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FINAL REPORT ON THE E-MODULE

Key Intellectual Output / Project Result

Project: Zero Food Waste Volunteers with Art

Programme: Erasmus+ KA220-SCH – Cooperation partnerships in school education

Project number: 2023-2-TR01-KA220-SCH-000185238

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Status: Final version, drafted following the third Transnational Project Meeting (TPM 3, Türkiye), which serves as the concluding quality assessment of the project results.

At a glance

The e-module is the central intellectual output of the project: a multilingual (11-language) Moodle-based e-learning platform at zvolunartist.cb.szczecin.pl, combining Web 2.0 activities, animated mascots (Ziva & Zio), project songs, seven hands-on workshops, and pre-/post-tests with a completion badge. It was evaluated through large-scale baseline surveys of **473 students and teachers**, an educator needs survey, pre- and post-tests, and a dissemination conference. At the Polish Multiplier Event (19 May 2026, >50 participants), the e-module and educational materials scored **4.71/5** and the event overall **4.79/5**, with participants and teachers rating the results as practical, relevant and ready for continued classroom use.



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1. Technical and content description

1.1 Characterisation of the tool (platform, HTML embedding and Web 2.0)

The e-module is the project's principal intellectual output: a fully interactive e-learning environment published online at <https://zvolunartist.cb.szczecin.pl/> and hosted on the **Moodle** learning-management system on Collegium Balticum's server. Moodle delivers the content as web pages built from standard **HTML**, so that learners open the module in any modern browser without installing dedicated software; a companion **mobile app** (Moodle Mobile) is also available. The environment is **multilingual**, offering the interface in eleven languages (Polish, English, German, Estonian, Spanish, French, Italian, Romanian, Slovenian, Turkish and Greek), reflecting the partnership's European reach.

Interactivity is provided through Moodle's built-in **Web 2.0 activity modules** together with embedded multimedia, allowing non-technical educators to build engaging content and letting learners interact with it directly in the browser. The module combines the following categories of components:

- **Interactive “Book” lessons** that structure each thematic chapter (e.g. the mascot story “One Slice of Bread at a Time!” and the “Song Creation Process” lesson);
- **Embedded animations and images** featuring the project mascots, including an illustrated “**E-Module Adventure Map**” that guides learners through the path;
- **Automatically scored quizzes** – a mandatory **pre-test** before starting and a **final test** that awards a digital **badge and certificate** (“Zero Food Waste Volunteer”);
- **Interactive “Choice”/voting and media activities** (e.g. “Join the Adventure of Ziva and Zio”), plus embedded **audio** (the project song as an MP3);
- **Graphics and infographics** created with design and AI-image tools such as Canva;
- **Downloadable resources** – workshop scenarios, song lyrics and chords, and a photo gallery of the project meetings, attached as files and folders.

The module is organised as a Moodle course space (“Zero Food Waste Volunteers e-learning platform”) that groups the thematic courses listed in Section 1.2, and it was co-developed by the partnership of 8 institutions from 7 countries.

1.2 Substantive content: climate and food-waste topics

The module covers all the substantive themes foreseen in the project application, organised into two complementary strands. The first strand addresses **climate and environmental problems** and explains the systemic causes and consequences of food waste:

- the impact of the intensive use of non-renewable (fossil) energy and the distinction between renewable and non-renewable sources;
- pollution and greenhouse-gas emissions, including the methane released when food decomposes in landfill;
- global warming and the carbon footprint, illustrated through the “hidden water” and “hidden energy” embedded in everyday products;
- the link between wasting food – particularly bread – and wasting the entire chain of resources (water, energy, fuel, labour) used to produce it.

The second strand presents **practical solutions to bread and food waste** that learners can apply immediately at home and at school:

- recycling and reusing leftover bread and other food;
- composting of organic and bread waste;
- correct storage conditions, fridge zoning and the FIFO (“first in, first out”) principle;
- interpreting “use by” versus “best before” dates;
- meal and shopping planning, freezing, and food-sharing initiatives and apps.

