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1. Introduction

Climate change is one of the most urgent crises of our times. It is already a challenge for all people, in all parts of the world (IPCC, 2021); its impact on health is one of the greatest concerns. Europe has already recognised the need for preparation and has policies in place to adapt to the climate crisis (European Commission, European Environment Agency, n.d.). Climate change risks are most serious for vulnerable populations, and older people are among these (Hosseini et al. 2024; Prina et al. 2024; Montoro-Ramirez et al. 2025). As Europe's population is rapidly ageing, this poses new and immense challenges for the healthcare sector.

Considering the interaction between climate change risks and the ageing population, the *chAnGE* project was designed to address an urgent need to prepare health and social care (HSC) professionals to be able to respond to the needs of the older population. These needs include social isolation during climate crises such as heat waves, storms, floods, and wildfires, which are the most frequent hazards for European countries.

Recent global heat crises, often called 'the silent killer' in the media, have highlighted that the just and inclusive societal transition, central to the European Union (EU) Green Deal (The European Commission, 2021), must specifically address the needs of this growing ageing population. While the EU Green Deal aims to improve human health, this goal cannot be achieved through climate mitigation policies alone (Paltriguera et al. 2024). EU member states report that climate change is placing a strain on health and social care services and infrastructures due to increased demands (European Committee of the Regions. 2020). Adaptation to climate change is therefore essential to create resilient health care systems (Ferguson et al. 2024). For this, HSC professionals should be given appropriate support, including relevant training (Dupraz and Burnard 2021).

It is noteworthy that, thus far, solutions to climate change have seldom been integrated with public health or healthy ageing interventions (Bose-O'Reilly et al. 2021). Climate change is scarcely addressed in strategic policy documents related to health or active ageing, such as the Decade of Healthy Ageing (2020-2030) or the Green Paper on Ageing (2022) (WHO 2020; European Commission 2022). Equally, discussions on climate adaptation and mitigation often neglect health systems (Ferguson et al. 2024). Furthermore, the discourse on climate action tends to focus predominantly on youth engagement (such as youth challenges within the EU Climate Pact 2020, and UNESCO and UNECE's Education for Sustainable Development strategies). The acknowledgment of the specific needs and potential for active involvement of older citizens in transforming today's societies into "climate-resilient and age-friendly" environments is lacking. The Paris Agreement (2015) emphasises that social transformation is required, a transformation that must be inclusive and harness all untapped potential to achieve the necessary economic change.

To ensure older people's empowerment and safety, both general awareness and specific knowledge related to climate change, adaptation, and mitigation are urgently needed among the older population and those working directly with them (Dupraz and Burnard 2021). This aligns with the European Commission's mission 'A Climate Resilient Europe' (2020), which seeks to prepare Europe *"to deal with climate disruptions, and assist[ing] all citizens, communities and regions in better understanding, preparing for and managing climate risks"*. The HSC sector, as one of the world's largest employers with a unique position of trust and integration into communities, is ideally positioned to serve as a multiplier, identifying and communicating synergies for equitable climate-health adaptation for the most vulnerable populations. As stated by the WHO-CS Working Group to Advance Action on Health and Climate Change (2022): *Health professionals have an ethical and professional responsibility to be familiar with both current and future climate change and environmental health threats in order to fulfil duties to their patients and to society."*



The *chAnGE* project, “climate change and healthy AgeinG: co-creating E-learning for resilience and adaptation”, aimed to bridge these knowledge gaps, bringing into specific focus the needs of the older population. A primary objective of this three-year initiative was to equip HSC workers, who are responsible for planning and delivering care to older individuals, with the necessary knowledge, confidence, and skills to integrate climate adaptation strategies into their work. The project sought to empower HSC professionals to become local leaders (called “champions” in clinical contexts), who can then train others, thereby multiplying the project’s impact. This was achieved by co-developing with HSC workers and older citizens a range of flexible, tailored online learning resources to respond to the need to adapt and become resilient in climate change and support older people adequately.

During the life of the project, the chAnGE Alliance of Higher Education Institutions (HEI), Vocational Education and Training Institutions (VET) and HSC Organisations (HSCOs) in Ireland, Portugal, Finland, Austria and Greece, performed the following actions:

1. Co-created a suite of online microcredentials (MC) for HSC workers involved in planning and/or delivering care to older people. These MCs were intended to enhance their knowledge, confidence, and skills in integrating climate adaptation and resilience into their professional practices.
2. Sought to empower HSC professionals to become local leaders, champions, and peer-trainers in climate adaptation, thereby amplifying their impact.
3. Fostered collaboration & knowledge co-creation among VETs, HEIs, and HSCOs through project activities and targeted knowledge-exchange (KE) events.
4. Facilitated the modernisation of learning offerings by HEI and VET institutions and supported learners in transitioning to higher education.
5. Agreed on an EU-aligned framework for the recognition and accumulation of MC credits, enabling their utilisation across various topics and learner groups by HEI and VET institutions throughout Europe.

Within the scope of WP3-Implementation (learning delivery, monitoring, and evaluation), we conducted an evaluation to assess the perceived effectiveness and impact of the courses. Through systematic evaluation of learners' experiences and perspectives, the evaluation sought to generate meaningful insights that informed substantive improvements in the educational content and delivery methods and would also be of value to other educators. The study research questions (RQs) were:

- **RQ1:** What are participants’ overall experiences with the e-learning course in terms of content, usability, engagement, and perceived value throughout the training process?
- **RQ2:** What changes occur in knowledge, attitudes, and skills related to climate adaptation and healthy ageing during participation in the e-learning course?
- **RQ3:** To what extent is the chAnGE e-learning course potentially effective in building capacity for learners to act as multipliers of climate-health-ageing knowledge and initiatives within professional and community contexts?

2. Methodology

A multi-method approach was employed, including the administration of questionnaires before, during, and after the learning, and post-training interviews, targeting both learners and HSC managers. This multi-method approach was chosen to evaluate experiences, knowledge, and skills, as well as changes in practice, and aligns with three levels of the Kirkpatrick learning model (1: reaction [learner’s opinion on the learning]; 2: learning [changes in learner knowledge or skills]; 3: behaviour [application of the learning] [(Kirkpatrick 1998). Interviews were also conducted with HEI/VET educators and senior administrative staff to gain a broader understanding of the relevance of and usefulness of the educational programme for learners and its impact on the ageing population. The different methods were divided into three tasks within the work package (3.5. 3.6. 3.7), and these are described in detail below.



2.1 Task 3.5. Embedded surveys

Objectives: The main objectives of Task 3.5 were:

- ✓ To collect immediate feedback from learners at various moments (during and after completing an MC) on content, learning process, interaction with the platform (1st level of Kirkpatrick model);
- ✓ To assess changes in learners' knowledge, skills, and attitudes (2nd level of Kirkpatrick model).

Study design

Task 3.5 employed a comprehensive mixed-methods approach combining quantitative survey data with qualitative open-text responses, implemented through an embedded evaluation design that integrated assessment seamlessly into the learning experience. The methodology followed a longitudinal approach, tracking learner progress and satisfaction throughout their educational journey.

