STEAME
FOR SAVING LIFE

Guidelines for developing and implementing Disaster Risk Reduction Education in Elementary School Curriculum

O3/A1
Design and implementation of a training course for teachers

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Reference number: 2023-2-CY01-KA210-SCH-000169945
Implementation period: 31 August 2024 – 30 August 2026



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Steame for Saving Life

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Deliverable leading partner: Cyprus Pedagogical Institute (CPI)

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1. BRIEF DESCRIPTION

The report outlines the design and content of the teacher professional learning programme developed within the framework of the STEAME for Saving Life project, with the aim of supporting the systematic integration of Disaster Risk Reduction Education (DRRE) into everyday teaching practice. It presents the programme's rationale, purpose, learning objectives, expected learning outcomes and the competences it seeks to develop, as well as the experiential, participatory, collaborative and context-based pedagogical approaches underpinning its design. In addition, it reports findings from the evaluation of the programme by teachers from the two participating countries, reflecting their perceptions and experiences of both their participation in the programme and its implementation.

The training programme comprises three successive and interrelated professional development modules. The first module introduces the core concepts and terminology of Disaster Risk Reduction (DRR) and examines the educational value of integrating Disaster Risk Reduction Education (DRRE) across the different subject areas of the curriculum. The second module familiarises teachers with the use of authentic real-world scenarios, storytelling, thematic mapping, geospatial information, and virtual and augmented reality applications as resources for curriculum-based learning. The third module focuses on the interpretation and educational use of authentic earthquake, flood, rainfall, and weather data and supports teachers in designing activities that pursue curriculum and DRRE objectives simultaneously.

For each module, the content, learning objectives, methodology, professional development activities, supporting materials, digital tools and expected outputs are specified. Emphasis is placed on the pedagogically purposeful use of authentic contexts, real-world data, thematic maps, educational simulations and digital technologies, as well as on aligning DRRE activities with curriculum objectives and with the age and learning needs of the students.

Overall, the report provides a coherent professional learning framework through which teachers progress from conceptual understanding and the exploration of pedagogical approaches to the design of curriculum-aligned DRRE activities that can be integrated into everyday teaching practice.

2. INTRODUCTION

Education is widely recognized as a central component of disaster risk reduction and resilience building. The *Sendai Framework for Disaster Risk Reduction 2015–2030* identifies understanding disaster risk and enhancing disaster preparedness as priorities for action and explicitly calls for disaster-risk knowledge to be incorporated into formal and non-formal education, civic education, and professional education and training (UNDRR, 2015). The *Comprehensive School Safety Framework 2022–2030* further positions risk reduction and resilience education within a whole-school approach and emphasizes the development of pre-service and in-service professional capacities among teachers and school leaders (GADRRRES, 2022).

Teachers are central to the implementation of Disaster Risk Reduction Education (DRRE), as they are responsible for transforming disaster-related knowledge into child-centered, context-sensitive, curriculum-aligned, and pedagogically meaningful learning experiences (Selby & Kagawa, 2012; GADRRRES, 2022; Oda & Ichinose, 2025). This role requires both an understanding of key DRR concepts—including hazards, exposure, vulnerability, capacity, preparedness, and resilience—and the pedagogical capacity to identify curriculum entry points, select authentic and locally relevant contexts, and design interdisciplinary learning activities that promote inquiry, collaboration, critical thinking, problem-solving, decision-making, and responsible action (Oda & Ichinose, 2025; Tyas et al., 2025). It also involves the

purposeful use and interpretation of scientific data, thematic maps, geospatial information, and digital resources to support students' investigation of real-world disaster risks (Li et al., 2022; Lee et al., 2025).

Despite the importance of this role, teacher preparation for DRRE has often been uneven and fragmented. International curriculum mapping has identified contexts in which teacher education was delivered through short or isolated activities, with limited follow-up and insufficient support for translating professional learning into classroom practice. It has also highlighted the limited systematic inclusion of DRR within initial teacher education (Selby & Kagawa, 2012). More recent research continues to identify gaps in interdisciplinary curriculum integration, alignment with emerging pedagogical approaches, and the meaningful connection of DRR content with technology, pedagogy, and higher-order thinking skills (Tyas et al., 2025). The growing but still uneven DRRE research field further reinforces the need for capacity building, needs assessment, programme evaluation, and stronger evidence regarding the effectiveness of educational strategies and interventions (Canlas, 2023).

Evidence from teacher-education initiatives in different national and institutional contexts indicates that DRRE professional learning can be strengthened when it is embedded within structured pre-service or in-service provision and combines conceptual knowledge with authentic disaster cases, locally relevant contexts, inquiry, field-based and experiential learning, interdisciplinary collaboration, curriculum design, and structured reflection (Kawasaki et al., 2022; Kitagawa, 2023; Park et al., 2024, 2025; Oda & Ichinose, 2025). Collectively, these studies suggest that DRRE teacher education should be context-sensitive, adequately supported, and closely connected to curriculum requirements and classroom practice, rather than being limited to isolated awareness-raising activities.

Taken together, the literature suggests that well-designed teacher education in DRRE should integrate conceptual understanding with active, experiential, interdisciplinary, context-based, and practice-oriented learning (Kawasaki et al., 2022; Park et al., 2024, 2025; Oda & Ichinose, 2025). It should provide opportunities for teachers to analyze authentic disaster cases and design curriculum-linked learning activities (Park et al., 2024, 2025), as well as to interpret scientific and geospatial data and engage with thematic maps, simulations, and digital platforms (Kawasaki et al., 2022; Li et al., 2022; Lee et al., 2025; Oda & Ichinose, 2025). Teacher education should also encourage interdisciplinary and peer collaboration and provide structured opportunities for feedback, reflection, and the revision of teaching practices and learning designs (Darling-Hammond et al., 2017; Park et al., 2025; Oda & Ichinose, 2025).

These characteristics are consistent with the broader literature on effective teacher professional development, which identifies a strong content focus, active learning, collaboration, modelling of effective practice, expert support, feedback and reflection, and sustained duration as important features of professional learning capable of contributing to changes in teaching practice and student learning (Darling-Hammond et al., 2017). They are also aligned with international guidance and recent research emphasizing continuing professional development, curriculum integration, practical and interactive learning, collaboration, preparedness exercises, and systematic evaluation as important components of school preparedness and resilience (GADRRRES, 2022; Marzban et al., 2026).

Against this background, the present report focuses on the design of the teacher professional learning course developed and implemented within the framework of the *STEAME for Saving Life* project. The course connects conceptual understanding of DRR and DRRE with curriculum integration, Context-Based Learning, authentic natural-hazard scenarios, real-world data, thematic and geospatial resources, educational simulations, digital technologies, and collaborative learning design. The following chapter presents the course rationale, objectives, intended learning outcomes, learning activities, competences, and implementation process. It also presents evaluation findings concerning the effectiveness of the programme, as evidenced through its implementation.

3. PROFESSIONAL DEVELOPMENT PROGRAMME

Overview

The professional learning programme on Disaster Risk Reduction Education (DRRE) was designed to strengthen teachers' knowledge, skills, and pedagogical competences for the systematic integration of DRRE into everyday classroom practice. Its central purpose was to support teachers in embedding DRRE objectives and activities within existing curriculum subjects and in designing meaningful learning experiences through which students could understand natural hazards, examine how exposure, vulnerability, and capacity shape disaster risk, and develop the knowledge, skills, attitudes, and sense of responsibility required to contribute to safer and more resilient communities (UNDRR, 2015; GADRRRES, 2022).

The programme conceptualised DRRE as an interdisciplinary and curriculum-embedded field of learning grounded in authentic, real-world contexts. DRRE was approached as a field that could be integrated into the objectives, content, and learning activities of different school subjects, including Science, Geography, Mathematics, Language Education, Social and Civic Education, Arts, and Digital Technologies. Within this framework, it provided a meaningful context for connecting disciplinary knowledge with real-life situations, contemporary societal challenges, and issues directly relevant to students' local environments (Selby & Kagawa, 2012; Tyas et al., 2025).

Emphasis was placed on enabling teachers to identify appropriate curriculum entry points for integrating DRR concepts, processes, and competences. Through the use of authentic local and regional events, real-world data, thematic maps, digital tools, and educational simulations, teachers were supported in designing age-appropriate learning activities that were aligned with curriculum objectives and responsive to students' learning needs. These activities were intended to foster subject knowledge alongside transferable skills, informed attitudes, and active participation in risk prevention, preparedness, and community resilience (Li et al., 2022; Lee et al., 2025; Oda & Ichinose, 2025).

The initial phase of the programme had a duration of 10 hours. This was followed by a period during which the participating teachers designed educational activities and implemented them in their classrooms. Upon completion of the classroom implementation phase, an additional five-hour professional learning event was organized. During this event, the teachers presented and discussed the activities they had implemented, exchanged feedback and professional experiences, engaged in collective reflection on the implementation process and the challenges encountered, and disseminated the practices and learning outcomes developed through the programme.

Phases of Programme Implementation

The programme was implemented through three successive and interrelated phases:

Phase 1: Professional learning and exploration of DRRE approaches and resources (10 hours)

Phase 2: Design and classroom implementation of educational activities (online synchronous and asynchronous support)

Phase 3: Presentation, reflection, and dissemination through a five-hour educational conference

Together, the three phases established a coherent progression from professional learning and the exploration of relevant pedagogical approaches and resources to the design, classroom implementation, critical review, and dissemination of curriculum-based DRRE activities. Throughout the process, teachers assumed an active role as designers, practitioners, and reflective evaluators of educational practices aimed at integrating DRRE into the curriculum.

The first phase focused on developing teachers' conceptual understanding of Disaster Risk Reduction Education and strengthening their pedagogical capacity to integrate it into different curriculum subjects. Through experiential and participatory workshops, teachers explored curriculum entry points, pedagogical approaches, and examples of DRRE learning activities. They also engaged with thematic maps, geospatial information, authentic datasets, digital tools, and educational simulations. This phase provided the conceptual knowledge, pedagogical foundations, and practical resources required for the subsequent design of curriculum-based activities.

During the second phase, the teachers drew on the approaches, examples and resources introduced during the professional learning sessions to design educational activities tailored to the needs of their students and aligned with both curriculum objectives and the objectives of Disaster Risk Reduction Education (DRRE). Throughout the design process, the teachers received ongoing scientific and pedagogical support from the Project team. Provided through online meetings, this support included guidance, clarification of theoretical and methodological issues, feedback on the initial learning designs, and recommendations aimed at strengthening their pedagogical coherence, scientific validity and alignment with the intended learning outcomes.

The teachers subsequently implemented the activities in their classrooms. Classroom implementation enabled them to examine the pedagogical appropriateness of their learning designs, the clarity and usability of the supporting materials and digital tools, and the suitability of the activities in relation to the students' age, prior knowledge and learning needs. It also provided opportunities to assess the extent to which the intended learning outcomes had been achieved, identify challenges arising during implementation, and make the necessary adaptations in response to the particular conditions and dynamics of each classroom.

The third phase centered on a five-hour educational conference dedicated to the presentation, discussion, reflection, and dissemination of the activities implemented by the participating teachers. Teachers presented the rationale and design of their activities, the classroom implementation process, examples of students' learning products, the challenges encountered, the adaptations introduced, and the conclusions drawn from their experience. The conference provided a structured forum for documenting and disseminating curriculum-based DRRE practices, exchanging professional experiences, receiving feedback, and promoting collective reflection on the integration of DRRE into everyday teaching.

Objectives of the Training Programme

The training programme aimed to strengthen teachers' conceptual understanding, pedagogical competence, and capacity to design and implement curriculum-based Disaster Risk Reduction Education (DRRE). Emphasis was placed on curriculum integration, experiential and participatory learning, the purposeful use of authentic data and digital technologies, and the development of age-appropriate learning activities aligned with clearly defined curriculum and DRRE objectives.

