 1 confirms that the GARDENS game functions effectively both as:

- a **knowledge acquisition tool**, particularly in contexts with limited baseline awareness; and
- a **reflective learning instrument**, encouraging deeper conceptual engagement with complex sustainability issues.

4.2 Analysis of Engagement and Usability Across Game Levels

Figure 2 illustrates aggregated student feedback on **engagement, enjoyment, gameplay clarity, and perceived learning value**, analysed across different game levels. This visualisation synthesises qualitative feedback collected during the pilot testing and highlights key patterns in user experience.



The figure clearly demonstrates **high levels of engagement and enjoyment in Level 1**, indicating that the introductory phase of the game is accessible, motivating, and well aligned with students' expectations. This confirms the effectiveness of the game's initial design in capturing attention and fostering a positive learning environment.

A gradual decline in scores related to **gameplay clarity and usability** is observed in Levels 2 and 3. This trend is consistent across national contexts and reflects recurring feedback related to:

- reduced player agency,
- automatic gameplay sequences, and
- technical challenges affecting movement and scoring mechanics.

Despite these usability challenges, the **perceived learning value remains relatively stable across levels**, suggesting that students continued to recognise the educational relevance of the content even when the gameplay experience became more demanding. This finding is particularly significant, as it indicates that pedagogical value was not undermined by technical limitations.

From an analytical perspective, Figure 2 confirms that:

- engagement is highest when usability and player control are strongest;
- technical and design refinements in advanced levels are necessary to sustain motivation; and
- the educational content remains meaningful and impactful even under less optimal usability conditions.

4.3 Integrated Interpretation of Visual Findings

When analysed together, Figures 1 and 2 provide complementary insights into the **effectiveness and limitations** of the GARDENS game. The visual evidence supports the conclusion that learning outcomes are positively influenced not only by content quality but also by **user experience and game design**.

High engagement at early stages appears to facilitate learning gains, while usability challenges in later stages risk reducing motivation without necessarily diminishing educational impact. This highlights the importance of addressing technical and design issues to ensure that **learning potential and user experience evolve in parallel**.

The visual analysis therefore reinforces the central conclusion of this report: the GARDENS game represents a **highly promising hybrid educational tool**, whose impact can be significantly enhanced through targeted refinements informed by empirical pilot testing evidence.

5. Conclusions

Based on the pilot testing evidence, priority should be given to improvements that directly affect user experience in advanced game levels, as these have the strongest potential to enhance both engagement and learning impact.

The international pilot testing of the GARDENS educational game provides robust evidence of its **pedagogical relevance, innovation potential, and alignment with contemporary educational priorities** in the fields of nutrition education and environmental sustainability. The consolidated findings demonstrate that the game effectively addresses a clearly identified gap in school education, namely the limited integration of sustainability perspectives within traditional nutrition-related curricula.

From an educational standpoint, the GARDENS game proved particularly effective in **enhancing students' understanding of the environmental impact of food choices**, an area where baseline knowledge was consistently weak across all participating countries. The observed learning gains—especially in contexts with lower initial awareness—confirm the game's capacity to introduce complex sustainability concepts in an accessible and engaging manner. At the same time, the pilot testing showed that the

game stimulates **critical reflection and deeper conceptual thinking**, indicating that its educational value extends beyond factual knowledge acquisition.

The evaluation further highlights the importance of **user experience and game design** as determinants of learning effectiveness. High engagement levels observed during initial gameplay stages played a crucial role in fostering motivation and supporting learning outcomes. Conversely, usability and technical challenges encountered in more advanced levels underline the need for continued refinement to ensure that educational objectives and gameplay mechanics evolve in a coherent and mutually reinforcing way.

Importantly, the pilot testing confirmed that the GARDENS game achieves its greatest impact when implemented as part of a **structured hybrid learning approach**, combining digital gameplay with facilitation, discussion, and reflection. This finding reinforces the project's methodological assumptions and supports the integration of the game into broader educational frameworks rather than its use as a standalone tool.

While certain methodological limitations were identified—such as short-term measurement and evaluation fatigue—these do not undermine the validity of the findings. On the contrary, they provide valuable insights for improving both the **educational design** and the **evaluation methodology** in future implementation phases.