Participant selection and recruitment

The learners were recruited from the institutional contacts of each HEI, VET, and HSC organisations, via email cascade in the local and national HSC services, and via social media advertising. Initial interest was registered via the project's website, and learners were enrolled in the Moodle e-learning platform after accepting GDPR and additional research consent conditions. In some HEIs, learners were formally registered as learners in the HEI (for credit accumulation). Individual usernames and passwords were created for each learner. All registered learners were invited to participate in the knowledge test and embedded feedback surveys. A single learner could contribute multiple knowledge tests and feedback surveys, as they were invited to complete these for each MC taken.

Data collection

Intermediate surveys: Four items, answered via 5-point Likert options, administered during each MC to assess content relevance and organisation/flow; e-learning platform experience; and overall learning experience. These intermediate, ultra-brief surveys were embedded in the Moodle platform and accessed directly by learners during their learning in the MC, via a prompt at the end of a learning section.

Post-MC survey: Twenty-one questions were administered at the end of each MC, which, apart from initial demographic questions, aimed to collect learners' perspectives via a 5-point Likert scale; four additional open text boxes explored learning expectations, the learning experience, gaps and any suggestions for improvement. This survey was anonymous, via the LimeSurvey platform and accessed via a link in the Moodle platform, at the end of the MC.

Knowledge test before and after completing the MC: For each MC, 10 multiple-choice questions were developed, and learners were prompted to complete those before starting the learning process and after completing it. The test aimed to assess changes in climate-health knowledge. The knowledge test was embedded in the Moodle platform. It was mandatory at the beginning to gain access to the MC content.

All surveys were translated into the five project languages (English, Portuguese, German, Greek, and Finnish).



2.2. Task 3.6. Post-training interviews

While Task 3.5 surveys concentrated on immediate, quantifiable feedback on the learning experience, Task 3.6 post-training interviews delved into more profound qualitative insights regarding learners' experiences. We also explored the perspectives of HSC senior managers concerning their perceptions of early practice changes and knowledge dissemination that may have resulted from the educational training provided. Finally, we sought to collect the perspectives of HEI/VET representatives, who served as managers or lecturers and collaborated in the development of educational materials.

Objectives

The objectives of Task 3.6 were:

- ✓ To conduct an in-depth exploration of learners' overall experiences with the MC educational intervention, gathering detailed feedback on content structure, course logical flow and progression, delivery and assessment methods, and suggestions for improvement.
- ✓ To assess whether learners have successfully applied (or plan to apply) acquired climate-health knowledge and skills in their professional practice, addressing level 3 of the Kirkpatrick model for training evaluation.
- ✓ To investigate the broader impact of HSC worker learning on climate change awareness and culture within HSC organisations, including early practice changes and knowledge dissemination beyond direct learners. This objective addresses the multiplier effect and organisational transformation potential of the educational intervention.
- ✓ To assess the effectiveness of the collaborative partnership between HEI and VET institutions in delivering climate-health education, identifying strengths, challenges, and opportunities for improvement in the educational alliance model.

Study design and data collection

Task 3.6 employed a comprehensive qualitative research design utilising semi-structured individual interviews as the primary data collection method. The methodology was grounded in phenomenology (Heidegger 1962), seeking to understand participants' lived experiences and meaning-making processes related to climate-health education. The study design incorporated multiple stakeholder perspectives to achieve triangulation and a comprehensive understanding of the educational intervention's impact. We used different interview guides for the several streams of interviews conducted, which can be supplied upon request. All interview guides were translated into the five project languages.

The data collection strategy encompassed three distinct but interconnected interview streams, each targeting specific stakeholder groups with tailored objectives.

Stream 1: Learner Post-Learning Interviews

The target population was HSC workers who had completed 2 or more MCs. Learners who had completed 4 or more MCs were prioritised as they could give additional comparative feedback; additional purposive sampling targeted variation in gender, role, work setting, and the MCs taken. The initial target sample size was 90 interviews total (minimum 10 per HEI/VET site).

Interviews were conducted online, individually, in the participant's native language. Interviews were planned to be conducted 8-12 weeks post-learning completion to ensure fresh recollection while allowing time for initial practice implementation. The interview guide included the overall learning experience and satisfaction; registration challenges and platform usability issues; and application of acquired knowledge in the professional practice.



Stream 2: HSCO Senior Manager Interviews

The target population was key senior managers in participating HSC organisations. The planned sample size was 15-25 interviews total (3-5 per HSC organisation per country). Interviews were conducted online, individually, in the participant's native language. The interview guide focused on feedback received from learners about their educational experience; early practice changes within the organisation; barriers and facilitators to organisational change; and leadership perspectives on the value of climate-health education.

Stream 3: VET and HEI Staff Interviews

The target population was educators and senior staff involved in learning delivery and support. The sample size was 18-27 interviews total (1-2 senior staff per participating institution). Individual interviews were conducted online in the participants' native language. The interview guide included perspectives on learners' skills development and change; experiences of delivering educational support for MCs; unexpected challenges or issues encountered; assessment of the HEI-VET collaboration; institutional value and benefits of project participation; recommendations for future educational partnerships.

2.3 Task 3.7. User experience and usage data evaluation

Task 3.7 comprised two complementary evaluation activities. The first was the pilot evaluation of the Moodle-based e-learning platform, which included user experience assessment, qualitative feedback, and automated usage data collection. The automated usage data were used to examine learners' engagement with different types of learning activities and resources across the MCs, providing insights into the use of different didactic formats. The second was a separate laboratory-based eye-tracking study, conducted by CUAS, which investigated participants' interaction with selected MCs, including visual attention patterns and their experience of the courses' structure, navigation, presentation, and didactic design.

2.3.1 Pilot evaluation

Objectives

- ✓ To systematically assess the overall user experience of the Moodle-based e-learning platform, focusing on both pragmatic qualities (usability, usefulness) and hedonic aspects (emotions, aesthetics) of interaction with climate-health educational content.
- ✓ To analyse learners' interaction with the online content through automated usage data collection, focusing on the frequency of access to different learning activities and resources (e.g., H5P activities, Text and Media elements, URLs, and Books) to provide insights into the use of different didactic formats across the e-learning courses.
- ✓ To gather qualitative feedback on the user interface, navigation experience, and technical challenges encountered during online learning, complementing the quantitative meCUE questionnaire data and identifying opportunities for improving the platform and learning experience.

Secondary objectives were:

- ✓ To validate the effectiveness of the chosen technological platform (Moodle-based system) for delivering complex climate-health content to healthcare professionals, providing evidence for scalability and replication in other educational contexts.
- ✓ To assess the platform's accessibility for HSCO professionals with varying levels of digital literacy and technical expertise, identifying barriers to participation and opportunities for inclusive design improvements.