More specifically, the programme aimed to:

Accordingly, the course aims to:

a) develop teachers' understanding of the core concepts and terminology associated with Disaster Risk Reduction, including natural hazards, exposure, vulnerability, preparedness, and resilience

b) enable teachers to recognise the educational value of systematically integrating Disaster Risk Reduction Education into the school curriculum in order to promote prevention, preparedness, responsible behaviour, and resilience

c) strengthen teachers' capacity to identify appropriate curriculum entry points for integrating DRRE-related objectives, content, and learning activities across different subject areas

d) familiarise teachers with inquiry-based, context-based, place-based, experiential, and collaborative pedagogical approaches, and support their purposeful application in curriculum-based DRRE activities

e) develop teachers' capacity to select, interpret, and use authentic local and regional events, real-world datasets, thematic maps, geospatial information, tables, graphs, digital simulations, and relevant digital technologies—including mapping applications and virtual and augmented reality—as teaching and learning resources aligned with specific learning objectives, and

f) strengthen teachers' capacity to develop coherent, age-appropriate, and curriculum-aligned learning designs in which curriculum and DRRE objectives are pursued simultaneously and explicitly connected with instructional procedures, learning resources, worksheets, student products, and assessment processes.

Expected Learning Outcomes

By the end of the training programme, participants are expected to be able to:

a) explain the key concepts and principles of Disaster Risk Reduction Education;

b) recognise appropriate opportunities for integrating DRRE into different curriculum subjects;

c) select suitable pedagogical approaches, authentic contexts, digital tools, and real-world data for DRRE-related learning;

d) design age-appropriate learning activities that combine curriculum objectives with DRRE objectives;

e) apply DRRE activities in classroom practice and adapt them to students' needs and local contexts;

f) reflect on, evaluate, and improve the design and implementation of curriculum-based DRRE activities.

Content of the Training Programme

The professional development programme was organized into three interconnected experiential modules that followed a progressive and coherent sequence. The first module established the conceptual foundations of Disaster Risk Reduction Education and examined its educational significance and integration across different curriculum subjects. The second module focused on the use of authentic natural-hazard scenarios and introduced pedagogical approaches, methods, digital tools, thematic mapping, geospatial resources, and immersive technologies that can support the meaningful integration of DRRE into everyday teaching. The third module concentrated on the interpretation and educational use of real-world data and on the application of an integrated teaching and learning framework, culminating in the collaborative design, presentation, feedback, and refinement of curriculum-based DRRE learning activities.

Module 1: Disaster Risk Reduction Education for Natural Hazards in the School Curriculum

Module Description

This introductory module establishes the conceptual and pedagogical foundations required for the meaningful integration of Disaster Risk Reduction Education (DRRE) into the school curriculum. It supports teachers in developing a shared understanding of key DRR and DRRE concepts, including natural hazards, vulnerability, preparedness and resilience, while recognising the educational significance of DRRE for sustainable development, everyday teaching practice and the development of responsible and resilient school communities.

The module progresses from the activation and discussion of participants' prior knowledge to the systematic exploration of the principles, requirements and pedagogical approaches associated with curriculum-based DRRE. Particular emphasis is placed on the Context-Based Pedagogical Integration Model, which provides a structured framework for connecting subject-specific curriculum objectives and learning outcomes with authentic and locally relevant natural hazard contexts, DRRE objectives, appropriate pedagogical approaches, educational resources and meaningful learning activities.

Through collaborative work, curriculum-linked examples and the analysis of lesson plans, participants examine how DRRE can be embedded across different subjects and age groups rather than treated as a separate area of learning. They apply the model to generate initial ideas for classroom activities that simultaneously support curriculum learning and the development of knowledge, skills and attitudes related to preparedness, resilience, prevention and responsible action.

Indicative Duration

180 minutes

Learning Objectives

This module aims to enable teachers to:

a) recall, articulate and share their prior knowledge and experiences related to Disaster Risk Reduction (DRR) and Disaster Risk Reduction Education (DRRE)

b) understand and distinguish the core concepts and terminology associated with DRR and DRRE

c) explain the educational significance of DRRE and its relevance to sustainable development, school education and everyday teaching practice

d) identify opportunities for integrating DRRE into different curriculum subjects by aligning DRRE objectives and activities with subject-specific curriculum objectives.

e) understand the principles and key components of the Context-Based Pedagogical Integration Model as a structured framework for the curriculum integration of DRRE, and explain how it connects subject-specific curriculum objectives, authentic and locally relevant natural hazard contexts, appropriate pedagogical approaches and DRRE objectives

f) identify and examine appropriate pedagogical approaches, methods, techniques and tools for integrating DRRE into everyday teaching practice

g) analyse curriculum-linked examples and develop initial ideas for integrating DRRE into different curriculum subjects and educational contexts.

Methodology

The module adopts an experiential and participatory methodology that combines concept mapping, brainstorming, small-group work, interactive presentations, plenary discussion, and the analysis of curriculum-linked examples. Participants also present the outcomes of their group work, reflect on the ideas and approaches explored during the activities, and exchange feedback with their peers.

Activities

Activity 1: Introductory Presentation - Project Context and Educational Rationale

The module began with a brief introductory presentation that established the overall context and purpose of the training. Participants were introduced to the STEAME for Saving Life project and to the educational importance of integrating Disaster Risk Reduction Education into school education and everyday teaching practice. The main goals and objectives of DRRE were also presented and discussed, with particular emphasis on developing knowledge and understanding of disaster risks, strengthening preparedness and resilience, and promoting the skills and attitudes required for prevention, protection, and appropriate action. The activity aimed to orient participants to the focus of the programme and provide a common starting point for the experiential activities that followed.

Materials and supporting resources: PowerPoint presentation (Annex 1), Goals and Objectives of DRRE (Annex 2)

Activity 2: What Do We Already Know about DRRE? - Activating Prior Knowledge through Concept Mapping

Following the introductory presentation, participants worked in small groups to create a concept map representing their existing knowledge, experiences, ideas, concepts, processes, and associations related to DRRE. Each group organised its ideas according to criteria selected by its members. The groups presented their concept maps to the plenary and explained how they had organised their ideas. A brief discussion and reflection followed, focusing on participants' prior experiences and on possible connections between DRRE and different curriculum subjects.

The activity aimed to activate and make visible teachers' prior knowledge and experience, establish a shared conceptual starting point, highlight the breadth of concepts associated with DRRE, and initiate connections between DRRE and existing educational practice.

Materials and supporting resources: Post-it notes, markers, and A3 paper sheets.

Indicative output: An initial DRRE concept map.

Activity 3: Conceptual and Pedagogical Framing of DRRE

Following the concept-mapping activity, participants were introduced to the core concepts associated with Disaster Risk Reduction and Disaster Risk Reduction Education. Particular attention was given to the different types of disasters, as well as to more detailed terminology and concepts associated with earthquakes and floods. The presentation also addressed the educational importance of DRRE and its relationship with sustainable development.

Building on this conceptual foundation, participants were presented with a structured overview of the key elements required for the integration of DRRE into the curriculum. These included the definition of an appropriate thematic context; the identification of relevant curriculum subjects, units or lessons; the formulation of subject-specific learning objectives and DRRE objectives; and the identification of relevant sources and ideas. Other elements included the selection of suitable methodological approaches, teaching techniques, digital and non-digital tools, materials and resources, as well as the design of activities addressing both curriculum and DRRE objectives. The need for an appropriate pedagogical integration model capable of providing a coherent framework for the systematic and meaningful integration of DRRE activities into different curriculum subjects was also highlighted. Each of these elements was subsequently explored through relevant examples illustrating its practical application in the planning and implementation of curriculum-based DRRE activities. In response to the identified need for an integration model, the Context-Based Pedagogical Integration Model was presented and analyzed in detail. Its overall structure, core components and constituent elements were explained, with particular attention to their application in curriculum planning, the selection of pedagogical approaches and the design of DRRE learning activities. (ANNEX 3).

More specifically, the model comprises two closely interrelated components: the context and the pedagogy of the context. The context is provided by an authentic and locally relevant natural hazard issue, through which curriculum objectives and intended learning outcomes can be addressed. The pedagogy of the context encompasses the teaching approaches, methods, techniques, resources and digital tools used to transform this real-world issue into a coherent and meaningful learning experience. Through this detailed presentation, participants were encouraged to consider how DRRE could be embedded across different curriculum subjects rather than treated as a separate or supplementary area of learning.

In practical terms, the model provides teachers with a structured process for designing curriculum-based DRRE activities. Teachers begin by identifying a subject-specific learning objective and selecting an appropriate natural hazard. They then choose a suitable pedagogical approach, such as storytelling, through which the natural hazard is presented and used as an authentic context for inquiry and learning. Subsequently, they select the appropriate sources, tools, materials and other educational resources required to support the learning process. On the basis of these choices, they design the learning activity, define the expected learning product and incorporate opportunities for investigation and reflection.

The activity aimed to consolidate a shared conceptual and pedagogical understanding of DRRE and to familiarize teachers with a structured model for designing curriculum-aligned activities that address subject-specific and DRRE objectives in an integrated manner.

Materials and supporting resources: PowerPoint presentation (Annex 1).

Activity 4: DRRE Across the Curriculum: From Ideas to Classroom Action

Participants work in groups to propose practical ideas and activities for integrating Disaster Risk Reduction Education into different curriculum subjects and everyday teaching, guided by the Context-Based Pedagogical Integration Model.

Activity 5: From Pedagogical Framing to Practice: DRRE Examples and Lesson Plans

Participants were presented with practical examples and lesson plans illustrating how the conceptual and pedagogical principles of DRRE can be translated into curriculum-based classroom activities across different subjects and age groups. The examples were subsequently discussed, with emphasis on their curriculum relevance and practical classroom application.

Materials and supporting resources: PowerPoint presentation (Annex 1).

Indicative Module Outputs

By the end of the module, participants are expected to have developed:

a) an initial concept map reflecting their prior knowledge, experiences and understanding of DRRE

b) a shared understanding of the core concepts and terminology associated with DRR and DRRE, and

c) initial ideas for integrating DRRE objectives and activities into different curriculum subjects, based on the principles of the Context-Based Pedagogical Integration Model.

Module 2: Natural Hazard Scenarios and Educational Simulations

Module Description

This module familiarizes teachers with methodological approaches, techniques, and digital tools that can support the meaningful integration of Disaster Risk Reduction Education into everyday teaching. Using the 1995 Kozani - Grevena earthquake as an authentic real-world scenario, participants explore web-based resources, Google Earth, thematic maps, geospatial information and analysis, virtual and augmented reality applications, and educational simulations. Through these experiences, they examine how digital tools can make natural-hazard phenomena more accessible and tangible, support risk mapping and preparedness, and be transformed into age-appropriate learning activities aligned with curriculum and DRRE objectives.

Indicative Duration

240 minutes

Module Objectives

The module aims to:

a) develop teachers' understanding of how authentic natural-hazard scenarios can be used as meaningful educational contexts

b) familiarise teachers with the pedagogically purposeful use of geospatial, virtual reality, augmented reality, and simulation tools

c) strengthen teachers' capacity to support inquiry, risk awareness, preparedness, and spatial understanding through experiential learning, and

d) enable teachers to adapt digital resources and immersive experiences into age-appropriate, curriculum-aligned DRRE learning activities.

Methodology

The module adopts an experiential and participatory methodology that combines group work, discussion, analysis of authentic sources and examples, collaborative mapping, immersive simulation, hands-on engagement with digital tools, and reflection on their pedagogical application.

Activities

Activity 1: Exploring an Authentic Earthquake Scenario through Google Earth

The earthquake that struck the Kozani–Grevena area in May 1995 is used as the main educational scenario for the activity. Participants explore how an authentic natural-hazard event can be interpreted through scientific and geospatial information and consider how it could be transformed into an age-appropriate learning context.

(a) Introduction to the Case Study

Participants are introduced to the 1995 Kozani - Grevena earthquake through selected publications and supporting sources, together with an image presenting the "1995 Earthquake Fault Zone" in the wider Kozani - Grevena area. Working in groups, they discuss how they would explain the event to their students and how scientific and geospatial information could be translated into accessible and age-appropriate classroom language. Each group presents its ideas to the plenary, followed by discussion.