On the platform these themes are organised into five sequential courses, each building on the previous one:

- **Climate and environmental problems** – non-renewable energy, deforestation, soil erosion and food waste, and how everyday choices affect the climate;
- **Proper and Healthy Eating** – balanced meal planning, avoiding food waste and reducing the carbon footprint of what we eat;
- **The Impact of Bread Waste and Solutions** – why bread is one of the most wasted foods in Europe, its environmental and economic cost, and practical remedies (storage, recycling, creative reuse);
- **How I Assess My Waste** – practical skills to measure and reduce food waste through everyday actions and creative reuse;
- **Summary and Final Test** – “Become a Zero Food Waste Volunteer!” – consolidation and assessment, rewarded with a digital badge and certificate.

These topics are reinforced by the animations and songs (Section 1.4) and are put into practice through the seven workshops described below.

1.3 Workshops integrated into the e-module

Seven hands-on, CLIL-oriented workshops (English-language, primarily for lower-secondary learners aged 11–14) are embedded in the module as ready-to-use teaching scenarios. Each connects a creative or practical activity to the environmental message of the project, translating abstract climate concepts into tangible classroom experiences.

Workshop	Focus and link to the e-module
BB – Best Before...	Food preservation and expiration. Students explore why food spoils (microorganisms, enzymes, temperature, pH, water activity) and master techniques to extend the shelf life of bread, yogurt, eggs and fruit – directly supporting the storage-conditions content.
Explore Your Fridge	Technical “zoning” of a refrigerator to maximise shelf life, framed around the methane / landfill problem. Learners become “Food Heroes” and complete a “Leftover Remix” challenge.
How to Recycle Leftover Food	The Neapolitan “Cucina Povera” tradition: transforming stale bread, leftover pasta and fruit peels into iconic dishes – a culinary route to bread-waste reduction.
Too Good to Go	Using technology and “Surprise Bag” apps (e.g. Too Good To Go) to rescue unsold food. Builds digital literacy and clarifies the “use by” vs “best before” distinction.
DYE – Shibori Technique	Natural textile dyeing with beetroot and spinach scraps using the Japanese Shibori resist technique – a circular-economy lesson merging art, chemistry and sustainability.
Organic Powders into Works of Art	Dehydrating and grinding vegetable peels, fruit scraps and coffee grounds into natural pigments for sustainable painting, replacing synthetic dyes.
Beauty Recipes from Leftover Food	DIY “circular beauty”: turning coffee grounds, citrus peels and overripe fruit into scrubs and emulsions, illustrating the circular economy in a domestic setting.

All seven workshops were positively received when presented and discussed with participants and teachers during the Polish Multiplier Event; the practical, food-waste-prevention content was the single most appreciated element of the conference (see Section 2.7).

1.4 Artistic elements: mascots Ziva & Zio and project songs

The module’s distinctive feature is its art-based approach. Two custom mascots, **Ziva** (a curious girl from Slovenia) and **Zio** (a cheerful boy from Italy), appear throughout as recurring guides, and their origin story is told in the illustrated Book lesson “**One Slice of Bread at a Time!**”. For 2D animation they were prepared with each limb drawn as a separate, visible graphic element (rigging) so that an animation tool such as Animaker could move each part independently. The mascots serve two main functions: they act as friendly narrators that make complex, abstract environmental topics (carbon footprint, bread decomposition) accessible to children, and they foster international cooperation – pupils from the partner schools voiced the characters in English. Learners even choose their “team” (#TeamZiva / #TeamZio) in a dedicated interactive activity.



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The module also incorporates **project songs** whose lyrics were written by the students themselves, on project themes (food-waste prevention, saving bread, recycling, caring for the planet). The signature track, **“The Song of Ziva and Zio”**, is embedded as audio, accompanied by a downloadable **“Zero Food Waste Song Lyrics and Chords”** resource and a **“Song Creation Process”** lesson that walks learners through composing their own version. Music functions as a “universal language” intended to increase the long-term retention of the educational content. Together, the mascots and songs give the module a coherent, child-friendly identity that ties the scientific content to a creative, memorable form.

A photo gallery embedded in the module documents the collaborative creation of these elements across the project meetings (Konya, Italy, Estonia, Austria “Music Days”, Romania, Slovenia and Poland).

2. Results analysis and evaluation

2.1 Evaluation methodology and indicators

Evaluation of the e-module combined **quantitative** and **qualitative** indicators, in line with the project application. The evidence base comprises: large-scale baseline surveys of students and teachers in the partner schools; an educator needs survey; a knowledge pre-test and a post-test administered around the training activities; automatically collected reach data (video views, downloads, completions); and structured feedback gathered at the dissemination conferences, including rating-scale questionnaires, participant comments and interviews with learners and teachers.