Participant selection, recruitment and data collection

Component 1: meCUE user experience questionnaire

The meCUE 2.0 questionnaire (modular evaluation of key Components of User Experience) (Minge et al., 2017) was administered with the specific objective of evaluating the user experience of the MCs implemented on the Moodle e-learning platform. It was decided to use this instrument due to its solid theoretical foundation, scientific recognition, and established empirical validation (Thüring and Mahlke, 2007). The instrument demonstrates proven psychometric properties for comprehensive measurement of user experience in interactive software products, as is the case with the e-learning platform used within the project scope.

The meCUE was administered through the LimeSurvey platform. Data were collected from learners at the end of an MC. A learner could complete multiple questionnaires during their overall learning.

Component 2: automated usage data collection

Led by CUAS with support from NKUA, this component involved automated logging integrated into all online content delivery on the Moodle learning platform. The collected data focused on learners' interaction with different types of learning activities and resources within the MCs. Specifically, the system recorded the frequency of access to different content components, including H5P activities, Text and Media elements, URLs, Books, and other Moodle learning resources.

In addition, general usage information, such as login patterns, session frequency, overall time spent on the platform, and MC completion status, was recorded. These data were automatically recorded in real time through the Moodle e-learning platform infrastructure using Moodle's standard logging functionality.

2.3.2 Separate eye-tracking study

The eye-tracking study was conducted as a separate laboratory-based investigation, independent of the pilot evaluation, with the objective of obtaining complementary behavioural information about user motivation and experience. It provided measurable indicators of users' interaction with the e-learning platform that complemented the data collected through the meCUE questionnaire.

Objectives

- ✓ To evaluate cognitive load and stress responses during online learning interactions, identifying interface elements or content presentations that may cause cognitive or learning barriers.

For the identification and selection of participants for the separate eye-tracking study, a convenience sampling strategy was applied based on participants' availability and ability to physically access the CUAS facilities. They did not complete the MCs as regular learners and were not required to acquire or demonstrate knowledge of the climate-health content. The participants needed to possess basic digital skills and be at least 18 years old. Participants who agreed to take part first provided written informed consent and subsequently scheduled an appointment for the laboratory sessions.

The study was conducted in a controlled and comfortable laboratory environment at the CUAS facilities. The experimental protocol comprised four separate sessions, corresponding to four distinct MCs, which were developed early in the project. Each participant interacted with all four MCs.

Before beginning, participants completed a pre-study questionnaire to collect demographic and background information. Participants received a short orientation phase of approximately three minutes for each MC. The participants then interacted with the MC while their eye movements were recorded using the Gazepoint eye-tracking system.



Participants were also video-recorded to enable subsequent analysis of facial expressions and emotional responses.

2.4 Data analyses

Quantitative data were analysed by simple descriptive statistics, such as absolute and relative frequencies (percentages) for qualitative variables, or mean scores and standard deviations for quantitative variables. Results are presented in tables and are compared to the KPIs in the project agreement form. The open-text survey data, translated to English, underwent content analysis.

For the automated usage data collection, analysis of time spent in an MC, frequency of access, and depth of interaction was performed, with identification of the most common learning sequences.

For the eye tracking study, data analysis was performed by the generation of heat maps from eye tracking data, allowing for the visual representation of attention distribution across learning content.

HSC manager and HEI/VET staff interview data were transcribed in the native language and analysed locally using reflexive thematic analysis (Braun & Clarke, 2006; Maguire & Delahunt, 2017; Byrne, 2022). The codes were shared with UCC for collation into a narrative synthesis.

For the learner interviews, framework analysis was used, where coding of transcripts was done locally in the native language of the responsible partners, using a codebook agreed by the consortium. Researchers at UCC performed a narrative synthesis of the matrix data.

2.5 Ethical considerations

Participant informed consent. Within-learning, ultra-brief surveys and usage data collection were covered by a participant information sheet and consent form. There was an additional participant information sheet on the first page of the post-learning survey, as participants left Moodle to complete this. Participants ticked the consent box before proceeding, and could later still choose to not submit the survey. The interviews had a separate participant information and consent form.

For the eye-tracking study, a separate informed consent form was provided specifically for participation in the laboratory study (developed by CUAS and available in German). All study data were stored securely on the CUAS server infrastructure and processed in accordance with applicable data protection regulations.

Anonymity of data. Pre-post knowledge and “during learning” surveys were not anonymous; learners took the surveys embedded in Moodle as they learned, and thus their responses were linked to their Moodle accounts. Such data were only accessible to the researchers. At the earliest opportunity, this data was transferred to a Microsoft Excel sheet and anonymised.

MeCUE surveys and post-learning feedback surveys were anonymous as accessed via a separate link. Interview transcripts were anonymised locally by redacting any potentially identifiable data.

Data management and GDPR Compliance: Full compliance with the European General Data Protection Regulation (GDPR) was observed, including participant rights to data access, correction, and deletion. Learners were informed of their rights and provided with clear procedures for exercising these rights before they were enrolled in the Moodle e-learning platform. GDPR-compliant data storage and



handling procedures were used. Access to learner data was restricted to authorised consortium members only.

- Audio files of interviews were stored on encrypted, password-protected systems. Audio recordings of interviews were deleted after transcription and verification were completed. The transcripts were anonymised and stored locally.
- Regarding automated usage data collection, although user activity is routinely logged by the platform, participants were informed about the collection and research use of these data and provided explicit informed consent before participating in the study.
- For the eye-tracking study, all collected data, including the informed consent forms, pre-study questionnaires, eye-tracking recordings, video recordings, observational notes, and meCUE questionnaires, are stored exclusively on the CUAS server infrastructure.
- Anonymous, aggregated data was shared among chAnGE consortium partners through secure file transfer protocols for collaborative analysis and educational improvement.

Voluntary participation. Pre-learning knowledge tests were mandatory to access the MC content, but not the post-learning tests or the assessment, as not all students sought learning credits (i.e. submitted assignments or undertook assessments). While clicking on the post-learning survey link was mandatory for learning certification, actual survey completion remained entirely voluntary with no academic penalties for non-participation. This dual approach ensured educational requirements were met while preserving research participation autonomy. Learner interviews were entirely voluntary.

Withdrawal Procedures. Participants could withdraw from the study at any time without providing reasons and without academic or professional consequences. Data deletion requests could be honoured up to two weeks after within-learning surveys and interview completion, before integration into aggregated datasets. Data that was anonymous from the start (post-learning and meCUE surveys) could not be withdrawn.

Risks Considering the format and nature of the interviews and the data collection being coded, no physical or psychological risks existed for participants or researchers. The study enabled the participant to reflect on their experiences of the education they had taken part in. When interviewing both managers and learners from the same organisations, interviews were taken separate and to prevent influence between manager and staff perspectives.

Ethics Approvals. The research study protocol was approved by the Ethics Committees in all countries as follows:

- UCC (Social Research Ethics Committee 2025-187);
- Faculty of Human Kinetics, University of Lisbon (CEIFMH. No 20/2025);
- NKUA Ethics Committee (249/9.7.2025);
- KARELIA (17/13.5.2025);
- RIVERIA (27/2025).