(b) Creation and Exploration of a Digital Map through Google Earth

Participants create a new project in Google Earth and progressively develop their own digital map of the 1995 Kozani - Grevena earthquake. They first use the Google Earth search function to locate Kozani city centre and Lake Polyfytos, which serve respectively as an orientation point and a major geographical reference point. They add and label these locations using placemarks.

Drawing on the coordinates, scientific information, and source image provided for the 1995 earthquake fault zone, participants then locate the approximate position of the fault in the wider Kozani - Grevena area. They enter the relevant coordinates into Google Earth, compare the resulting location with the geographical features visible on the satellite image, and adjust the placemark where necessary. They subsequently use the line or path tool to draw the indicative fault line and add a short description containing relevant information about the earthquake and the approximate displacement recorded along the fault.

Participants then examine the surrounding settlements, infrastructure, terrain, and proximity to the fault in order to identify locations that may have been more exposed or could face greater risk in the event of similar seismic activity. They add and label these areas on their map, using different placemarks, lines, or polygons where appropriate, and include brief explanatory notes describing the reasons for their selection.

Within their groups, participants compare their digital maps, discuss the criteria used to identify areas of greater exposure, and justify their decisions based on the available geographical and scientific information. Finally, they save and export the completed project as a KML or KMZ file, thereby producing a reusable digital resource that can later be adapted for classroom activities.

Objectives

The activity aims to:

a) familiarise teachers with the use of an authentic natural-hazard event as an educational context

b) develop teachers' skills in using Google Earth, geographical coordinates, and scientific sources to create and organize a digital hazard map

c) strengthen teachers' capacity to interpret geospatial information, identify areas of greater exposure, and justify their choices, and

d) demonstrate how the creation and use of KML/KMZ files can support inquiry, spatial thinking, and the integration of DRRE into different curriculum subjects.

Materials and Resources

a) Google Earth and, Google My Maps

b) worksheets containing the source image, scientific information on the 1995 earthquake fault zone, the geographical coordinates, and the tasks for locating, mapping, and analysing the fault zone (Annex 4)

c) selected publications and online resources on the 1995 Kozani - Grevena earthquake (Annex 4)

d) a separate step-by-step guide for creating, editing, labelling, saving, and exporting a digital map in KML format (Annex 4), and

e) computers or tablets with internet access.

Activity 2: Immersive Earthquake Experience through Virtual Reality

Participants watch the UNDRR video "Can Virtual Reality Teach Kids How to Stay Safe During Disasters?" and discuss the educational potential of virtual reality, sharing their views and any previous experience of using immersive technologies in teaching and learning. They then use VR headsets to view a 360° earthquake simulation set in a classroom. Through this immersive activity, participants experience a simulated earthquake in a virtual school environment.

Following the simulation, participants are invited to undertake the following tasks:

(α) Analysis of protective responses: They identify and discuss correct and incorrect actions or reactions observed during the simulation.

(β) Mapping key locations: They return to Google Earth and add relevant locations to the map, including Victory Square, Servia Bridge, their school, Mamatsio Hospital of Kozani, the Kozani Fire Service, and an indicative assembly point, such as OSE Park. Each location is clearly labelled.

(c) Design of an evacuation route: Participants design a route from their school to the selected assembly point using a line or polyline. They may add other relevant points of interest, such as squares, roads, or buildings. This is followed by a brief discussion of the safest route and the possible difficulties or obstacles that could arise during evacuation.

(d) Reflection on classroom application: Participants consider how the simulation and mapping activity could be integrated into everyday teaching, and which curriculum objectives could be addressed.

Objectives

The activity aims to:

a) enable teachers to use GIS tools and Google Earth in curriculum-based DRRE activities;

b) familiarise teachers with VR applications and their potential contribution to DRRE-related learning;

c) provide participants with an immersive earthquake-simulation experience;

d) support them in identifying appropriate protective responses during an earthquake;

e) enable them to design and examine evacuation routes using geospatial tools; and

f) strengthen their capacity to select and use VR tools in alignment with clearly defined curriculum and DRRE objectives.

Materials and Resources

a) Google Earth or My Maps

b) Worksheets (Annex 4)

c) KML File Creation Guide (Annex 4)

d) UNDRR video: "Can Virtual Reality Teach Kids How to Stay Safe During Disasters?" https://www.youtube.com/watch?v=taBvuhad21Y

e) VR headsets, smartphones and tablets

f) Virtual Reality (VR) For Earthquake Preparedness: Scenario in a Classroom» (https://www.youtube.com/watch?v=HA1kIzCoIX4)

g) "Earthquake VR Experience (360°)" video (https://www.youtube.com/watch?v=6JBA8gP2jrU)

h) Sketchfab earthquake simulation (https://sketchfab.com/3d-models/earthquake-simulation b686ebb4ab13470dbaf2956426cde095)

i) 3D Classroom: Earthquake SIZE Comparison! (https://www.youtube.com/watch?v=VHHelQVg-RM)

j) publications and reference material on the 1995 Kozani - Grevena earthquake (Annex 4).

Activity 3: Exploring Earthquake Phenomena through Augmented Reality

Participants are provided with a ready-made Merge Cube, which they use in conjunction with the Merge EDU application to explore fault mechanics, the generation and propagation of seismic waves, and the phenomena associated with the movement of tectonic plates.

Following the augmented reality experience, participants discuss how the activity could be incorporated into one of their curriculum subjects. Each group then develops a short teaching scenario illustrating how the selected AR resource could be used meaningfully in classroom practice.

Objectives

The activity aims to:

a) familiarise teachers with AR applications and their potential contribution to DRRE-related learning

b) enable teachers to select appropriate AR tools and resources for use in curriculum-based activities

c) support the pedagogically purposeful use of AR technologies in lesson planning, and

d) connect immersive digital experiences with the design of meaningful classroom learning activities.

Materials and Resources

a) Merge Cube and Merge EDU application (Merge Explorer και Merge Object Viewer)

b) selected resources from the Merge EDU Library, including:

- Seismic Waves: visualisation of the propagation of P and S waves, supporting explanations of why some areas experience stronger shaking
- Layers of the Earth: representation of the Earth's crust, mantle, and core, supporting understanding of where faults originate
- Plate Boundaries / Tectonic Plates: visualisation of lithospheric plate movement, supporting explanations of the causes of earthquakes, and
- Buildings and Structures under Stress: models illustrating how buildings respond to seismic forces and structural stress, supporting discussion of earthquake-resistant construction

Indicative curriculum connections include:

Geography:

- using coordinates and geographical reference points
- reading and creating digital maps
- analysing fault zones, exposure, infrastructure, spatial relationships, and evacuation routes

Natural Sciences:

- understanding earthquakes, faults, tectonic plates, seismic waves, energy transfer, and the effects of seismic forces on buildings and the environment

Mathematics:

- using scale and measurement
- calculating and comparing distances, route lengths, and estimated evacuation times
- interpreting numerical information

Language Education:

- reading scientific and informative sources
- translating specialised information into age-appropriate language
- developing knowledge and accurate use of specialized terminology
- describing events and routes
- producing instructions, explanations, and short reports
- using argumentation to support decision-making

ICT/Digital Technologies:

- using Google Earth, digital mapping, KML/KMZ files, virtual reality, augmented reality, and 360° simulations as learning tools

History and Local History:

- examining the 1995 Kozani - Grevena earthquake through publications, photographs, maps, testimonies, and evidence of its impact on local communities

Social and Civic Education:

- understanding the responsibilities of citizens, schools, local authorities, and emergency services
- promoting cooperation, solidarity, preparedness, and collective responsibility.

Health Education:

- recognising appropriate protective behaviour, managing emotional responses, and developing personal and school preparedness plans

Physical Education:

- practising safe and coordinated movement, evacuation procedures, cooperation, and appropriate responses to emergency instructions

Design and Technology:

- examining the response of buildings and materials to seismic forces and exploring principles of earthquake-resistant construction

Environmental Education and Education for Sustainable Development:

- investigating the relationship between natural hazards, the built environment, vulnerability, preparedness, and community resilience

Arts Education:

- using role play to explore emergency scenarios and creating maps, posters, visual instructions, models, and safety infographics

Indicative Module Outputs

By the end of the module, participants will have produced or completed:

a) an interpretation of the 1995 Kozani - Grevena earthquake adapted for classroom use

b) a digital KML map showing the fault zone and areas of greater exposure

c) a mapped evacuation route incorporating key infrastructure and possible obstacles, and

d) a curriculum-aligned teaching scenario for a specific subject area, incorporating virtual and augmented reality.

Module 3: Using Real Data in Educational Activities and Linking DRRE to the Curriculum

Module Description

The module focuses on the educational use and interpretation of authentic data, thematic maps, simulations and geospatial information within curriculum-aligned Disaster Risk Reduction Education (DRRE) activities. Participants explore how real-world data relating to earthquakes, floods, rainfall and weather phenomena can be transformed into meaningful teaching and learning resources. The Context-Based Pedagogical Integration Model is examined through practical examples that use real data from digital platforms as the thematic context for learning. Drawing on this model, the teachers subsequently design comparable curriculum-aligned activities of their own.

Module Objectives

The module aims to enable teachers to:

a) understand the pedagogical value of using authentic and locally relevant contexts to integrate Disaster Risk Reduction Education (DRRE) across curriculum subject areas;

b) identify, analyse and interpret real-world data, thematic maps, geospatial information and related visualisations concerning natural hazards;

c) transform authentic data and digital resources into pedagogically meaningful learning activities aligned with both curriculum objectives and DRRE objectives;

d) apply the Context-Based Pedagogical Integration Model to design, justify and present DRRE activities across different curriculum subject areas; and

e) reflect on the development of their understanding and critically evaluate their teaching designs by identifying challenges, necessary adaptations and opportunities for further improvement and classroom application.

Methodology

The module adopts an experiential and participatory methodology that combines group work, brainstorming, discussion, exploration of digital platforms, analysis and interpretation of authentic data, examination of practical examples, collaborative activity design, presentation, and reflection.

Indicative Duration

180 minutes

Activities

Activity 1: Thematic Maps and Geospatial Analysis

(a) Exploration of Thematic Maps and Digital Platforms

Within the context-based learning approach, participants are introduced to thematic maps presenting real-world data and explore the corresponding digital platforms. They identify and interpret key features, patterns and information represented on the maps and discuss how these data can contribute to a deeper understanding of natural hazards and disaster risk. The inquiry is guided by the question: “How can data provide a thematic context for teaching curriculum subjects while also helping us to anticipate and understand risk?”

(b) Examination of Curriculum-Aligned Examples

Participants examine examples illustrating how real-world data can be integrated into educational activities designed to support the achievement of curriculum objectives across different subject areas, while simultaneously addressing the objectives of Disaster Risk Reduction Education (DRRE).

(c) Design of Activities Based on Real-World Data

Working in groups, participants use the Context-Based Pedagogical Integration Model to design their own educational activities. Each group selects either an earthquake or a flood scenario and identifies relevant thematic maps from the digital resources provided. Drawing on the individual components and sequential stages of the model, they design learning activities for one or more curriculum subject areas, in which authentic data are used either by the teacher to explain a phenomenon or directly by students as an integral part of the learning process. Participants also transfer selected data into an Excel spreadsheet, generate graphs and interpret the resulting visualizations. During the design process, they identify the relevant curriculum and DRRE objectives, appropriate pedagogical approaches and learning activities, the required resources, the expected learning products and the assessment procedures. Each group then presents the activity it has developed to the plenary and provides a rationale for its key design and pedagogical choices.

Objectives

The activity aims to:

a) familiarise teachers with the Context-Based Pedagogical Integration Model for integrating Disaster Risk Reduction Education (DRRE) into the curriculum within the framework of STEM+ Education;

b) deepen their understanding of the approaches, methods, techniques and practices that can support the integration of DRRE activities into everyday teaching;

c) familiarise teachers with digital thematic maps and their pedagogical use in classroom practice;

d) strengthen teachers' ability to interpret data and information presented through digital thematic maps, including data relating to earthquakes and rainfall; and

e) enable teachers to use the Context-Based Pedagogical Integration Model and authentic data to design activities across different curriculum subject areas, thereby linking scientific analysis with educational practice.