Important note on comparability. The pre-test and the post-test were designed to assess different bodies of knowledge – the pre-test covers general animation fundamentals, while the post-test assesses the specific content of the finished e-module (mascot rigging, Animaker, the food-waste topics, the role of songs). They should therefore be read as two complementary measurements of learning around the training, not as a single before/after gain on identical items.

2.2 Baseline knowledge survey: students and teachers

Before and during the project, a **large-scale baseline survey** on food safety, global warming and bread waste was administered through Google Forms in the partner schools, completed anonymously by **389 students** and **84 teachers** (473 respondents in total). Each questionnaire contained 15 statements, with respondents rating themselves as having “no information”, “insufficient information”, or “knowledge” on each topic. This provides a robust evidence base for the need the e-module addresses.

The results confirm a substantial knowledge gap. Among **students**, only 43.2% of responses indicated actual knowledge, while 56.7% signalled no or insufficient information (23.3% “no information”, 33.4% “insufficient”). Among **teachers** the pattern was similar: 47% knowledge against 53% no or insufficient information (24% and 29% respectively). In other words, on a typical food-safety or bread-waste topic, roughly half of both students and teachers did not feel adequately informed – a clear justification for the module.

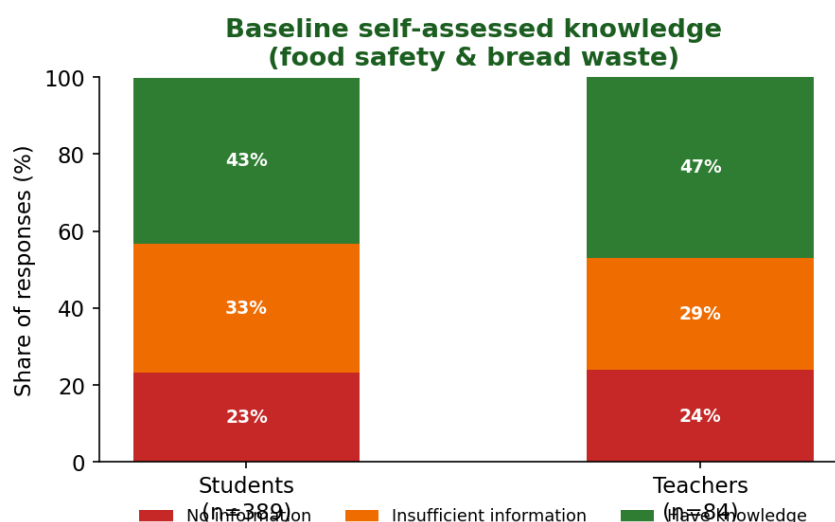


Figure 1. Baseline self-assessed knowledge on food safety and bread waste (students $n = 389$, teachers $n = 84$). Around half of both groups reported no or insufficient information.

The item-level data pinpoint the weakest areas, which the module deliberately targets. Among **students**, the lowest levels of knowledge concerned the effects of “fast food” on the body (27.2%), whether preservatives should be added to bread (26.8%), and access to safe food globally (29.4%). Among **teachers**, the weakest areas were knowing how to be a conscious consumer (14%), how to utilise leftover food such as bread (22%), and access to safe food (24%). Selected items are shown below.

Survey statement (self-reported “I have knowledge”)	Students	Teachers
Effects of high-fat/salty/additive “fast food” on the body	27%	62%

Survey statement (self-reported “I have knowledge”)	Students	Teachers
Storage conditions of foods such as bread	53%	72%
What to do to utilise leftover bread/food	57%	22%
Access to safe food in our country and the world	29%	24%
What to do to be a conscious consumer	54%	14%
How much food such as bread is wasted worldwide	41%	53%
Combating bread waste on a global scale	39%	50%
Whether preservatives should be added to bread	27%	48%

These gaps map directly onto the module’s content: storage conditions, leftover reuse, conscious consumption and the global scale of bread waste are all addressed through the animations, workshops and tests. The baseline therefore both justifies the module and provides a reference point against which its educational impact can be read.