In conclusion, the GARDENS educational game represents a **high-quality, innovative, and scalable educational resource** with strong potential to support schools in fostering eco-conscious nutritional attitudes among young people. The pilot testing phase successfully fulfilled its purpose by validating the game's educational concept, identifying concrete areas for improvement, and generating evidence-based guidance to enhance its long-term impact within European school education systems.

6. International Recommendations

The international pilot testing of the GARDENS educational game generated a clear set of evidence-based recommendations aimed at enhancing its **educational effectiveness, usability, and long-term impact**. These recommendations are grounded in the consolidated findings from all participating countries and address both pedagogical and technical dimensions of the tool.

6.1 Pedagogical and Educational Recommendations

1. **Strengthen the integration of the game within structured learning processes**
   The evaluation confirms that the GARDENS game achieves the strongest learning impact when embedded within a guided educational framework. It is therefore recommended that future implementations systematically combine gameplay

with **teacher-led facilitation, reflection sessions, and follow-up activities**, enabling students to contextualise in-game experiences within real-world food systems and sustainability challenges.

2. **Enhance support for reflective and critical learning**
   Given the game's demonstrated capacity to stimulate reflection rather than simple knowledge recall, future iterations should further support **critical thinking**, for example through integrated prompts, decision explanations, or post-level reflection questions. This would reinforce higher-order learning outcomes aligned with competence-based education.
3. **Adapt educational content to diverse age groups and learning levels**
   While the game proved suitable for a broad age range, differentiated pathways or adjustable difficulty levels would allow for more tailored learning experiences, ensuring relevance for both younger and older students and supporting inclusive education practices.

6.2 Technical and User Experience Recommendations

4. **Improve player agency and control in advanced game levels**
   Recurring feedback indicates that reduced player control in Levels 2 and 3 negatively affected user experience. Enhancing agency, decision-making freedom, and responsiveness is essential to maintain motivation and align gameplay mechanics with educational objectives.
5. **Resolve technical issues affecting performance and gameplay flow**
   Technical challenges related to movement mechanics, scoring logic, and loading performance should be prioritised for resolution. Addressing these issues will reduce frustration and ensure that technical barriers do not detract from learning outcomes.
6. **Ensure usability coherence across all game levels**
   The evaluation highlights the need for consistent usability standards throughout the game. Maintaining clarity and accessibility from introductory to advanced levels is crucial for sustaining engagement and supporting cumulative learning.

6.3 Evaluation and Implementation Recommendations

7. **Refine evaluation methodologies to capture reflective learning outcomes**
   Future evaluations should complement multiple-choice questionnaires with tools that better capture **critical reflection and conceptual understanding**, such as short open-ended questions or guided discussion frameworks.
8. **Localise evaluation and support materials**
   To ensure inclusiveness and accuracy, all evaluation instruments and guidance materials should be fully adapted to national languages and cultural contexts.

Collectively, these recommendations aim to strengthen the coherence between **educational design, gameplay experience, and evaluation methodology**, ensuring that the GARDENS game reaches its full potential as a hybrid learning tool.

7. European Added Value and Sustainability

7.1 European Added Value

The GARDENS project demonstrates clear **European added value** by addressing shared educational challenges through **transnational cooperation**, innovation, and knowledge exchange. The integration of nutrition education with environmental sustainability reflects priorities that are common across European education systems and aligns closely with EU strategies promoting healthy lifestyles, environmental responsibility, and digital innovation in education.

The international pilot testing phase highlighted the importance of **cross-country collaboration** in validating educational tools across diverse cultural and pedagogical contexts. By testing the GARDENS game in multiple countries, the project ensured that the tool is **transferable, adaptable, and relevant** beyond a single national setting, reinforcing its European dimension.

Furthermore, the project contributes to the development of a **shared European understanding** of sustainable food systems, empowering young people to make informed choices as future European citizens. The use of a digital game as a learning medium enhances accessibility and supports the EU's objectives related to **digital competence development and innovative pedagogy**.

In this way, the project directly contributes to Erasmus+ priorities related to innovation in school education, digital transformation, and the promotion of sustainable development competencies among young learners.