Materials and Resources

- Context-Based Pedagogical Integration Model for integrating Disaster Risk Reduction Education (DRRE) into the curriculum within the framework of STEM+ Education (Annex 3)
- PowerPoint presentation (Annex 1)
- Computers with internet access and Microsoft Excel
- Earthquake-related resources: Seismoi Live, Earthquakes.gr, Seismos.gr, University of Athens Geophysics maps, EMSC-CSEM earthquake information, and NOA real-time seismicity maps (Annex 4)
- Flood-related resources: European Environment Agency Floods Viewer, and Copernicus Emergency Management Service – Global Flood data access (Annex 4)
- Weather-related resources: Meteoblue weather maps (Annex 4)

Activity 2: Guidelines for Designing and Integrating DRRE Activities into Everyday Teaching - Approaches, Methods, Techniques, and Examples

(a) Review and Enrichment of the Concept Maps

Working in groups, participants revisit the concept maps developed in Module 1 and reflect on them considering the knowledge and experiences gained through the preceding modules. They enrich, reorganise or redesign their maps to reflect their evolving understanding of Disaster Risk Reduction Education (DRRE) and its integration into the curriculum.

Participants identify the curriculum subject areas in which DRRE-related activities could be integrated and specify the curriculum objectives that could be addressed through these activities. Each group then presents its revised concept map to the plenary.

(b) Presentation of Teachers' Teaching Scenarios, Reflection and Discussion

Teachers present to the plenary the teaching scenarios they have designed, highlighting their objectives, methodology, learning activities and tools. This is followed by a reflective discussion focusing on the teachers' experiences, the challenges they encountered, the adaptations they made, and the possibilities for further improving and applying the scenarios in classroom practice.

Objectives

The activity aims enable teachers to:

a) reflect on the development of their understanding of Disaster Risk Reduction Education (DRRE) and its integration into the curriculum, identifying specific subject areas and curriculum objectives within which it may be incorporated, and

b) present and critically evaluate the teaching scenarios they have designed, identifying the challenges encountered, the adaptations made, and specific opportunities for their further improvement and application in classroom practice.

Materials and Resources

- A2 paper sheets, markers, and Post-it notes

4. EVALUATION OF THE TRAINING PROGRAMME

Brief Description

This chapter presents the evaluation of the teacher training programme on Disaster Risk Reduction Education (DRRE), drawing on data collected at different stages of the training and classroom implementation process. A mixed-methods evaluation design was adopted, incorporating a pre-training questionnaire, a post-training questionnaire administered following the completion of the first phase of the programme, and semi-structured interviews conducted with 18 teachers after they had implemented DRRE-related activities in their classrooms.

The pre-training questionnaire examined participants' existing knowledge, perceptions, teaching practices, professional learning needs, anticipated barriers, and expectations regarding DRRE. The post-training questionnaire assessed their perceptions of the quality, relevance, usefulness, and overall effectiveness of the programme, as well as their understanding of curriculum integration, their perceived capacity to design and implement relevant learning activities, and their readiness and intention to apply the knowledge, pedagogical approaches, and educational tools introduced. The interviews provided qualitative evidence concerning teachers' experiences of classroom implementation, the ways in which the training content was adapted to different educational contexts, the benefits and challenges encountered, and the perceived contribution of the activities to teaching and learning.

The chapter first describes the evaluation design, the data collection instruments, and the demographic and professional characteristics of the participants. It then presents the findings from the pre-training questionnaire, focusing on participants' baseline knowledge, perceptions, existing teaching practices, professional learning needs, and expectations. This is followed by the results of the post-training questionnaire, including the overall quantitative findings and a more detailed analysis of the programme's content and methodology, its professional relevance, the integration of DRRE into the curriculum, and the practical applicability of the educational tools and activities introduced.

The chapter subsequently brings together the pre- and post-training findings at group level in order to identify important patterns of continuity and change across the main evaluation dimensions. The themes emerging from the open-ended questionnaire responses are then considered alongside the interview findings. Particular attention is given to the practices teachers intended to adopt, their experiences of classroom implementation, the contextual factors that facilitated or constrained implementation, and their recommendations for the further development of the programme.

By combining quantitative and qualitative evidence from different stages of the programme, the evaluation enabled triangulation across data sources, methods, and phases of implementation. Taken together, the findings provide evidence concerning participants' initial professional learning needs, their immediate evaluation of the training experience, and the perceived transfer of the knowledge, pedagogical approaches, activities, and educational resources introduced during the programme into curriculum-based classroom practice.

Introduction

The evaluation of the training programme was designed to examine participants' professional learning across different stages of the training and classroom implementation process. Contemporary research on teacher professional development emphasises the importance of assessing not only participants' immediate perceptions of a training experience, but also its contribution to their professional knowledge, instructional capacity, and ability to transfer newly acquired approaches into classroom practice (Sims et al., 2025; Ventista & Brown, 2023). In the field of Disaster Risk Reduction Education (DRRE), particular

emphasis is placed on curriculum integration, the use of appropriate pedagogical approaches and technologies, and the development of knowledge and practical competencies that support preparedness and resilience (GADRRRES, 2022; Tyas et al., 2025).

Accordingly, the evaluation sought to capture participants' initial knowledge, perceptions, teaching practices, professional learning needs, and expectations before the training, their immediate assessment of the programme following the completion of its first phase, and their subsequent experiences of applying the acquired knowledge, pedagogical approaches, activities, and educational tools in classroom practice. Particular attention was given to the quality and relevance of the training content, the effectiveness of the instructional and methodological approaches employed, the appropriateness of the educational materials, and the extent to which theoretical concepts were connected with practical examples and authentic teaching situations.

A mixed-methods evaluation design was adopted, incorporating data collected through a pre-training questionnaire, a post-training questionnaire, and semi-structured interviews with 18 teachers conducted after the implementation of DRRE-related activities in their classrooms. The use of multiple methods and data sources enabled triangulation across different stages of the programme and provided a more comprehensive understanding of participants' professional learning. More specifically, the questionnaires generated quantitative evidence regarding participants' baseline characteristics, perceptions, self-reported knowledge, readiness, and intended application, while the open-ended responses and interviews provided qualitative evidence concerning their expectations, implementation experiences, adaptations, perceived benefits, challenges, and recommendations.

The pre-training questionnaire established a baseline regarding participants' existing knowledge of natural hazards and disaster preparedness, their perceptions of the importance of DRRE, their current teaching practices, the barriers they anticipated in integrating DRRE into the curriculum, and their expectations of the training programme. It therefore provided evidence concerning the professional learning needs that the programme was expected to address.

The post-training questionnaire examined participants' perceptions of the quality, relevance, usefulness, and overall effectiveness of the training. It also investigated their understanding of how DRRE could be integrated into different curriculum subjects, their perceived ability to identify connections between DRRE objectives and subject-specific learning objectives, and their readiness to design and implement relevant curriculum-based activities. In addition, it assessed the perceived usefulness and applicability of the digital tools, simulations, authentic data sources, practical examples, and experiential approaches introduced during the programme.

The interviews complemented and extended the questionnaire findings by examining teachers' experiences following classroom implementation. They explored the ways in which participants selected, adapted, and applied the training content; the extent to which activities were aligned with pupils' age, school grade, curriculum requirements, available instructional time, and technological infrastructure; and the benefits and challenges observed during implementation. The interview evidence was therefore used not only to corroborate the post-training questionnaire results, but also to explain, contextualise, and deepen their interpretation. Where relevant, the interviews also provided insights into aspects of implementation that could not be captured fully through the questionnaire data alone.

The findings are presented in a sequential and integrated manner. First, the results of the pre-training questionnaire are reported in order to describe participants' initial knowledge, perceptions, teaching practices, anticipated barriers, professional learning needs, and expectations. The findings from the post-training questionnaire are then presented, focusing on the overall evaluation of the programme, the quality and professional relevance of its content and methodology, the integration of DRRE into the curriculum, and the practical applicability of the educational tools and activities introduced.

The pre- and post-training findings are subsequently considered together at group level in order to identify important areas of continuity and difference across the principal evaluation dimensions. As the two questionnaires were completed by partially different samples and individual responses could not be matched, these comparisons are interpreted descriptively rather than as paired measures of individual change. Finally, the interview findings are integrated with the post-training results to examine how the knowledge, strategies, and resources introduced during the programme were transferred into classroom practice and to identify the factors that facilitated or constrained their implementation.

Taken together, the three sources of evidence provide a multidimensional assessment of the training programme. They allow the evaluation to consider participants' initial professional learning needs, their immediate perceptions of the training experience, and the subsequent application and contextual adaptation of the acquired knowledge, pedagogical approaches, activities, and educational resources within curriculum-based classroom practice.

Methodology

Evaluation Design and Data Sources

The evaluation adopted a mixed-methods design to examine the training programme across three successive stages: participants' initial knowledge, perceptions, teaching practices, and professional learning needs before the training; their immediate evaluation of the programme following its completion and prior to classroom implementation; and their subsequent experiences of implementing DRRE-related activities in educational practice.

Data were collected through three complementary sources: a pre-training questionnaire, a post-training questionnaire, and semi-structured interviews. The combination of quantitative and qualitative evidence enabled triangulation across data sources, methods, and stages of the programme, thereby supporting a more comprehensive interpretation of its relevance, quality, professional value, and practical applicability.

The pre-training questionnaire was completed by 127 participants before the commencement of the training programme. It was designed to establish a baseline regarding participants' existing knowledge of natural hazards, disaster preparedness, and Disaster Risk Reduction Education (DRRE). It also examined their perceptions of the importance of integrating DRRE into the curriculum, their existing teaching practices, the barriers they anticipated in implementing DRRE-related activities, and their expectations of the training programme. The questionnaire included both closed-ended and open-ended questions, allowing the quantitative data to be complemented by participants' more detailed accounts of their professional learning needs and expectations.

The post-training questionnaire was completed by 123 participants following the completion of the training programme and before the classroom implementation phase. It examined participants' perceptions of the quality, relevance, usefulness, and overall effectiveness of the training, as well as its perceived contribution to their professional learning. Particular attention was given to their understanding of curriculum integration, their perceived capacity to design and implement DRRE-related learning activities, and their views regarding the usefulness and potential applicability of the educational materials, digital tools, teaching approaches, and examples presented during the training.

Following the subsequent implementation of DRRE-related activities in classroom practice, semi-structured interviews were conducted with a subsample of 18 teachers drawn from the wider group of programme participants. The interviews provided more detailed qualitative evidence concerning how the teachers selected, adapted, and applied the knowledge, activities, pedagogical approaches, and educational tools introduced during the training. They also explored the perceived benefits for teaching

and learning, pupils' responses, the challenges encountered, and the contextual factors that influenced classroom implementation.

The three data sources served distinct but complementary purposes. The pre-training questionnaire provided evidence of participants' starting points, existing practices, anticipated barriers, and professional learning needs. The post-training questionnaire captured their immediate evaluation of the training programme, their self-reported professional learning, their perceived readiness to apply the approaches introduced, and their views regarding the potential relevance and applicability of the resources presented. The interviews provided more detailed and contextualised evidence of the subsequent implementation process and enabled the quantitative findings to be interpreted in relation to teachers' actual classroom experiences.

The integration of the findings was organised around common thematic dimensions, including participants' understanding of DRRE, curriculum integration, instructional design, the use of educational and digital tools, readiness and intention for classroom application, and the factors that facilitated or constrained subsequent implementation. The interview findings were used not only to corroborate the patterns identified in the post-training questionnaire but also to explain, contextualise, and extend their interpretation. They therefore provided insight into how the programme content was adapted and applied across different educational settings and into aspects of classroom implementation that could not be fully captured through questionnaire responses alone.

The pre- and post-training questionnaires were analysed descriptively using frequencies, percentages, and mean scores. Responses to the open-ended questionnaire items and the semi-structured interviews were analysed thematically to identify recurring patterns, intended and implemented practices, perceived benefits, implementation challenges, and recommendations for further programme development. The quantitative and qualitative findings were subsequently considered together to develop an integrated interpretation of the programme's contribution to teachers' professional learning and classroom practice.