2.3 Educator needs survey

A separate **needs survey** was completed by 20 educators from the partner countries and beyond (Türkiye, Romania, Italy, Estonia, Austria, Slovenia and others). It confirmed a clear rationale for the module’s design. While most respondents had some experience with e-learning (17 of 20) and with Canva (14 of 20), familiarity with structured e-learning platforms was limited – 15 of 20 had never used or only heard of Moodle – and understanding of copyright rules for educational materials was a notable gap.

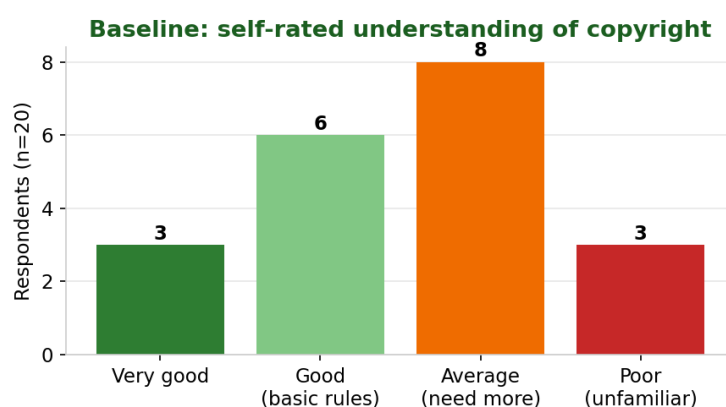


Figure 2. Self-rated understanding of copyright law among surveyed educators (n = 20). Only 3 rated themselves “very good”, confirming the need to embed legal, openly licensed materials and guidance in the module.

Respondents’ open comments shaped the design brief, requesting high-quality step-by-step visuals, audio and music support, and diagrams explaining the carbon footprint of food waste – all of which were incorporated into the final module.

2.4 Pre-test results

The pre-test on animation and content fundamentals was completed by **24 participants** (educators and students from Romania, Italy, Türkiye, Estonia, Slovenia and Austria). The mean score was **15.1 / 20 (75%)**, with a median of 14.5 and a range from 8 to 19. The pass rate ($\geq 50\%$) was 96%. This indicates a reasonably strong baseline among the training participants in general animation and communication concepts.

2.5 Post-test results and item analysis

The post-test, focused on the finished e-module and the animation training delivered during the Polish LTT, was completed by **22 participants**. The mean score was **12.1 / 20 (60%)**, with a median of 13 and a pass rate of 91%. The lower mean relative to the pre-test reflects the greater difficulty and specificity of the post-test items – several were multi-select application questions on precise module content rather than general recognition questions.

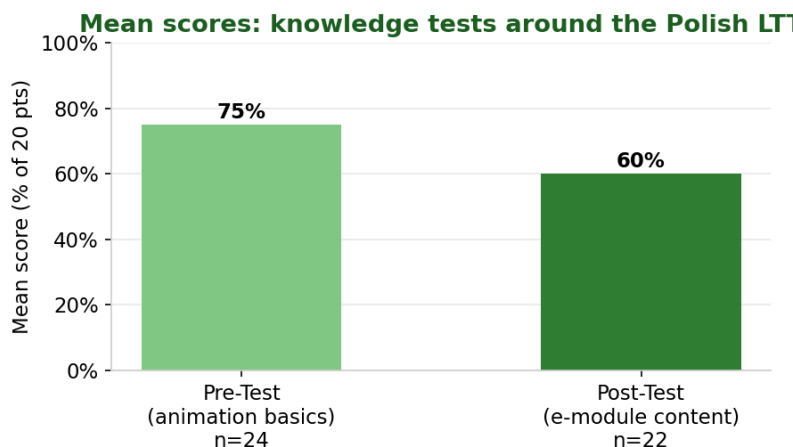


Figure 3. Mean scores on the two knowledge tests administered around the Polish training. The tests measure different content and are complementary rather than directly comparable.