3 Results

3.1. Learner numbers

It was planned to have at least 5 registered learners per HEI/VET partner per MC, i.e., a total of 45 registered learners per MC, or 630 MC registrations in total. In reality, 420 learners registered for 1761 MCs, which far surpassed the target, with the lowest registration count for an MC being 77.

However, many individuals registered for a large number of MCs (sometimes all 14), possibly with the intention to learn all, or more likely to be able to explore the different MC options and choose within these, noting that all MCs were free. Many of these learners did not progress beyond registration for many MCs, or a quick viewing of the MC.

Registrations were also not evenly distributed per MC (Table 1). This largely reflected the staggered release of the MCs so that earlier MCs had larger numbers. MC1 was also mandatory initially, as the foundation MC (although this was later changed to allow quicker access to other MCs), which resulted in larger registration numbers for this MC.

Table 1 shows the breakdown of learners enrolled, along with the numbers of MCs where learners had access but never started; started but did not complete; and completed the MC learning. For “completed”, we included those who completed the pre/post test and the MC assessment, but also those who took the directed learning content but did not want to do an assignment for credit.

Table 1. Number of learners who participated in MCs (as of 27.7.2026)

Name of MC	Registered (target 45 per MC)	Never started	Not completed yet	Completed (target 36 per MC)
MC1: Understanding Climate Change and Its Effects on Older Persons' Health (EQF 4/5/6)	256	104	54	98
MC2: Assessing and prioritising risk for climate adaptation in healthcare (EQF 6)	155	99	20	36
MC3: Climate Mitigation and Health Co-Benefits for Older Persons (EQF 4/6)	134	92	13	29
MC4: Coping with Uncertainty & Mental Resilience (EQF 4/5/6)	171	116	6	49
MC5: Project Management Relevant to Climate Adaptation for Older People (EQF 6)	115	88	6	21
MC6: Inclusive Leadership in Climate Adaptation in Health and Social Care (EQF 6)	128	97	10	21
MC7: Applying crisis management (EQF 6)	94	64	4	26
MC8: Entrepreneurship Relevant to Climate Change (EQF 6)	75	57	0	18
MC9: Communicating with Stakeholders (EQF 4/5/6)	130	101	3	26
MC10: Using Digital Tools for Collaboration, Content Creation & Problem-Solving in Climate Adaptation (EQF 4/5/6)	141	99	21	21
MC11: Climate-adaptive interventions and training for HSC workers (EQF 5/6)	99	68	4	27
MC12: Climate Change and Older People in Healthcare: Planning & Applying Solutions (EQF 6)	89	64	5	20
MC13: Influencing Policymakers & Advocating (EQF 6)	78	58	6	14
MC14: Promoting Inclusion and Empowering Individuals. Families. and Groups (EQF 4/6)	96	67	8	21



Total (target 630 registrations and 504 completions)	1761	1173	160	428
Total active or completed learning episodes			588	
MC15 Knowledge translation 5 or 15 ECTS module (target 10)	8	1	3	4

3.2 Pre- and Post-learning knowledge test

A pair of tests, with identical questions, was collected per MC per learner. Possible scores ranged from 0-10 in every test. Only learners who completed both pre and post-tests are included in the analysis. Table 2 shows the average pre- and post-learning scores per MC, and the percentage of learners who showed improved knowledge is presented. The KPI was that 80% of learners would complete pre- and post-tests; to date, 389 of the 582 learning episodes have these tests done (66.8%). Looking only at those who have completed the learning (n=422), the completion rate is 92.18%.

There was no fixed target for improvement, as this was expected to vary according to the learner's baseline level of knowledge in the MC topic and the complexity of the content learned. In addition, learners might look up answers for the pre-test and/or rush the post-test, as this was not a true test in a controlled environment. Nonetheless, in all MCs (excluding the MC with perfect pre-test scores), the mean score in the post-test was higher, and in almost all MCs, more than 50% of learners improved.

Some numbers in this table and the following tables are replaced by an X, because academic papers based on the data are being prepared but are not yet published. Final values will also change as final learners complete the learning, but the visible data gives a clear idea of the project impact.

Table 2. Pre- and post-learning test scores per Microcredential.

Name of MC	N (pairs of tests)	Pre-learning score (0-10)	Post-learning score (0-10)	Percentage of learners with improved knowledge
MC1	91	6.xx	7.xx	57.3%
MC2	33	5.xx	5.xx	6X.x%
MC3	31	7.xx	8.xx	4X.x%
MC4	38	8.xx	9.xx	6X.x%
MC5	22	8.xx	8.xx	5X.x%
MC6	16	9.xx	9.xx	2X.x%
MC7	29	9.xx	9.xx	3X.x%
MC8	12	8.xx	8.xx	6X.x%
MC9	24	8.xx	9.xx	5X.x%
MC10	19	8.xx	8.xx	5X.x%
MC11	28	8.xx	8.xx	4X.x%
MC12	12	10	10	-
MC13	13	7.xx	8.xx	5X.x%
MC14	21	7.xx	8.xx	5X.x%
Total	389			

3.3 During and post-learning questionnaires

In the short survey embedded within the Moodle platform during learning in each MC, learners were able to express their learning experience on the MC organisation, the content, the learning platform, and their overall experience at that point in time. The KPI was that 90% of learners would complete these, with a survey completed for 72% of all learning episodes, and 100% for completed learning episodes.

Answers ranged from 1-5, with higher values indicating a better experience. MC1 had a second within-learning survey, as it was the foundation MC. Table 3 shows the results, where the worst rating for any item in any MC was 3.82, indicating high student satisfaction, with the caveat that this was not anonymous feedback and learners had not yet received grades. The rating for the Moodle platform's ease of use received slightly lower ratings overall than other domains. In the Table, any score below 4 is highlighted in red, and any score of 4.5 or higher is green.

Table 3. Student feedback during learning.

Number of MC	N	Q1. The micro-credential content is well-organized and easy to follow	Q2. The learning content is appropriate for my needs	Q3. The Moodle platform is easy to use and navigate	Q4. Overall, how would you rate your learning experience so far?
MC1a	114	4.xx	4.xx	4.xx	4.xx
MC1b	83	4.xx	4.xx	4.xx	4.xx
MC2	43	4.xx	4.xx	4.xx	4.xx
MC3	31	4.xx	4.xx	4.xx	4.xx
MC4	50	4.xx	4.xx	4.xx	4.xx
MC5	18	4.xx	4.xx	4.xx	4.xx
MC6	24	4.xx	4.xx	4.xx	4.xx
MC7	16	4.xx	4.xx	4.xx	4.xx
MC8	6	4.xx	4.xx	4.xx	4.xx
MC9	25	4.xx	4.xx	4.xx	4.xx
MC10	28	3.8x	3.9x	3.9x	4.xx
MC11	29	4.xx	4.xx	4.xx	4.xx
MC12	22	4.xx	4.xx	4.xx	4.xx
MC13	10	4.xx	4.xx	4.xx	4.xx
MC14	21	4.xx	4.xx	4.xx	4.xx

In Table 4, the demographic data of learners are presented. Because some learners completed the post-learning questionnaire more than once, this table presents the sample as a total. The majority of learners were women, in the age group 35-44, with a bachelor's or master's degree, in full-time employment, and the most frequent challenges/barriers they faced were economic or health-related.