Participants

Pre-training Questionnaire Sample

The pre-training questionnaire was completed by 127 participants, of whom 63.0% were from Greece and 37.0% from Cyprus. Women represented 72.4% of the sample and men 27.6%.

Most participants had substantial professional experience: 64.6% had more than 20 years of service, and 89.8% had worked in education for at least 11 years. Among the Greek participants, 63.7% were teachers, 25.3% headteachers, 4.4% deputy headteachers, and 6.6% held other education-related roles. All participants from Cyprus were primary school teachers.

Post-training Questionnaire Sample

The post-training questionnaire was completed by 123 participants, with 63.4% from Greece and 36.6% from Cyprus. Women accounted for 85.4% of respondents and men for 14.6%.

The group was also professionally experienced, as 54.5% had more than 20 years of service and 76.4% had at least 11 years of experience in education. Regarding professional roles, 65.9% were teachers, 22.0% headteachers, and 12.2% deputy headteachers. All primary school grade levels were represented.

Interview Participants

The interview sample consisted of 18 teachers who participated in the classroom implementation phase of the programme. Of these, 13 were women (72.2%) and 5 were men (27.8%). The interviewees constituted a subsample of the wider group of programme participants and provided more detailed accounts of their experiences in implementing DRRE-related activities in classroom practice.

Data Collection Instruments

Pre-training Questionnaire

The pre-training questionnaire was administered before the commencement of the training programme to establish a baseline regarding participants' existing knowledge, perceptions, teaching practices, professional learning needs, and expectations in relation to Disaster Risk Reduction Education (DRRE). It combined demographic and professional questions, closed-ended items, rating-scale statements, multiple-choice and multiple-response questions, and open-ended questions.

The first section collected demographic and professional information, including participants' country, gender, years of service, professional position, teaching specialisation, grade levels taught, and previous participation in Erasmus programmes.

The second section examined participants' existing knowledge and experience in relation to natural hazards, disaster prevention, preparedness, and school safety. It included questions concerning their self-assessed knowledge of natural disasters and prevention, previous participation in school emergency drills, perceptions of the most important stages of disaster risk management, and views regarding the importance of integrating DRRE into the school curriculum. These aspects were assessed through categorical and multiple-response questions, as well as five-point rating scales.

The third section focused on participants' existing teaching practices, the barriers they anticipated in integrating DRRE into the curriculum, and their perceived knowledge and capacity to implement relevant educational activities. The perceived barriers were assessed through statements rated on a five-point scale, ranging from "to a minimal extent" to "to a great extent". The frequency with which participants used interdisciplinary activities, authentic contexts, inquiry-based learning, and digital tools was assessed on a four-point frequency scale, ranging from "never/rarely" to "very frequently". Participants' perceived knowledge and capacity in relation to disaster preparedness, curriculum integration, and the design of DRRE-related activities were assessed through six statements rated on a four-point scale, ranging from "to a small extent" to "to a great extent".

The questionnaire also included open-ended questions that invited participants to identify the principal risks faced by schools during disasters and to describe what they expected to gain from the training programme. These responses provided qualitative evidence concerning participants' understanding of school-related risks, their professional learning priorities, and their expectations regarding the practical and pedagogical contribution of the programme.

Overall, the pre-training questionnaire was designed to provide a comprehensive account of participants' starting points and to identify the knowledge, skills, practices, and areas of support that the training programme was expected to address.

Post-training Questionnaire

The questionnaire was designed to investigate participants' perceptions of the quality, relevance, usefulness, and overall effectiveness of the training seminar, as well as the extent to which its content could be transferred to and applied in school practice. It was organised into three main sections: demographic and professional information, closed-ended statements, and open-ended questions.

The first section collected demographic and professional data, including participants' country, gender, age, years of service, professional position within the education system, and the grade levels they taught.

The second section consisted of 23 closed-ended statements rated on a four-point Likert scale. These statements examined the quality and relevance of the seminar content, the appropriateness of the instructional methodology and educational materials, and the extent to which theoretical concepts were connected with examples from teaching practice. They also assessed participants' understanding of how Disaster Risk Reduction Education (DRRE) could be integrated into the curriculum, their perceived ability to design and implement relevant learning activities, and their views regarding the usefulness and

immediate applicability of the tools and activities presented. In addition, this section explored participants' professional learning, their perceived readiness to apply the knowledge and strategies acquired, and their intention to incorporate them into their teaching practice.

The third section comprised four open-ended questions. These invited participants to identify the practices they intended to implement, the aspects of the seminar that warranted greater emphasis, potential areas for improvement, and additional topics that could be addressed in future training activities.

Overall, the questionnaire was designed to examine both participants' perceived quality of the training experience and the potential transfer of the knowledge, tools, and pedagogical approaches introduced during the seminar to everyday educational practice.

Semi-structured Interviews

A semi-structured interview guide was developed to explore teachers' experiences of implementing DRRE-related activities following the training programme. The instrument was designed to generate detailed and contextualised evidence regarding the transfer of the knowledge, pedagogical approaches, activities, and educational tools introduced during the training into classroom practice.

The interview guide consisted of open-ended questions organised around several thematic areas. These included the description of the activity implemented; its integration into the curriculum; the adaptation of the training content to pupils' age, learning needs, and classroom context; and the teaching approaches, educational materials, and digital tools used during implementation.

Further questions focused on pupils' engagement and participation, teachers' perceptions of the learning outcomes achieved, the aspects of the activity that worked particularly well, and the challenges encountered during planning and implementation. Participants were also invited to reflect on the contribution of the training programme to their professional learning, their confidence in integrating DRRE into their teaching, their intentions regarding future application, and the additional guidance or support that could facilitate further implementation.

The semi-structured format ensured consistency across interviews while allowing the interviewer to ask follow-up questions, seek clarification, and explore issues arising from each participant's experience in greater depth.

Data Collection Procedure

Data collection was conducted in three successive stages corresponding to the different phases of the training programme. Before the commencement of the training, participants completed the pre-training questionnaire. This first stage established a baseline regarding their existing knowledge, perceptions, teaching practices, anticipated barriers, professional learning needs, and expectations in relation to Disaster Risk Reduction Education (DRRE).

The post-training questionnaire was administered immediately after the completion of the training programme and before participants proceeded to classroom implementation. It collected evidence concerning their evaluation of the quality, relevance, usefulness, and effectiveness of the training, as well as their perceived professional learning, understanding of curriculum integration, readiness to design relevant activities, and intention to apply the knowledge, approaches, and educational tools introduced.

Following the completion of the questionnaire phase, participants implemented DRRE-related activities in their classrooms. After this implementation period, semi-structured interviews were conducted with a subsample of 18 teachers. The interviews explored how the training content had been selected, adapted, and applied in practice, as well as teachers' experiences of pupils' participation and learning, the benefits and challenges encountered, and the contextual factors that influenced implementation.

This sequential procedure enabled the evaluation to collect evidence at three distinct points: before the

training, immediately after its completion, and following classroom implementation. The data generated at these stages were subsequently considered together to examine participants' initial professional learning needs, their immediate evaluation of the programme, and the transfer of learning into educational practice.

Data Analysis

The quantitative data obtained from the pre- and post-training questionnaires were analysed using descriptive statistics. Frequencies and percentages were calculated for the demographic and professional characteristics of the participants and for the categorical and multiple-response questions. Mean scores and response distributions were calculated for the rating-scale items to summarise participants' initial knowledge, perceptions, teaching practices, anticipated barriers, and expectations, as well as their subsequent evaluation of the quality, relevance, usefulness, and effectiveness of the training programme.

The pre- and post-training findings were also examined comparatively across common thematic dimensions, including participants' understanding of DRRE, curriculum integration, instructional design, readiness for classroom application, and perceptions of the usefulness of the educational approaches and resources introduced. This comparison was used to identify broader patterns between participants' initial needs and their perceptions following the training.

The responses to the open-ended questionnaire questions and the semi-structured interviews were analysed thematically. The analysis involved repeated reading of the responses, the identification and coding of recurring ideas, and the organisation of related codes into broader thematic categories. The main themes concerned participants' expectations and professional learning needs, intended and implemented teaching practices, curriculum integration, pupils' engagement and perceived learning, the use of educational and digital tools, implementation challenges, and recommendations for further programme development.

The quantitative and qualitative findings were subsequently integrated through triangulation. Evidence from the pre-training questionnaire, the post-training questionnaire, and the interviews was compared across the main evaluation dimensions to identify areas of convergence, complementarity, and further explanation. The interview findings were used to contextualise and extend the questionnaire results by providing more detailed evidence of how the knowledge, pedagogical approaches, activities, and resources introduced during the training were adapted and applied in classroom practice.

Results

Pre-training Questionnaire Findings

Baseline Knowledge, Preparedness, and Perceived Importance of DRRE

Participants entered the programme with moderate self-assessed knowledge of natural disasters and prevention measures (M = 3.32/5), but with substantial practical experience of school preparedness: 70.1% had frequently participated in emergency drills and 28.3% had done so occasionally. They also strongly supported the integration of DRRE into the curriculum (M = 4.52/5), with 94.5% selecting one of the two highest response categories. Overall, the group combined positive attitudes and practical familiarity with a clear need to strengthen its conceptual and pedagogical understanding of DRRE.

Perceptions of Disaster Risk Management and School-related Risks

Participants primarily associated disaster risk management with prevention (86.6%) and preparedness (72.4%), while response (24.4%), evaluation and feedback (8.7%), and recovery (3.9%) were selected less often. Their open-ended responses identified three main categories of school-related risk: injuries, entrapment and evacuation difficulties; panic, fear and possible psychosocial consequences; and damage

to buildings, infrastructure and equipment. These findings indicate strong awareness of immediate safety and anticipatory action, but a less developed understanding of the full disaster risk management cycle.

Perceived Barriers to the Integration of DRRE into the Curriculum

The principal barriers were structural and professional. Limited curriculum time was rated most strongly (M = 4.04/5; 77.2% to a considerable or great extent), followed by insufficient educational materials (M = 3.86; 67.5%) and limited teacher training or knowledge (M = 3.79; 67.5%). By contrast, limited support from school leadership (M = 2.62), pupils (M = 2.95), or parents and guardians (M = 2.63) was viewed as less significant. The results therefore pointed to the need for practical resources, curriculum-linked examples and focused pedagogical guidance rather than to a lack of willingness within school communities.

Existing Teaching Practices and Perceived Capability

Participants already reported frequent use of pedagogical approaches compatible with the programme: realistic contexts (72.4%), interdisciplinary activities (71.7%), inquiry-based learning (70.9%), and digital tools (83.5%). Their perceived capability was strongest in earthquake protection (M = 3.76/5), general school preparedness (M = 3.49), and the identification of relevant educational activities (M = 3.46). Lower scores concerned curriculum integration (M = 3.34), flood protection (M = 3.20), and the explicit connection of hazard-related activities with curriculum content (M = 3.19). The overall mean across the six capability items was 3.42/5, indicating a sound pedagogical starting point but a need for more systematic curriculum-based instructional design.

Expectations Regarding the Training Programme

The open-ended responses showed that participants expected both conceptual knowledge and directly applicable support. Their priorities included practical teaching strategies, adaptable lesson plans and materials, simulations and experiments, interdisciplinary and STEAME-based approaches, digital tools, and guidance for developing pupils' preparedness, resilience, critical thinking, problem-solving and self-protection. These expectations were closely aligned with the programme's emphasis on curriculum integration, experiential learning and the purposeful use of educational resources.

Post-training Questionnaire Findings

Following the analysis of participants' baseline knowledge, perceptions, existing teaching practices, professional learning needs, and expectations, the evaluation proceeded to examine their responses immediately following the completion of the training programme. The post-training questionnaire therefore provided evidence concerning participants' evaluation of the training experience, their perceived professional learning, their understanding of curriculum integration, and their views regarding the relevance and potential applicability of the knowledge, pedagogical approaches, activities, and educational tools introduced during the programme.