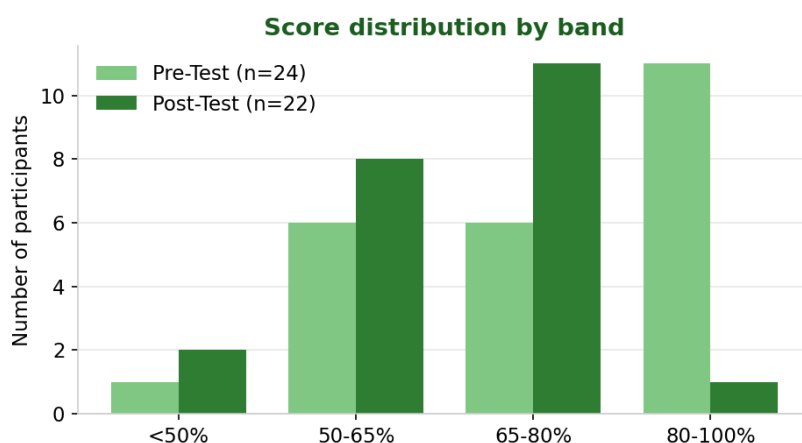


Figure 4. Distribution of participants by score band. Most post-test scores cluster in the 65–80% band, indicating solid understanding with room to strengthen the hardest application items.

Item analysis of the post-test highlights where the module succeeds and where reinforcement is needed. Participants performed strongly on core technical and organisational concepts and weakly on two multi-select items:

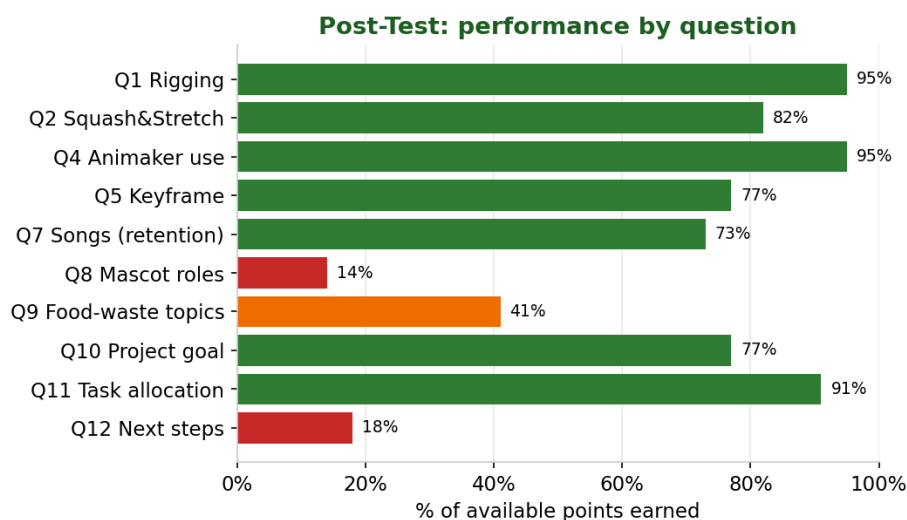


Figure 5. Post-test performance by question (share of available points earned). Open-ended items Q3 and Q6 were not machine-scored and are omitted.

Strengths ($\geq 90\%$): understanding of rigging (Q1, 95%), the nature of the Animaker platform (Q4, 95%) and the organisational goal of the training (Q11, 91%). Areas for reinforcement: the two lowest items were the multi-select “main functions of the mascots” (Q8, 14%) and “next steps in the work plan” (Q12, 18%). Because both are strict multi-select questions requiring every correct option, low scores partly reflect the scoring rule; nonetheless they indicate that the roles of the mascots and the project workflow should be stated more explicitly within the module. The food-waste topic item (Q9, 41%) similarly suggests the list of covered topics could be signposted more clearly.

2.6 Quantitative reach indicators

The following reach metrics are collected automatically from the hosting platforms and website and will be inserted in the final version once the reporting period closes:

Indicator	Value
Total views of the animated videos	—
Number of downloads of the module / workshop resources	—
Number of learners who completed the module (finished the post-test)	—
Website / e-module unique visitors	—
Social-media reach and engagement	—

[TO BE COMPLETED: insert video views, downloads, completions, visitors and social-media figures]

2.7 Qualitative indicators: Multiplier Event Poland

The strongest qualitative evidence comes from the **Final Dissemination Conference / Multiplier Event in Poland** (Collegium Balticum, Szczecin, 19 May 2026), attended by more than 50 participants – teachers, educators, pedagogy and dietetics students, NGO representatives, parents and specialists. **38 participants** completed the structured evaluation questionnaire (73.7% students/pupils, 13.2% teachers and trainers, the remainder institutional, NGO and other stakeholders).