Table 4. Post-learning feedback survey demographics (N=384).

Domain	Variable	N=384	%
Gender	Woman	26X	6X.x
	Man	5X	1X.x
	Prefer not to answer	1	0.3
	Missing	5X	15.1
Age group	Under 18 years	-	-
	18 – 24 years	2X	6.x
	25 – 34 years	7X	1X.x
	35 – 44 years	10X	2X.x
	45 – 54 years	7X	2X.x
	55 – 64 years	4X	1X.x
	65 plus	1	0.x
	Missing	5X	1X.x
Highest level of education	Secondary education or lower	2X	5.x
	Vocational training	1X	4.x
	Bachelor's degree (BA. BSc. other)	10X	2X.x
	Master's degree (MA. MSc. MBA. other)	15X	4X.x
	Doctoral degree (PhD)	2X	7.x
	Missing	6X	15.x
Current employment status	Employed full-time	23X	6X.x
	Employed part-time	3X	9.x
	Self-employed	5	1.x
	Unemployed (looking for work)	8	1.x
	Unemployed (not looking for work)	3	0.x
	Retired	2	0.x
	Student	3X	8.x
	Apprenticeship/Internship	1	0.x
	Voluntary job	1	0.x
	Missing	5X	15.x
Challenges or barriers currently faced	Disability	6	1.x
	Health problems	6X	1X.x
	Barriers linked to education and training	4X	1X.x
	Barrier linked to discrimination	2X	5.x
	Social barriers	3X	9.x
	Geographical barriers	3X	8.x
	Barriers linked to cultural differences	2X	6.x
	Economic barriers	10X	2X.x

In the anonymous post-survey, possible answers ranged from 1-5, and higher values show a better learning experience. The majority of learners completed the survey (N=384/435 [88.28%]), just short of the KPI of 90%, but a large proportion did not note which MC they had just completed (despite this being a question).

As the survey was anonymous, it could not be traced back to the individual or the MC. Therefore, in this analysis, only the surveys that included the MC name or number were used (Table 5), giving a sample of 221 surveys.



Findings show a high level of satisfaction in all four dimensions, as well as in overall satisfaction. In the Table, any score below 4 is highlighted in red, and any score of 4.5 or higher is green.

The satisfaction was quite similar across the four domains, being highest overall for course content and structure, and their perceived engagement in the Moodle structure, and slightly lower for instructor support and feedback.

Table 5. Post-learning feedback survey.

MC	N	Course Content and Structure	Learning Experience	Engagement with the Moodle Platform	Instructor's Support and Feedback	Overall Satisfaction
MC1	45	4.xx	4.xx	4.xx	4.xx	4.xx
MC2	12	4.xx	4.xx	4.xx	3.8x	3.9x
MC3	14	4.xx	4.xx	4.xx	4.xx	4.xx
MC4	25	4.xx	4.xx	4.xx	4.xx	4.xx
MC5	6	4.xx	4.xx	4.xx	4.xx	4.xx
MC6	10	4.xx	4.xx	3.7x	3.5x	4.xx
MC7	28	4.xx	4.xx	4.xx	4.xx	4.xx
MC8	9	4.xx	4.xx	4.xx	4.xx	4.xx
MC9	11	4.xx	4.xx	4.xx	4.xx	4.xx
MC10	10	3.xx	3.9x	4.xx	3.8x	3.8x
MC11	13	4.xx	4.xx	4.xx	4.xx	4.xx
MC12	23	4.xx	4.xx	4.xx	4.xx	4.xx
MC13	4	3.9x	3.7x	4.xx	4.xx	4.xx
MC14	11	4.xx	4.xx	4.xx	4.xx	4.xx

Some learners also provided additional feedback on the MC just completed, regarding their expectations, positive & negative aspects, perception of missing content, suggestions about the learning platform and any other comments.

Their **Expectations** were mostly met, as in the sample quotes below:

"[My] initial expectations were fully met.... In many cases, the provided knowledge and information beyond what was expected..... Concepts that I had not known before or only knew partially were explained in a clear and understandable way."

"I expected the micro-certificate to provide me with that I could apply in my daily work, especially in relation to supporting I feel that my expectations were met, because I learned useful things that I can put to immediate use. It was an experience that helped me see my work from a new perspective."

For **Positive & Negative Aspects**, the vast majority only gave positive comments. From the few that report both, the following is an example:

"Pros: Diverse, practical with direct relevance to the profession. Development of skills in the healthcare sector. Flexible, independent learning using a variety of tools (e.g., ...). Negative: Time-consuming and, in some cases, complex topics. Occasional technical challenges Little opportunity for personal interaction or discussion."

In relation to the **Topics** that could be covered in more detail, the majority were satisfied with what was provided; a few would like more specific culturally/locally relevant info.



In **Suggestions to enhance the Moodle** platform experience, there were no specific comments about the Moodle platform itself, although some had difficulties with it. Most suggestions were related to the specific MC content and how this was presented within Moodle.

Finally, very few had further suggestions; these mostly reiterated earlier feedback, as in the example:

"I would like to highlight how the material was, but I would say that the volume of information was quite and the were very demanding, as I have explained in more detail above."

3.4. Learners' interviews

There were 74 interviews completed and analysed by the time of this report; 58.5% of learners had 3 or more MCs completed before the interview was conducted, 27.7% had 2, and the remaining had completed one MC. Within the interview transcripts, there were nine (9) main categories and 21 subcategories recognised. During coding, a traffic light (green/yellow/red) was used to highlight learners' experiences for some aspects, and from this, it is clear that the majority had a positive experience. Table 6 shows the categories, subcategories, and relevant examples.

Table 6. Learners Interviews

Categories	Subcategories	Examples of quotes
A. Registration & Access	Registration	<i>"I'd prefer a simpler way to sign up, ... After I managed it, I did it and now it opens right up on my computer when I log in, so I didn't have to deal with it again. "</i>
	Moodle Access	<i>"Hard having to log in, log out.; not as user-friendly as I hoped."</i> <i>"it was very easy to navigate"</i>
B. Moodle Platform Experience	Ease of Navigation in Moodle	<i>"The progress bar at the top that changed colour as I completed sections was very helpful for me"</i> <i>"The best is that everything is genuinely linked in the order in which we should view it. I felt a bit lost there. I didn't find it particularly user-friendly."</i>
	Technical issues	<i>"My only suggestion relates to that issue with the progress bar....."</i>
C. MC Learning Design & Materials	Flow & Connectedness	<i>"No, in the three I took, there was no overlap or maybe served as a reminder of basic concepts that were important"</i>
	Comparisons between MCs	<i>"You can clearly see that different sections were made by completely different people, ..."</i> <i>"Many courses had a big difference in terms of interactivity."</i>
	Satisfaction with content –	<i>"It was a good experience. The excessive length is the only real criticism I have..... but I genuinely enjoyed doing them."</i>
	Format Preferences	<i>"I liked very much the quizzes. It's a good way to test knowledge and to acquire it more quickly. "</i> <i>"There has to be a balance between what I can read — content I can access in text form — and what is provided via video. "</i>