Overall Results

Content, Methodology, and Professional Relevance

The quality and relevance of the training content were evaluated very positively. Specifically, 94.3% of participants reported that the content met their expectations, while 92.7% indicated that it addressed their educational needs.

Similarly positive findings emerged in relation to the instructional and methodological dimensions of the training programme. The teaching and methodological approaches were considered effective by 95.9% of participants, while 92.7% regarded the overall methodology as appropriate. In addition, 95.1% positively evaluated the use of practical examples to support and clarify the theoretical content, and 94.3% considered the educational materials appropriate.

A particularly strong aspect of the programme was its connection with educational practice. A total of 97.6% of participants identified a clear link between the seminar content and everyday teaching situations, while the same proportion reported that they had acquired ideas and strategies that they intended to apply in practice. Furthermore, 94.3% described the seminar as both engaging and useful for their professional learning. Taken together, these findings indicate that the training programme successfully combined relevant content, appropriate methodological approaches, and practical applicability.

Integration of DRRE into the Curriculum

The training programme made a substantial contribution to participants' understanding of how Disaster Risk Reduction Education (DRRE) can be integrated into the curriculum. Specifically, 94.3% reported that they had developed a clearer understanding of how DRRE could be incorporated into different subjects, while the same proportion identified opportunities for its inclusion in everyday teaching practice.

Building on this enhanced understanding, 91.1% indicated that they were now able to identify specific points of connection between DRRE and the content of different curriculum subjects. In addition, 95.1% reported increased awareness of the importance of integrating DRRE systematically into the curriculum, while 97.6% stated that they had gained practical ideas for incorporating relevant themes into their teaching.

With regard to the transition from conceptual understanding to comprehensive lesson design, 87.8% reported that the training had strengthened their ability to design activities combining DRRE objectives with subject-specific learning objectives. Furthermore, 86.2% felt capable of designing a complete curriculum-based lesson, while 88.6% indicated that they were ready to implement DRRE-related activities in their everyday teaching practice. These findings suggest that the programme supported not only participants' conceptual understanding of curriculum integration but also their capacity and readiness to translate this understanding into instructional planning and classroom practice.

Practical Application and Educational Tools

All participants (100%) evaluated the examples, practices, and teaching techniques presented during the training positively. In addition, 78.0% considered the tools introduced to be applicable to everyday teaching, while 78.9% indicated that the proposed activities could be used directly in the classroom. A further 83.7% reported that the training materials as a whole could support their daily educational practice.

These findings indicate that participants recognised the educational value and practical potential of the materials and approaches presented. At the same time, their effective classroom implementation may require adaptation to the age and learning needs of the students, the subject area, the available instructional time, and the technological infrastructure of each school.

Findings from the Open-ended Questions

The responses to the open-ended questions further reinforced the positive evaluation of the training seminar. Participants appreciated the experiential, inquiry-based and collaborative character of the programme, and they most frequently reported that they intended to incorporate the following approaches and resources into their teaching practice:

a) virtual and augmented reality applications;

b) simulations, experiments, and model-building activities;

c) digital maps, Google Earth, and other geospatial tools;

d) authentic data and information sources related to natural hazards;

e) interdisciplinary STEAME scenarios as practices and

f) preparedness and protective-action activities focusing on earthquakes and floods.

The main suggestions for improvement concerned the provision of additional time for hands-on practice, and more extensive familiarisation with the digital tools introduced. They also requested a greater number of fully developed lesson plans and additional ready-to-use examples differentiated according to pupils' age, school grade and curriculum subject, and more guidance on the assessment of pupils' learning outcomes. Some participants also highlighted the need to consider the availability of technological equipment in schools and to present alternative activities that can be implemented using simpler resources.

Nevertheless, several participants indicated that they did not identify any areas requiring substantial improvement. Taken together, the qualitative findings suggest that participants valued both the practical orientation of the seminar and the range of resources presented, while also highlighting the importance of further opportunities for guided application and contextual adaptation.

Overall, the training programme can be evaluated as relevant, engaging and effective in supporting teachers' professional learning and in providing practical ideas for curriculum-based Disaster Risk Reduction Education. Its main strengths were the connection between theory and classroom practice, the use of innovative digital tools and authentic scenarios, and the promotion of experiential and interdisciplinary learning. Future implementations could further enhance the programme by providing extended practical workshops, differentiated lesson examples, ready-to-use educational resources and structured follow-up support during classroom implementation.

Interview Findings

The thematic analysis of the semi-structured interviews with 18 teachers showed a consistently positive assessment of classroom implementation. Across the participating schools, teachers described the activities as relevant, meaningful and closely connected with pupils' experiences and local communities. The findings are summarized below around four interrelated themes.

A particularly prominent and consistent finding across all interviews was the substantial strengthening of professional collaboration among teachers during both the planning and implementation of the activities. All the teachers interviewed emphasized this development, describing collaboration not as a peripheral feature of the programme but as a central element of the implementation process.

Authentic Contexts, Curriculum Integration, and Adaptation

Teachers emphasised the value of examining earthquakes, floods, preparedness and protection through authentic local situations rather than as abstract topics. DRRE was integrated into existing subjects, including Science, Geography, Language, Mathematics, Environmental Education, ICT and creative subjects, enabling curriculum objectives to be addressed through real-world problems. Implementation was not uniform: teachers adapted the content, complexity, methods, resources and expected outcomes to pupils' age, prior knowledge and abilities, as well as to curriculum requirements, available time and school infrastructure.

Experiential Learning, Pupil Engagement, and Perceived Outcomes

The implemented activities were predominantly experiential, inquiry-based, interdisciplinary and collaborative. Pupils investigated information, discussed real situations, formulated questions, justified choices, proposed protective measures and produced tangible learning outcomes, with digital tools used where they served clear pedagogical purposes. Teachers reported high levels of interest and active participation and perceived gains in understanding natural hazards and preparedness, as well as in collaboration, communication, critical evaluation of information, problem-solving, evidence-informed decision-making, creativity and responsible attitudes towards personal and collective safety. The teachers' accounts during the interviews were based both on their observations from the implementation

of the activities in the classroom and on data they had collected directly from their pupils. Although these outcomes were not derived from standardized assessments, they were reported consistently across the interviews.

Professional and Community Collaboration

One of the most strongly and consistently emphasised outcomes across the entire interview sample was the development of collaboration among teachers. All teachers reported that the collective planning, adaptation and implementation of the activities intensified communication, the exchange of expertise, shared decision-making and mutual support among colleagues. In several cases, this collaboration extended across subjects and classes, enabling teachers to combine different areas of expertise and develop more coherent and interdisciplinary learning experiences. Teachers considered this collaborative process an important form of situated professional learning that extended beyond the formal training. It therefore functioned not merely as an organisational mechanism for implementing the activities but also as a significant professional learning outcome in its own right.

Beyond collaboration within the school, cooperation with civil protection services, fire services, municipal authorities and other local organisations further strengthened the authenticity of the activities. These partnerships enabled pupils to understand more clearly the shared responsibilities of schools, families, citizens and public services in disaster preparedness and risk reduction. Teachers also noted that pupils could transfer the safety knowledge they acquired to their families, thereby contributing to the development of a broader culture of preparedness and resilience within the community.

Implementation of Challenges and Conditions for Sustainability

The main challenges concerned limited instructional time, additional preparation, coordination among teachers and external organizations, adaptation of materials, management of group work, and access to suitable resources, digital equipment and technical support. Although these activities generally required more time than conventional teaching, teachers considered the resulting pupil engagement and educational value to justify the additional effort. Importantly, they distinguished between the practical demands of coordination, which could complicate implementation, and professional collaboration, which they consistently regarded as a major benefit and a key enabling condition for successful implementation. For sustained implementation, they therefore recommended age-appropriate materials, explicit curriculum links, continued professional guidance, sufficient time for collaborative planning, adequate infrastructure, stable partnerships with local services and opportunities to exchange effective practices.

Overall Interpretation of the Interview Findings

Overall, the interviews confirmed that the programme's central pedagogical principles, including authenticity, curriculum integration, experiential and inquiry-based learning, interdisciplinarity and collaboration, were transferred into classroom practice. They also extended the post-training questionnaire findings by showing that successful implementation depended on contextual adaptation, organizational support and opportunities for collaborative planning. Among these principles, strengthened teacher collaboration emerged as one of the clearest and most consistently reported outcomes. Collaborative planning and implementation created sustained opportunities for peer learning, shared problem-solving, the exchange of expertise and interdisciplinary cooperation. In this respect, the programme's impact extended beyond individual teachers' classroom practices and contributed to the professional learning and collaborative culture of the participating schools. The longer-term sustainability of these practices will nevertheless require continued pedagogical guidance, adaptable resources, sufficient time for collaborative planning and stronger links between schools and their local communities.

Integrated Discussion and Triangulation

The integrated findings indicate a coherent progression from participants' initial professional learning needs to positive post-training outcomes and subsequent classroom application. Before the training, participants already recognised the importance of integrating Disaster Risk Reduction Education (DRRE) into the curriculum, as reflected in the high mean score of 4.59 out of 5 and the 94.4% of respondents who selected one of the two highest response categories. They also had considerable experience of school preparedness exercises, with 70.0% reporting frequent participation in emergency drills. However, their self-assessed knowledge of natural hazards and prevention was more moderate (M = 3.37/5), indicating that practical familiarity with emergency procedures was not necessarily accompanied by an equally developed conceptual and pedagogical understanding of DRRE.

Participants entered the programme with a favourable pedagogical foundation. Frequent or very frequent use was reported for digital tools by 81.1%, authentic thematic contexts by 72.2%, inquiry-based activities by 71.1%, and interdisciplinary teaching by 68.9%. Nevertheless, their perceived capability varied considerably across different dimensions of DRRE. Confidence was strongest in describing classroom protection measures during earthquakes (M = 3.98/5), whereas the lowest rating concerned the identification of pedagogical activities explicitly connecting earthquakes or floods with curriculum content (M = 3.14/5). Knowledge of how DRRE could be integrated across curriculum subjects was also comparatively moderate (M = 3.33/5). These findings identified a specific need to move beyond general preparedness and support teachers in translating DRRE concepts into subject-specific objectives, coherent learning activities, and structured classroom practice.

The barriers reported before the programme further clarified the conditions affecting implementation. Limited curriculum time emerged as the most prominent constraint (M = 4.06/5), followed by insufficient educational materials (M = 3.83) and inadequate teacher training or knowledge (M = 3.79). By contrast, limited support from school leadership and low interest among pupils or parents were perceived as less significant. The open-ended responses were consistent with this pattern, as participants expected practical strategies, adaptable lesson plans, authentic data, digital tools, interdisciplinary approaches, and structured guidance for classroom implementation. Thus, the initial findings suggested that teachers were motivated to engage with DRRE but required pedagogical and material support to integrate it systematically into existing curriculum requirements.

The post-training results suggest that the programme responded effectively to these needs. The overall mean across the 23 evaluation items was 3.76 out of 4, with 91.9% of responses concentrated in the two positive categories. Participants evaluated particularly positively the connection between theoretical content and classroom practice, the instructional approaches employed, and the practical examples provided. More specifically, 94.3% reported a clearer understanding of how DRRE could be integrated into different curriculum subjects, 91.1% felt able to identify relevant connections with curriculum content, and 87.8% indicated that the programme had strengthened their capacity to combine DRRE and subject-specific learning objectives. In addition, 86.2% felt capable of designing a complete curriculum-based lesson, while 88.6% expressed readiness to implement relevant activities. These findings indicate development primarily in the areas in which the pre-training questionnaire had identified the greatest need: curriculum integration, instructional design, and practical application.

The results concerning practical applicability were positive but also showed that implementation required contextual adaptation. Although the examples and teaching techniques were evaluated very favourably, ratings concerning the direct use of tools and activities in everyday teaching were somewhat less pronounced. Participants also requested more time for hands-on familiarisation, additional ready-to-use and age-differentiated lesson plans, guidance on assessing pupil learning, and alternatives for schools with limited technological resources. These responses suggest that the programme provided a strong pedagogical foundation but that the direct transfer of specific resources depended on curriculum demands, available time, technological infrastructure, and the characteristics of each classroom.