7.2 Sustainability of Project Results

The sustainability of the GARDENS project outcomes is supported by both **structural and pedagogical factors**. As a digital educational tool, the GARDENS game can be reused, updated, and disseminated across schools and educational networks with relatively low additional costs, facilitating long-term impact beyond the project lifetime.

Pedagogically, the game's alignment with curriculum-relevant topics—nutrition, health, environmental awareness, and sustainability—supports its continued integration into formal education. The hybrid learning approach promoted by the project encourages

educators to embed the game within existing teaching practices, increasing the likelihood of sustained use.

The pilot testing phase also generated a solid evidence base and clear recommendations for improvement, ensuring that future iterations of the game can build upon validated findings rather than starting from scratch. This iterative development logic strengthens the project's long-term relevance and scalability.

In conclusion, the GARDENS project not only delivers an innovative educational tool but also establishes a **sustainable and transferable model** for integrating game-based learning into European school education, contributing to the broader objectives of the Erasmus+ programme and the development of environmentally conscious future generations.

GARDENS

ANNEX I – Overview Tables (Annex-Ready Text)

Table 1. Overview of Local Pilot Testing Contexts

Country	School Type	Age Range	Number of Students	Number of Sessions
Cyprus	Secondary Schools	13–16	65	4
Germany	Secondary School	13–16	24 (pre) / 19 (post)	1
Italy	Secondary School	13–16	Reported at class level	Multiple
Serbia	Secondary School	14–17	41	1
Guadeloupe	Secondary Schools	11–16	56	4

Purpose and Analytical Relevance

This table provides a **comparative overview of the local pilot testing contexts** across participating countries, highlighting the diversity of educational environments, age groups, and implementation formats involved in the evaluation of the GARDENS educational game. By presenting key structural characteristics of the pilot activities, the table supports transparency in the evaluation process and facilitates cross-country comparison.

The variation in the number of students and sessions reflects **contextual adaptation** to national school systems, logistical conditions, and pedagogical approaches, while maintaining a common evaluation framework. This diversity strengthens the **external validity and transferability** of the findings, demonstrating that the GARDENS game was tested across a broad range of realistic school settings rather than under uniform or artificial conditions.

Interpretative Note

The range of age groups (11–17) and the inclusion of both single-session and multi-session implementations provide valuable insights into how the game performs across different educational stages and timeframes. This contextual diversity enhances the robustness of the consolidated findings and supports the conclusion that the GARDENS game is adaptable to varied European school environments.

Table 2. Evaluation Instruments Used in Local Pilot Testing

Instrument Type	Description	Countries Using the Instrument
Pre-test Questionnaire	30 multiple-choice questions covering 17 thematic areas	All partner countries
Post-test Questionnaire	Same structure as pre-test for direct comparison	All partner countries
Observation Sheets	Monitoring engagement, interaction, and behaviour	Cyprus, Guadeloupe
Quality of Experience (QoE) Questionnaire	Assessment of usability, enjoyment, and perceived learning	Cyprus, Germany
Oral / Group Feedback	Facilitated discussion and qualitative reflection	All partner countries

Purpose and Analytical Relevance

This table summarises the **mixed-methods evaluation framework** applied during the local pilot testing of the GARDENS educational game. The combination of quantitative and qualitative instruments was intentionally designed to capture both **measurable learning outcomes** and **experiential dimensions** of gameplay, such as engagement, usability, and perceived educational value.

The use of a standardised pre- and post-test questionnaire across all partner countries ensured a **high degree of comparability**, enabling the identification of common trends and cross-country patterns in learning outcomes. At the same time, the inclusion of qualitative tools allowed partners to contextualise quantitative results and interpret them in light of classroom dynamics and user experience.

Interpretative Note

The variation in qualitative instruments across countries reflects **context-sensitive implementation choices** rather than methodological inconsistency. This adaptive approach enabled partners to respond to local constraints, such as language considerations and time availability, while maintaining the core structure of the evaluation framework. As a result, the data collected provide both **comparative robustness** and **contextual depth**, strengthening the overall validity of the international assessment.