The e-module and educational materials were rated very highly by participants and teachers alike. Key results:

- **E-module and educational materials: average 4.71 / 5** – 76.3% awarded the top score of 5 and 94.7% gave one of the two highest ratings;
- **Applicability:** 97.4% stated the materials could be used extensively in the education of children, young people, teachers or parents, and the remaining 2.6% only after minor modifications – no respondent found them unsuitable;
- **Overall value of the event: 4.79 / 5** (81.6% gave 5/5; 97.4% top two ratings);
- **Usefulness of the food-waste-prevention content: 4.66 / 5**, with 100% selecting one of the two highest ratings;
- **Organisation: 4.74 / 5**, with no rating below 4;
- **Increased environmental awareness:** 97.4% confirmed the event raised their awareness of the link between food waste, carbon footprint and climate change;
- **Dissemination intent:** 100% of applicable respondents said they would use or recommend the materials, and 94.7% felt motivated to take concrete action to reduce food waste.

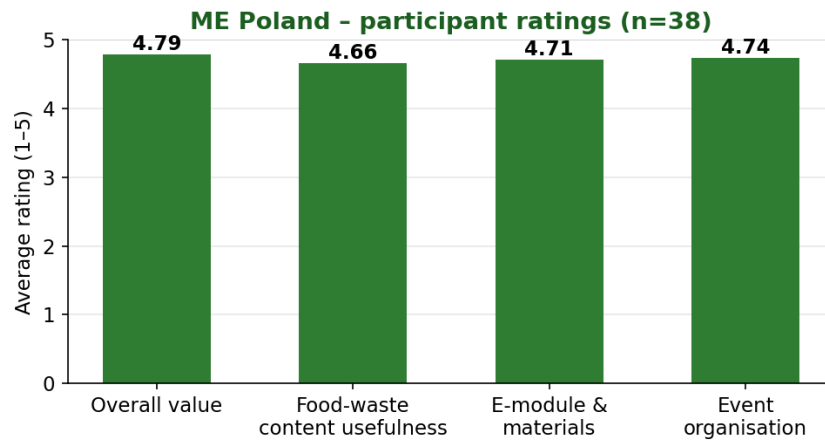


Figure 6. Average participant ratings at the Polish Multiplier Event ($n = 38$, scale 1–5). All headline dimensions scored above 4.6 out of 5.

The food-waste-prevention content and the e-module were named among the most valuable elements of the conference (selected by 81.6% and 34.2% of respondents respectively). In open comments, two-thirds of respondents (25 of 38) identified no necessary improvements, describing the event as professional, well prepared and matching their expectations. Verbal feedback from teachers and educators specifically praised the practical, classroom-ready character of the workshops and animations.

3. Revision and optimisation process

3.1 Feedback from dissemination conferences

The evaluation questionnaires completed at the dissemination events were used not only to measure impact but also to guide targeted revisions of the e-module. From the **Polish Multiplier Event**, 13 of 38 respondents offered concrete recommendations, which cluster into four themes:

- **More practical content (6 respondents):** additional recipes and examples for reusing food, more games and activities for children, and a dedicated practical-workshop block;
- **Additional or expanded topics (4):** nutrition for older people, explicit references to the school curriculum with indicated age groups, and regular updates reflecting new regulations on school nutrition;
- **Wider dissemination (1):** promoting future events more broadly at other universities;
- **Organisational points (2):** raising the presentation screen for better visibility and limiting photography noise during lectures.

Corrective actions taken or planned in response are summarised below:

Feedback	Action on the e-module
Request for more practical, ready-to-use content	The seven hands-on workshops were foregrounded as downloadable scenarios and additional leftover-recipe examples were linked to the relevant chapters.
Need for curriculum alignment / age targeting	Age group (lower secondary, 11–14) and CLIL orientation were stated explicitly for each workshop; curriculum-reference notes to be added.
Keep content current	A commitment to periodic updates of the online materials during the sustainability period was adopted.

In Slovenia, the partnership held a second Multiplier Event, “**Food Waste Impact on Climate and Environment**”, on **22 April 2026 (Earth Day) in Solkan / Nova Gorica**. The event explicitly linked the project to the EU **GreenComp** (European Sustainability Competence Framework) and combined art, science and sustainability with international participation from the partner countries. Slovenian dissemination was sustained and multi-channel across **April 2025 – May 2026**, carried out through a dedicated **public WhatsApp channel** (created to promote and disseminate the Slovenian LTT education programme), an **Instagram profile (@zvolunartist)** and the project website, with regular posts on food-waste prevention, composting, renewable energy, GreenComp and the launch of the e-module.