The interviews with 18 teachers confirmed that the training principles were subsequently transferred into classroom practice. Teachers integrated DRRE into different subject areas and adapted the content, resources, level of complexity, and expected learning products to pupils' age, prior knowledge, abilities, and curriculum requirements. The activities drew on authentic natural-hazard contexts, inquiry, experiential learning, collaboration, digital resources, and interdisciplinary connections. Teachers reported high levels of pupil engagement and perceived improvements in understanding natural hazards, preparedness, and protective behaviour, as well as in collaboration, critical thinking, problem-solving, communication, and responsible decision-making. These outcomes represent teachers' professional observations rather than independently measured changes in pupil achievement, but their recurrence across the interviews provides qualitative support for the educational relevance of the implemented activities.

Equally importantly, every interviewed teacher highlighted a marked strengthening of collaboration among colleagues during the joint planning, adaptation and implementation of the activities. This collaboration involved regular exchange of ideas and materials, shared decision-making, coordination across subjects or classes and mutual support in addressing implementation challenges. Its unanimous and emphatic recurrence across the interviews indicates that the programme contributed not only to individual teacher capacity but also to collective professional learning and school-level collaborative practice.

At the same time, the interviews confirmed several of the constraints announced before the training. Limited instructional time, increased preparation demands, the adaptation of materials, coordination among teachers and unequal access to technological equipment or technical support affected implementation. Although coordination created additional organizational demands, teachers consistently distinguished these practical requirements from the educational and professional value of collaboration itself, which they regarded as a major benefit and a key facilitator of successful implementation. Conversely, age-appropriate and curriculum-aligned resources, continued pedagogical guidance, sufficient time for collaborative planning, adequate infrastructure and cooperation with external organizations supported classroom application. The consistency of these findings across the pre-training questionnaire, the post-training responses and the interviews indicate that the principal challenges concerned the structural and organizational conditions of implementation rather than limited teacher or pupil interest.

Overall, the triangulation of the three data sources demonstrates substantial convergence and complementarity. The pre-training questionnaire identified strong motivation and relevant prior pedagogical experience, together with specific needs relating to conceptual understanding, curriculum integration, instructional design, materials and implementation support. The post-training questionnaire showed that participants perceived meaningful development in these areas, while the interviews provided evidence that the approaches introduced during the programme were subsequently adapted and applied in classroom settings. The qualitative findings further extended the questionnaire results by explaining how implementation was shaped by pupils' characteristics, curriculum requirements, available resources and school conditions. They also revealed an important outcome that was not captured fully by the questionnaire data: the pronounced strengthening of professional collaboration among teachers. As this development was consistently and strongly emphasized by all interviewees, it provides compelling qualitative evidence that the programme supported not only individual professional capacity but also collective planning, peer learning, shared problem-solving and interdisciplinary cooperation within the participating schools. Since the pre- and post-training responses could not be matched at the individual level, the questionnaire patterns should nevertheless be interpreted as descriptive group-level differences rather than direct measurements of individual change.

Conclusions and Recommendations

The evaluation findings indicate that the training programme addressed clearly identified professional learning needs in Disaster Risk Reduction Education. Although participants entered the programme with positive attitudes towards DRRE, substantial experience of school preparedness exercises and familiarity with active and digitally supported teaching approaches, their confidence was less developed in relation to curriculum integration, flood-related preparedness and the design of activities explicitly linking DRRE with subject-specific objectives. This finding is consistent with previous research identifying uneven teacher preparation, fragmented provision and continuing difficulties in integrating DRR systematically into curriculum subjects and classroom practice (Selby & Kagawa, 2012; Tyas et al., 2025).

The post-training findings suggest that the programme strengthened participants' understanding of curriculum-based DRRE, their perceived capacity to identify relevant curriculum entry points and their readiness to design and implement integrated learning activities. This outcome supports the view that effective DRRE teacher education should combine conceptual understanding with curriculum design, authentic natural-hazard contexts and practical classroom application rather than remain limited to general awareness raising (Kawasaki et al., 2022; Park et al., 2024, 2025; Oda & Ichinose, 2025). It is also consistent with the Comprehensive School Safety Framework, which emphasises the importance of developing teachers' professional capacities as part of a systematic approach to school safety and resilience (GADRRRES, 2022).

The classroom implementation reported through the interviews further indicates that teachers were able to transfer the programme's central pedagogical principles into different subjects and educational settings. Activities were adapted to pupils' age, prior knowledge, curriculum requirements and available resources, demonstrating that effective DRRE integration requires flexible and context-sensitive instructional design. The use of authentic events, inquiry, interdisciplinary learning, collaboration and reflection corresponds closely with the approaches identified in the literature as important features of meaningful DRRE professional learning (Kitagawa, 2023; Park et al., 2024, 2025; Oda & Ichinose, 2025).

The positive use of thematic maps, authentic datasets, digital mapping, simulations and immersive technologies also supports research highlighting the educational value of scientific and geospatial information for investigating natural hazards and developing hazard literacy (Li et al., 2022; Lee et al., 2025). However, the comparatively more moderate ratings concerning the direct applicability of some tools, together with the implementation challenges identified in the interviews, demonstrate that technology does not in itself ensure meaningful learning. Its effectiveness depends on explicit learning objectives, pedagogically appropriate use, teacher familiarity, adequate infrastructure and adaptation to the classroom context.

The findings further show that the sustainability of curriculum-based DRRE depends on both teacher competence and supportive implementation conditions. Limited curriculum time, preparation demands, insufficient materials and unequal access to technological resources were identified as continuing constraints. Conversely, practical and differentiated resources, collaborative planning, expert guidance, feedback and continuing support facilitated implementation. This pattern is consistent with the broader literature on effective professional development, which identifies active learning, collaboration, modelling, expert support, feedback, reflection and sustained duration as important conditions for changes in teaching practice (Darling-Hammond et al., 2017). It also reinforces the argument that DRRE professional development should be systematic and sustained rather than delivered through isolated training events (GADRRRES, 2022; Marzban et al., 2026).

Future implementations should therefore maintain the programme's experiential, interdisciplinary, context-based and practice-oriented structure while providing additional opportunities for supported lesson design and classroom experimentation. Particular emphasis should be placed on developing age- and subject-specific lesson plans, ready-to-use and adaptable resources, assessment tools, non-digital

alternatives for schools with limited infrastructure, and structured opportunities for peer collaboration, feedback and reflection. Continued pedagogical support during classroom implementation would further strengthen the transfer of professional learning into practice.

The findings should be interpreted in relation to the evaluation design. As the pre- and post-training responses could not be matched at the individual level, the observed patterns represent group-level differences rather than direct measures of individual change. The questionnaire findings were complemented by interviews, teachers' classroom observations and data collected by the teachers from their pupils, providing multiple sources of evidence regarding the implementation and perceived outcomes of the programme. Future evaluations could build on this evidence through matched pre- and post-training measures, systematic classroom observations and longer-term follow-up of teaching practices and pupil learning outcomes. Such approaches would further strengthen the assessment of the effectiveness and sustainability of DRRE educational interventions (Canlas, 2023; Sims et al., 2025; Ventista & Brown, 2023).

Overall, the convergence of the questionnaire and interview findings provides credible evidence that the programme responded to participants' initial needs, strengthened their perceived capacity to integrate DRRE into the curriculum and supported the contextual adaptation of its principal pedagogical approaches in classroom practice. In this respect, the findings reinforce international guidance positioning education, teacher capacity building and curriculum integration as central components of disaster preparedness, risk reduction and the development of resilient school communities (UNDRR, 2015; GADRRRES, 2022).

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ANNEXES

ANNEX 1

Power Point Presentation:

"STEAME for Saving Life: Guidelines for developing and implementing Disaster Risk Reduction Education in Elementary School Curriculum"

ANNEX 2

Integrating Disaster Risk Reduction Education (DRRE) into Everyday Teaching

Goals and Objectives of DRRE

Disaster Risk Reduction Education (DRRE) aims to:

- reduce the vulnerability of individuals and communities;
- promote prevention and preparedness at all levels (school, family, community and society); and
- foster a culture of safety and sustainability that supports sustainable development and human well-being.

Overall aim within the school context

- To foster a culture of prevention, preparedness and resilience in relation to natural hazards (earthquakes, floods, wildfires, extreme weather events, etc.), enabling students to prepare for and respond effectively to such events.

Dimension	Specific objectives
Cognitive dimension – Knowledge and understanding	Students: • Understand what natural phenomena are and which of them may develop into disasters • Understand the causes, consequences and mechanisms of natural hazards • Identify vulnerable locations in their immediate environment (school, neighbourhood and community) • Know the prevention and protection measures to be taken before, during and after an event • Understand the importance of scientific information and hazard mapping
Skills dimension – Application and action	Students: • Practise essential safety and evacuation skills • Learn to use digital and geospatial tools (e.g. maps, simulations, AR/VR) to understand natural phenomena • Develop observation, data-analysis and decision-making skills • Work collaboratively to develop school action or evacuation plans • Apply interdisciplinary knowledge (geography, science, language and social education) to solve relevant problems and respond to realistic situations
Affective and social dimension – Attitudes and values	Students: • Develop responsibility, solidarity and empathy • Understand the importance of teamwork and communication in critical situations • Recognise their role as active and informed members of the community • Develop a positive attitude towards prevention and preparedness, based on awareness rather than fear • Strengthen their psychological resilience and self-confidence in crisis situations

Dimension	Specific objectives
Institutional dimension – School culture and organisation	The school: • Integrates DRR into subjects and learning activities (e.g. lesson plans and projects) • Develops a School Emergency Plan and puts it into practice through drills • Builds collaborative networks with local authorities, the fire service, civil protection agencies and parents • Becomes a focal point for community information and awareness-raising.

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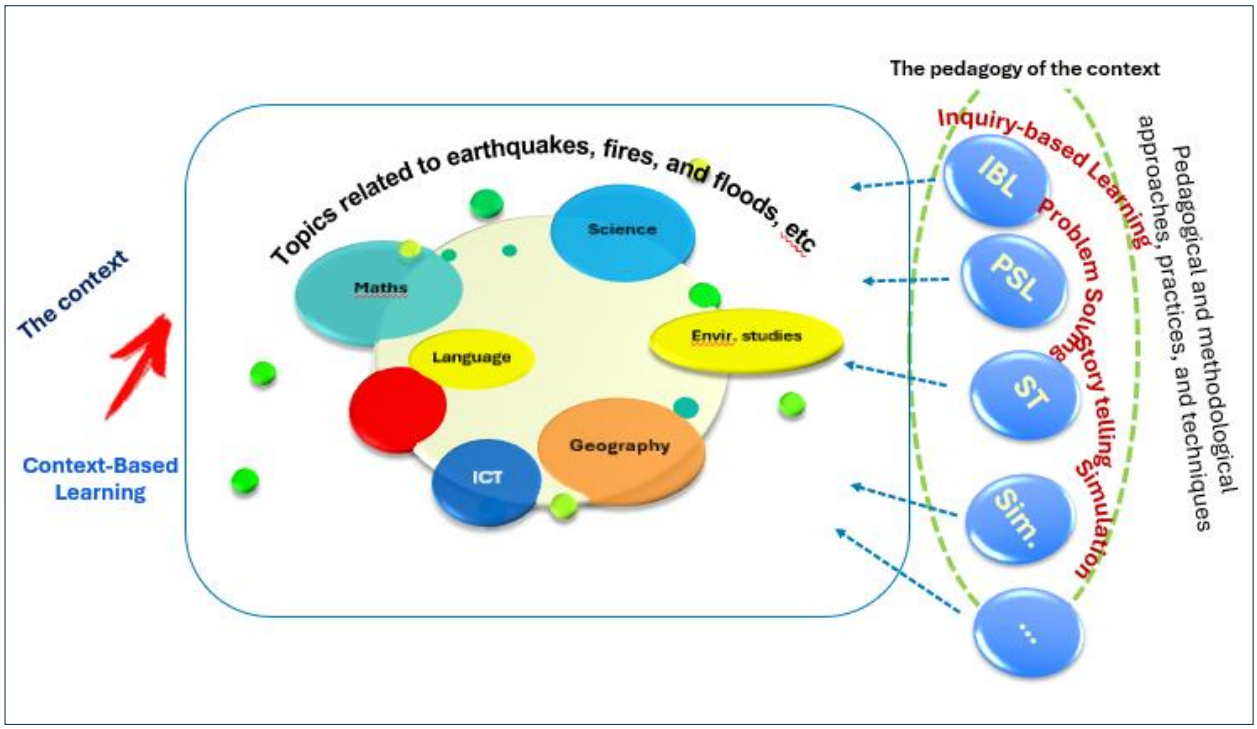
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ANNEX 3

A Context-Based Pedagogical Integration Model for Integrating DRRE Activities into Curriculum Subjects



All cognitive, social, and values-based dimensions of students' education are interconnected.