D. Contact with teachers and other learners	Contact with teacher Peer Review and Engagement	<i>"There were contact details at the beginning of the course, ..."</i> <i>"I liked the interaction with other colleagues That was very well done and was different from module to module, so it did not feel repetitive."</i>
E. Assignments and assessments	Instruction Clarity Challenges	<i>"one thing I noted that I thought was really good was, you know, from the very outset, it's clear how and when AI can be used, ..."</i> <i>"In MCX, the pre-quiz told me I had scored 9 out of 10, but it also showed me the correct answer....."</i>
F. Comparing MCs	Least preferred MCs Most Challenging Aspects e.g., workload, concepts, assessment Most Preferred MCs	<i>"That course was really very laborious and clogged somehow.... the course was also .. very laborious."</i> <i>"MCX was extremely theoretical, with no visible practical application. I do not consider it an exemplary module."</i> <i>"Personally, I liked number X best because I think it was more useful for my profession the rest were interesting, but they were a bit more detached from what I do."</i>
G. Application of Learning	Applicability to Work Encountered or Potential Barriers to Application to Work Application in Personal Life	<i>" I think the biggest impact would be the project I had made in micro-credential X. This has motivated the superiors and we have already started some discussions around the part of climate change. environmental factors. So I think it really had an importance."</i> <i>"Maybe it would be interesting to include but that would need to be discussed at a higher level, it is not for me to decide."</i> <i>".....Knowledge never goes to waste."</i>
H. Learning Motivation & Future Learning plans	Original Motivation for Enrolling Interest in Future Modules	<i>".....So asynchronous and online learning helps in this... I mean, in this area."</i> <i>".....it made perfect sense for my day-to-day practice, given that I work in the community sector... .."</i> <i>"Yes —, we look at how we can adapt the MCX content for XXXXXX operational context."</i>
I. Any Other Comments	Other key comments	<i>Most "other" comments were aligned to earlier themes. We were encouraged by learners to promote the learning as they felt it would benefit others.</i>



3.5. HSCO managers' interviews

At the time of the report, 15 interviews were performed and coded from 4 out of 5 participating countries. Although not a KPI, we had estimated that 15-25 interviews would take place in total (i.e. 3-5 per country). Due to ongoing health service issues in XXXX, it was not possible to interview any HSCO managers there. The consortium felt that sufficient data was available from the other 4 countries without increasing their numbers.

Findings from the interviews revealed that interviewees had different levels of involvement in the project, and this was reflected in their answers.

Regarding the **promotion of MCs**, a typical example was:

"Because, we made an effort on the administration's side to ensure our employees had access to this opportunity and we encouraged them".

Regarding **solutions for recruitment**, timing was key:

"I noticed higher uptake when I intensified dissemination during key moments linked to the climate context in XXXXXX."; "It is like talking about flu vaccination in summer – you need to link the topic to a real problem, a pain point, a concern, and show how these micro-credentials can make a difference."

In general, HSCO managers let their staff **choose the MCs** of their preference, for example:

"..... And those that became involved, they went and registered and did that themselves. Then they did that selection themselves".

As for the feedback from participants, HSCO managers reported it as **positive**:

"The employees who participated in the programme were thrilled; they really enjoyed it. They pointed out how much it helped them and they asked with particular interest if they could"

"They realised that the impact was greater than, They became more aware of what they can do, reflect on, and act upon at both level and in the delivery of care."

The MCs were also challenging in terms of **workload**:

"Some professionals enrolled in many micro-credentials thinking they would be able to complete all of them, and then found they could barely finish two or three."

"I felt it was very difficult for participants to manage the workload relative to what they expected".

However, they observed that there were positive changes in staff **awareness and attitudes**:

"What I have observed is and better awareness of how we ourselves are an active part of the climate challenge, alongside older people."

3.6. HEI/VET learning providers and managers interviews

The KPI was 18-27 total interviews with key HEI and VET staff. There were 27 interviews completed, of which 9 were with senior staff and 18 with learning providers. In all five countries, participants in both groups were aware of the project, although involvement in it varied. Learning providers had an immediate involvement by actively participating in the development of learning material. Interview guides were not identical; for managers, there was more focus on managing the process, while learning providers were asked more specifically about their experiences from their involvement in the process. The main themes resulting from the inductive content analysis are presented below.



3.6.1 HEI/VET managers interviews

Regarding their overall experience, the main theme was their active involvement in various stages of the MCs, which was reported, for different reasons, as both positive and challenging. Collaborative co-creation was considered a very positive aspect, while content development from teams within a partner was viewed as challenging, pointing out that it should have been collaborative across partners, for example, exchanging didactic experiences and a common framework across MCs.

Approval and registration processes were referred to as main challenges, resulting in delays, and having to devote more time to validation by those having the overall responsibility. Also, the difficulty for most partners in recruiting learners at EQF level 4 and 5 was felt to reflect a need for better dissemination of promotion information.

MC piloting, both internally (within the consortium) and externally (with local/national topic or education experts), was also a challenge, especially for MCs developed at a later stage. The internal piloting experience was however positively valued as an error-detection mechanism.

In terms of MC assessment experience for those who were involved, it was noted that automated feedback provided by the platform was underutilised; also, there was great variation in the assessment methods used, creating some difficulties, especially when having to mark in different languages.

The perceived feedback from other colleagues and learners was mostly positive. Interactivity was noted as one important feature; interdisciplinarity, both in content development and learners' involvement, was also noted as important. In terms of challenges, worth noting was the platform incompatibility with the lifelong learning education platform in some HSCO, and technological support issues in both digitalisation and learning support.

In relation to lessons learned and the impact on the institution, the project was felt to have opened new intellectual horizons, integrating sustainability into existing educational provisions. The link between health, ageing, and climate change was perceived to have national relevance due to climate change/heat waves.

Finally, some of the influences on teaching practices in the organization included seeing micro-credentials as a flexible and effective tool, but also the risk of using MCs more as a novelty than sustainable learning offering.

3.6.2. Learning providers

The key positive aspects included: significant creative and intellectual freedom, collaboration within the team developing an MC and among the consortium with the aim to provide learning material of high standard, and personal development. Participants' challenges could be summarised as follows: the development of learning material for asynchronous learning; the unfamiliarity with the Moodle platform; time limits and high workload; and different expectations for the output.

Processes that could be improved include the learning platform used, as some had different prior experiences and had to adapt to Moodle; possible better coordination to avoid duplications in content within and across MCs; clear instructions regarding content, technical aspects, and evaluation; more target audience involvement during content development; more coordination and guidance; and across-MC exchange.