3.2 Analysis of shortcomings and corrective actions

Monitoring of the module's development and the item analysis in Section 2.5 identified a small number of deficits, each with a corresponding corrective action:

- **Under-signposted content on the mascots' role and the covered food-waste topics** (post-test items Q8 and Q9 scored lowest): the module text now states the mascots' narrative and cooperation functions explicitly and lists the food-waste sub-topics at the start of the relevant chapter.
- **Workflow / “next steps” clarity** (Q12): the learning path and sequence of activities are presented more prominently so learners understand how the parts fit together.
- **Baseline knowledge gaps** confirmed by the 473-respondent survey (leftover reuse, conscious consumption, global scale of bread waste): these topics were reinforced with dedicated animations and workshop activities.
- **Baseline copyright-awareness gap** identified in the educator needs survey: all embedded media use openly licensed or original material, and a short note on legal reuse of educational resources was included.
- **Requests for more hands-on material:** addressed by making all seven workshops available as printable scenarios.

4. Impact and sustainability

4.1 Achievement of educational objectives

The evidence indicates that the module met its two core educational objectives: raising learners' **ecological awareness** and building their **digital competences**. On the environmental side, 97.4% of Multiplier-Event respondents confirmed that the materials and event increased their understanding of the link between food waste, carbon footprint and climate change, and 94.7% reported being motivated to change their everyday behaviour – a marked shift from the baseline, where around half of the 473 surveyed students and teachers reported no or insufficient information on these topics. On the digital side, the production process itself – creating animations with Animaker, designing graphics, recording songs and voicing the mascots in English – developed participants' practical digital and media-literacy skills, while the post-test confirmed strong grasp of the underlying tools and concepts (rigging 95%, Animaker 95%).

4.2 Accessibility and licensing

The module is published as a freely accessible **open educational resource**, hosted on Collegium Balticum's Moodle server at <https://zvolunartist.cb.szczecin.pl/> and available to teachers, students and parents without charge. In line with the application it will remain **available online for at least five years** after the end of the project, and the mobile-app access and eleven-language interface further widen its accessibility.

4.3 Added value: innovation and European dimension

The module's **added value** lies in its integration of art and environmental science: it teaches climate and food-waste content through animation, storytelling, music and hands-on creative workshops rather than text alone. This art-based, CLIL approach – with recurring mascots and student-written songs acting as a “universal language” – distinguishes it from more conventional environmental e-learning resources and supports long-term retention of abstract concepts.

Its **European dimension** is embedded in both content and process. The project brings together **8 partner institutions from 7 countries** – schools, municipalities and NGOs – and the resource is genuinely **multilingual**, with the platform offered in eleven languages. It was co-created through international cooperation: partner schools from several countries contributed workshops (for example the Neapolitan “Cucina Povera” recipes and the Japanese-inspired Shibori dyeing), pupils across the partnership jointly voiced the mascots and wrote the song lyrics in English, and the baseline surveys and tests drew on hundreds of students and teachers from Romania, Italy, Türkiye, Estonia, Slovenia and Austria. The result is a transferable resource relevant to schools, universities, families, NGOs and local communities across Europe.

Annex – Data sources

- Baseline student survey on food safety and bread waste (n = 389, Google Forms, partner schools).
- Baseline teacher survey on global warming, food safety and bread waste (n = 84, Google Forms, partner schools).
- Expanded educator needs survey for the Zero Food Waste e-learning platform (n = 20, December 2024).
- Pre-test / knowledge test on animation and content fundamentals (n = 24, October 2025).
- Poland Online LTT Post-Test on e-module content (n = 22, October 2025).
- Seven workshop scenarios integrated into the e-module (BB – Best Before; Explore Your Fridge; How to Recycle Leftover Food; Too Good to Go; DYE – Shibori; Organic Powders into Works of Art; Beauty Recipes from Leftover Food).
- Multiplier Event Report and Multiplier Event Evaluation Report, Final Dissemination Conference, Szczecin, 19 May 2026 (>50 participants, 38 questionnaires).
- Slovenia dissemination logs, parts II–III (public WhatsApp channel, Instagram and website), April 2025 – May 2026, incl. the Slovenian Multiplier Event “Food Waste Impact on Climate and Environment”, Solkan, 22 April 2026.