Process for Integrating Disaster Risk Reduction Education (DRRE) into Everyday Teaching

Steps	***Action***
Step 1	Select the subject and unit and choose a natural phenomenon as the learning context (linking the phenomenon/hazard to the subject). *The phenomenon serves as the "canvas" on which the learning activities are built*.
Step 2	Define the core learning objectives of the subject: what students are expected to learn in accordance with the curriculum (knowledge, processes, skills and attitudes).
Step 3	Link the activity to DRR objectives: selected DRR objectives are integrated into the learning objectives of the subject.
Step 4	(a) Design DRR activities that simultaneously address the objectives of both the subject and DRR. *How can the subject content be meaningfully connected with DRR? Identify one or more activities that combine curriculum and DRR objectives.*
	(b) Select appropriate methods, approaches and tools. *These may include cooperative learning, experiential learning, role-play, storytelling, experiments and digital tools.*
Step 5	Implement the activity in the classroom. *The DRR activity is embedded within the lesson rather than delivered as a separate, additional activity.*
Step 6	Reflection and connection with everyday life.
Step 7	Assessment. *Assessment may involve a game, a concept map, a poster or infographic, the writing of instructions or rules, and other suitable learning products*.

ANNEX 4

WORKSHEETS

Activity 1: The Great Earthquake of 13 May 1995- Natural-Hazard Scenarios and Educational Simulations

(a) Use the photograph below, bearing the caption "1995 Earthquake Fault Zone", and study the related publications (Table 1). The photographs show the fault zone associated with the earthquake of May 1995.

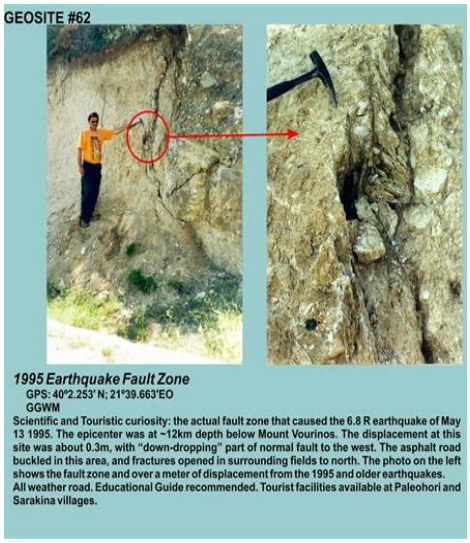
(b) Create an infographic in which the following are presented briefly:

(i) the characteristics of the earthquake (date, time, magnitude, focal depth, estimated fault length, estimated average displacement (slip) along the fault);
(ii) the impacts and damage;
(iii) testimonies of residents of the area.

You will need: Post-it notes, markers, and A3/A2 paper.

(c) How would you use this activity to explain to children what happened?

(d) In which subjects could you use it, and which objectives are expected to be achieved?



Activity 2: "Mapping" the Fault Zone of the Kozani–Grevena Earthquake

(a) (i) Open Google Earth and locate the following:

- Kozani – City Centre (for orientation)
- Lake Polyfytos – indicative central point (as a reference to flood risk)
- the 1995 fault (approximately)
- the indicative 1995 fault line

(ii) In each case, add a placemark and label it accordingly. Relate your points to the information in the image from the publication "1995 Earthquake Fault – Kozani–Grevena (approximation)":

Coordinates: approximately 40.03755°N, 21.66105°E, corresponding to 40°2.253' N, 21°39.663' E.

(The offset/displacement at the fault was approximately 0.3 metres (down-dropping).)

(iii) Save your file as a KML file (information is provided below).

(b) Identify the areas located closest to the fault and the areas that would face greater risk (fault analysis), and mark and label them on the map.

(c) State how this activity could be used in everyday teaching, in which subjects, and which curriculum and DRREC objectives could be achieved.

Activity 3: Experiential VR Experience – Earthquake Simulation

(a) Put on the VR headsets, watch a 360° earthquake simulation set inside a classroom, and identify correct and incorrect movements/reactions.

(b) Watch the video below, which relates earthquake magnitude to its consequences.

- "3D Classroom: Earthquake SIZE Comparison!" (https://www.youtube.com/watch?v=VHHelQVg-RM)

State how the simulations and the video could be used in everyday teaching, in which subjects, and which curriculum and DRREC objectives could be achieved.

Activity 4: Evacuation Route

(a) Return to Google Earth and mark and label additional key elements on the map, such as:

- Victory Square
- Servia Bridge
- your school
- Mamatsio Hospital of Kozani
- the Kozani Fire Service
- an assembly point (OSE Park, indicatively)

(b) Design an evacuation route (a polyline or straight line, depending on the route) from your school to the assembly point (LineString). If you wish, you may add your own "Points of Interest" (e.g. another square, road, or building) that you consider important in the context of the evacuation route. You may consult the "Xenokratis Plan".

(c) Discuss in your group which route is the safest. What problems could arise?

(d) State how such a simulation could be used in everyday teaching, in which subjects, and which curriculum and DRREC objectives could be achieved.

Activity 5: Familiarization with AR Digital Tools (Merge EDU)

(a) Download the Merge Explorer and Merge Object Viewer applications to your mobile phone.

(b) Use the cube and the AR applications to view the following:

From Merge Explorer

(i) Terraforming Earth

- Journey to the Core (Structure of the Earth)
- The Art of Subduction (Subduction)

(ii) We're Makin Waves

- wave-o-Rama (propagation of seismic waves)

(iii) Predicting Catastrophe

- Interactive Seismograph (seismograph)

From Merge Object Viewer

(i) Geology

- the formation of an earthquake
- faults
- tectonic plates
- the movement of waves, etc.

(c) Observe and note what happens when the lithospheric plates move.

(d) Discuss in your group how you would use this activity in one of your subjects. Create a short teaching scenario.

Activity 6: Designing Activities

Using real-world data and information on earthquakes, floods, rainfall and weather-related hazards obtained from digital platforms (see Table 2) design at least one complete activity aimed at achieving the objectives of specific curriculum subjects and DRRE.

Activity 7: Cyprus

Identify equivalent data and information relating to Cyprus and design activities like Activities 2-5.

KML File Creation Guide

Using Google Earth and Google My Maps

KML is a geographic data file format. It can contain points, lines, routes, polygons, labels, and descriptions, and it can be opened in digital mapping applications.

A. Creating a KML File in Google Earth

1. Open Google Earth.

2. Select the “Explore Earth” link.

3. Search for the town, city, or area you wish to map.

4. Add map features from the “Add” menu:
   - Select “Add → Placemark” to add and label a point.
   - Select “Add → Path” to draw a line or route.

5. Save your file. When you have completed the map, right-click the item or folder you created and select “Save Place As…”.

6. Select the .KML format and save the file to your computer.

Useful reminder: Before saving, check that all points and lines have clear labels and, where appropriate, a brief description.

B. Creating a KML File in Google My Maps

1. Open Google My Maps.

2. Sign in to your Google account, if you are not already signed in.

3. Select “Create a new map”. A blank map will appear.

4. Add your data:
   - Add a marker (point): select the marker icon and place it at the required location.
   - Add a line or route (line): select the line icon and draw a route or the boundary of an area.
   - Add a polygon: define the boundaries of an area, such as a flood zone or a school area.
   - You can change the colour, name, and description of each feature.

5. Export the map as a KML file. Select the three dots next to the layer name, then choose “Export data” → “Download as .KML”.

C. Using and Importing Data

Opening a KML File

- A .KML file can be opened in Google Earth, either in the web version or the desktop application.
- It can also be opened in GIS software such as ArcGIS or QGIS.

Importing Data from Excel or CSV

1. Organise your data in a CSV file using columns such as Name, Latitude, and Longitude.

2. In Google My Maps, select “Import” and upload the CSV file.

3. The points will be placed automatically on the map according to their coordinates.

4. When the map is complete, export it in .KML format.

Publications/Sources on the 1995 Kozani Earthquake

Table 1

Earthquake Planning and Protection Organisation (OASP) Κοζάνη 1995 (VIII) | Ο.Α.Σ.Π.	On its website, under the section "Kozani 1995 (VIII)", it states that "a strong earthquake (M = 6.6) struck Grevena and Kozani on 13 May 1995." oasp.gr
Wikipedia – 1995 Kozani–Grevena Earthquake **https://en.wikipedia.org/wiki/1995_Kozani%E2%80%93Grevena_earthquake?utm**	The event is presented as a major earthquake that occurred on 13 May 1995 in Western Macedonia, with a magnitude of 6.5–6.6, a focal depth of approximately 14 km, and damage amounting to millions of dollars. Wikipedia
Chronos Kozanis **27 χρόνια από το μεγάλο σεισμό της 13 Μαίου του 1995 - xronos-kozanis**	It reports that "in the Prefecture of Kozani, 7,693 houses in 30 communities either collapsed or sustained damage" as a result of the 1995 earthquake. xronos-kozanis.gr
News Article – "13 May 1995: The Major Earthquake in Kozani and Grevena" **https://news.tv4e.gr/13-maioy-1995-o-megalos-seismos-se-kozani-grevena/?utm**	The article provides further details, including 12 injuries, damage to thousands of buildings, and numerous affected communities. news.tv4e.gr
Greveniotis **https://greveniotis.gr/eidhseis/grevena/o-seismos-tis-13is-maiou-1995-sta-grevena-kai-tin-kozani/?utm**	The article provides a historical overview of the earthquake: "It was Saturday, at 11:47 a.m.; the earthquake measured 6.6 on the Richter scale and dealt a major blow to the region." Greveniotis.gr
Seismos.gr **https://www.seismos.gr/seismos/kozani/23471?utm**	The website refers to a recorded seismic event measuring 6.1 on the Richter scale, located 14.5 kilometres south-west of Kozani on 13 May 1995, at a focal depth of 39 km. seismos.gr
Testimonies and Local Websites kozani.tv	Accounts from local residents include statements such as: "The earthquake measured 6.7 on the Richter scale", "monasteries sustained damage", and "there were no fatalities", among others. kozani.tv

Sources with real time data

Table 2

For earthquakes	https://earthquaketoday.net/cyprus https://www.earthquakes-info.com/en/map/country/cyprus/month https://www.volcanoesandearthquakes.com/region/Cyprus https://www.volcanodiscovery.com/ https://cyprus-storms.net/ https://m.emsc.eu/ https://www.emsc-csem.org/ https://www.seismoi-live.gr/ https://www.earthquakes.gr/loc_eq/earthquakes-world.asp https://www.seismos.gr/ http://www.geophysics.geol.uoa.gr/stations/maps/recent_eq_1d_el.htm https://www.emsc-csem.org/Earthquake_information/ https://bbnet.gein.noa.gr/HL/seismicity/real-time-seismicity/last-24-hours
For floods	https://discomap.eea.europa.eu/floodsviewer/?page=Page https://discomap.eea.europa.eu/floodsviewer/ https://global-flood.emergency.copernicus.eu/general-information/data-access/
Weather analysis	https://www.meteoblue.com/en/weather-maps#coords=4/35.17/33.35&map=windAnimation~rainbow~auto~10%20m%20above%20gnd~none