Expectations vs. reality in the process of developing the MCs were also noted as the content development was genuinely demanding.

Regarding the content development process, experiences were mostly positive. The largely autonomous, self-directed process, built on a concise initial framework, was mentioned repeatedly, although scientific training is not enough—technical skills are also required. Others felt that content expertise was not the issue, but a significant challenge was transforming content into fully asynchronous learning, with a good balance achieved in some sections but too much text in others. Recommendations included more interactive games, videos, exercises, critical thinking, and optional reading.

Reflections on the experience and organizational impact were broad. The overall experience was perceived to have value in terms of personal and professional growth and in providing access to up-to-date scientific knowledge for ordinary people.

3.7 Platform usability and user experience

3.7.1. meCUE questionnaire

Responses were collected using seven-point Likert scales and analysed according to the dimensions of usefulness, usability, visual appeal, positive emotions, negative emotions, intention to use, product loyalty and overall judgement. Possible scores ranged from 1-7 for the meCUE dimensions. Higher values indicate more positive evaluations for all dimensions except negative emotions, where lower scores represent a more favourable user experience. Overall judgement was assessed separately using a thermometer scale ranging from 0 to 5, where a higher value is better.

Questionnaire responses were available for 12 of the 14 MCs. Two were excluded from the analysis because the number of responses was considered too low to support meaningful interpretation. Among the included MCs, the number of respondents ranged from 6 to 43.

Overall, the results indicate generally positive evaluations of the MCs. Mean scores for usefulness, usability and visual appeal were relatively high across most MCs. Positive emotions, intention to use and product loyalty showed greater variation between MCs, and overall lower scores, while negative emotions were generally rated relatively low. Overall judgement scores (0-5) ranged from 2.80 to 4.20, with MC05 receiving the highest and MC02 the lowest mean score.

Table 7 presents the mean scores for each analysed MC across all meCUE dimensions. For the negative emotion item, scores are reversed (subtracted from 7) for easier comparison to other domains. These values provide a detailed overview of how individual courses were perceived by participants. Items scoring over 6 are shown in green, and below 4 are in red.

Table 7. Mean meCUE scores for each MC

MC	N	<u>Individual domains (0-7)</u>							Overall rating (0-5)
		<i>Usefulness</i>	<i>Usability</i>	<i>Visual appeal</i>	<i>Positive emotions</i>	<i>Negative emotions*</i>	<i>Intention to use</i>	<i>Product loyalty</i>	
MC01	43	5.xx	5.xx	5.xx	4.xx	4.xx	4.xx	4.xx	3.xx
MC02	18	5.xx	5.xx	6.xx	4.xx	4.xx	4.xx	4.xx	2.xx
MC03	13	6.xx	6.xx	6.xx	4.xx	4.xx	4.xx	4.xx	4.xx
MC04	16	5.xx	5.xx	5.xx	4.xx	4.xx	3.xx	4.xx	3.xx
MC05	6	6.xx	6.xx	6.xx	4.xx	4.xx	5.xx	5.xx	4.xx
MC07	17	5.xx	5.xx	4.xx	4.xx	4.xx	4.xx	4.xx	3.xx

MC08	7	6.xx	6.xx	5.xx	4.xx	4.xx	4.xx	4.xx	3.xx
MC09	8	6.xx	6.xx	6.xx	4.xx	4.xx	4.xx	4.xx	4.xx
MC10	8	6.xx	6.xx	6.xx	4.xx	4.xx	4.xx	4.xx	3.xx
MC11	9	5.xx	5.xx	4.xx	3.0x	5.xx	2.8x	3.3x	3.xx
MC12	9	5.xx	6.xx	5.xx	3.9x	4.xx	4.xx	3.7x	3.xx
MC14	8	6.xx	6.xx	5.xx	4.xx	3.6x	4.xx	4.xx	4.xx

*A reverse score is shown for negative emotion (usually a lower score is better) to allow direct comparison to scores for other domains

3.7.2. Automated usage data

Automated usage data were collected from 409 learner-MC interactions through Moodle's standard logging functionality. Figure 1 presents the frequency of learner interactions with the different Moodle activity types across the 14 MCs. Overall, learners engaged with a broad range of learning resources, including Pages, H5P activities, Books, Resources, URLs, Forums, and Text and Media elements (Figure 1- legend explains the types of activities).

The results demonstrate considerable variation in both the overall number of interactions and the distribution of activity types across the MCs. While learner interactions in some MCs were concentrated on page-based resources, others had higher engagement with interactive H5P activities or other Moodle resources. These differences reflect the diverse instructional designs implemented across the MCs.

The collected usage data provide an objective overview of learner engagement with the different learning activities and complement the user experience evaluation conducted through the meCUE questionnaire. Together, these data contribute to the overall evaluation of the e-learning platform and its didactic design.

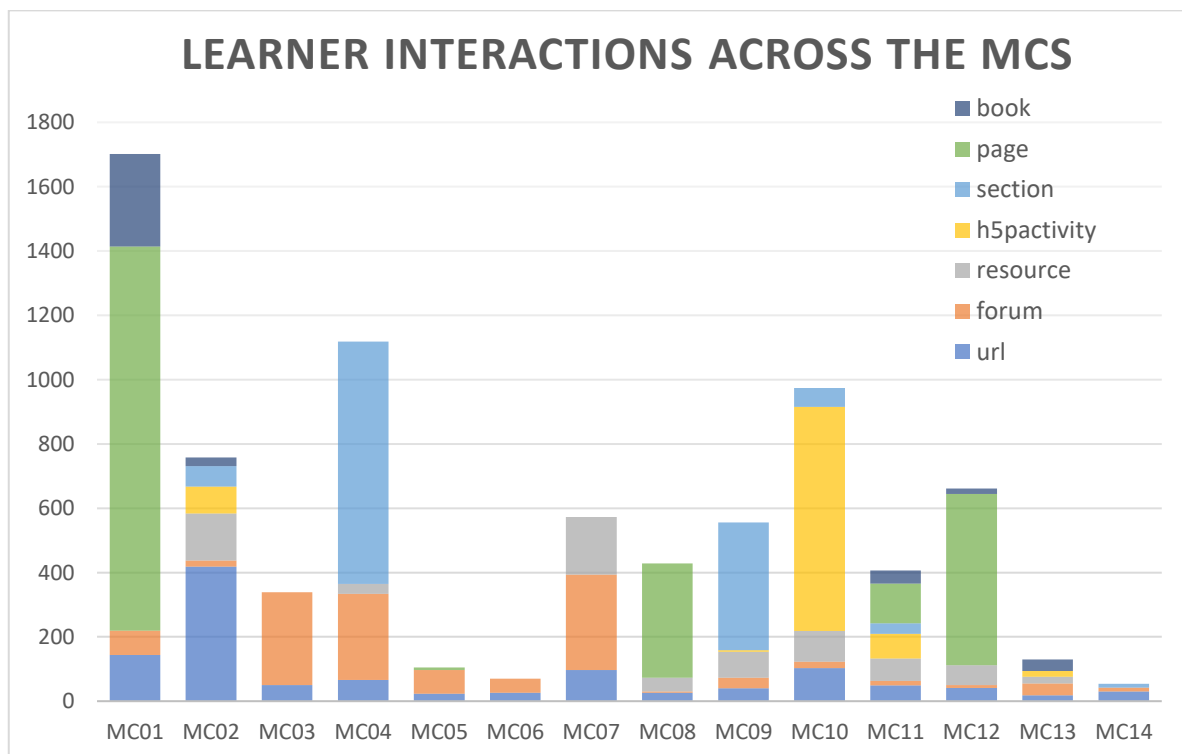


Figure 1: Frequency of learner interactions with different activity types across the 14 MCs (N = 4XX learners).

Book = embedded e-book; Page = content within Moodle with text, images, and media; Section = Text or media blocks for structuring the course; hp5 activity is interactive learning content and exercises like images and icons (click and text appears, etc); Resource = Uploaded files such as PDFs or presentations; Forum = group discussion forum; URL = link to external video etc.



3.7.3. Eye-tracking

The study was conducted as a laboratory-based UX study with 19 participants. A within-subjects design was used, in which all participants completed learning within the four selected MCs. To reduce potential order effects, the order in which the learning modules were presented was randomized.

At the time of writing this report, the analyses of the pre-session (demographic) questionnaires and the post-session meCUE questionnaires have been completed. The analyses of the eye-tracking recordings, the *Think Aloud* observations (participants' verbal observations during content interaction), and video-based emotion data are still ongoing.

These complementary data sources will be analysed together to provide an integrated understanding of participants' interaction with the learning materials. The combined analysis aims to identify how different didactic concepts, interface elements, and content presentation formats influence user experience, visual attention, emotional responses, and learner engagement.

4 Summary and Conclusion

In this short summary, we will assess whether the research questions were answered and demonstrate whether we succeeded in reaching the initially set KPIs.

The study research questions (RQs) were:

RQ1: What are participants' overall experiences with the e-learning course in terms of content, usability, engagement/interactivity, and perceived value throughout the training process?

*Across the within-learning brief surveys, the anonymous post-learning survey, and the post-learning interviews, participants consistently reported a **very positive experience**; they found the content engaging, useful, and usable in their everyday life and clinical practice, and liked the **flexibility** of online learning, although some missed the teacher and peer live interaction.*

RQ2: What changes occur in knowledge, attitudes, and skills related to climate adaptation and healthy ageing because of participation in the e-learning course?

*Knowledge as measured by the pre-post test **increased in all MCs** where there was room for improvement. Within the interviews, learners reported that the learning process provided them with **skills to improve their everyday work**. The HSCO managers reported **greater awareness and openness to climate change resilience**.*

RQ3: To what extent is the chAnGE e-learning course potentially effective in building capacity for learners to act as multipliers of climate-health-ageing knowledge and initiatives within professional and community contexts?

*Although little time had passed since the learning, some learners reported that they already used the knowledge they gained and the material they were provided to **improve their practice**, but also to make their colleagues **aware of the problem and its possible solutions**.*

The project KPIs were mapped to results. Green highlight indicates the target is already met. Yellow indicates the target is almost met. Red would indicate the target is not met (no instance of this).

- **Learner numbers reach targets** (target 5 learners per MC per institution, total 45 per MC, total **630** for the total 14 MCs; for knowledge translation MC, target n: 10 total learners). Although there was a vast number of registrations (1761), a much smaller number actively participated in learning (**588**, currently just below target). Especially in MCs that were developed later in the life of the project, numbers were smaller than planned. However, overall, a large number have already completed the MCs they were enrolled in, and the process of learning continues.



- **Learners complete learning** (target 80% of those who register for an MC complete the MC). So far, 72.8% of those who started an MC have finally completed it.
- **Learning credit is accurately counted**/accumulated within each MC and across MCs, by the Moodle e-learning platform (target 100% concordance with manual checks). The within-MC credit was always correctly accumulated. The across-MC credit accumulation was done manually as learners were registered in their local institution but took the learning in CUAS (as the consortium chose a single, centrally hosted platform rather than multiple local platforms), so that credit accumulation required a manual step in the local HEI/VET.
- **Learners' pre-post learning knowledge**/confidence improves (target number taking pre-post survey: 80%; no target for improvement value). Of those completing an MC, the vast majority (89%) also completed the pre-post test. In all MCs, learner knowledge stayed at a perfect score (n=1) or improved (n=13).
- **Learners complete online feedback surveys** during and at the end of each MC (target 90% of learners). Although 88% completed the online feedback survey, it was difficult for all data to be linked to the specific MC, as learners did not always note which one they had just completed.
- **Learner post-learning interviews** are completed to the target number and time schedule (initial target n: 10 per HEI/VET, total n: 90; revised later to 75 to avoid data redundancy). So far, 74 learner interviews have been analysed, and some final interviews are taking place.
- **Learners engage with MCs** in an appropriate way, and learner engagement data is collected by M30. Data were collected and analysed on time. Findings show that learners engaged with learning material according to what was expected from each MC; differences observed among MCs reflect the diverse instructional designs implemented across them.
- **HEI/VET educators and senior staff interview** analysis completed by M33 (target n: 18-27). There were 27 interviews completed and analysed on time.
- **HSCO senior staff interview** analysis completed by M34 (target n: 15-25). Already, 15 interviews have been completed and analysed, although in Finland it was not possible to perform interviews due to health service organizational issues.

Of the four levels of evaluation (Kirpatrick, 1998), it was possible to evaluate the first three:

- Learners gave feedback on their learning experience by completing the post-learning feedback survey and, for a smaller sample, the interviews, and this was reported as very positive.
- From the pre-post test results, the majority of learners gained new knowledge that could impact their relevant skills, reinforced by subjective knowledge and confidence gain as per interviews.
- Short-term changes in their practice were evaluated through interviews sometime after the learning experience, and by interviewing their HSCO managers. It was clear that learners intended to apply the knowledge and skills in their practice, and some already have done this.

Some limitations include:

- There was difficulty in reaching HSC workers who would take the learning at EQF level 4 and 5; some of those enrolled did not proceed with learning, although all MCs that were developed for EQF Level 4 were provided in all 5 languages. This calls into question the value of fully online learning for learning at this level.
- Although registrations were threefold more than anticipated, completion of learning was limited. This likely relates to the learning being free, so that HSC professionals registered for multiple MCs but did not feel they had an obligation to complete them. This may also be related to language barriers; later MCs were provided only in English and the native language of the developers.



Conclusions

The microcredentials developed to train HSC professionals, looking after older people, in climate resilience were perceived to be useful, knowledge was improved, and the experiences with learning were positive. HSCO managers reported that MCs were a necessary element for HSC professionals to become resilient and be able to support older people during climate change.

HEI/VET managers and learning developers and providers found the process beneficial, valuing the opportunity to exchange experiences and collaborate with colleagues from other institutions and to learn new skills and broaden learning offerings.

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