



WP7: Exploitation and Scaling-Up Report
for the Erasmus+ Project 3C4Life



Co-funded by the
Erasmus+ Programme
of the European Union



Pädagogische Hochschule Freiburg
Université des Sciences de l'Éducation · University of Education

Deliverable D7.1 / WP7

WP N° 7

Publication date: 27/02/2024

Report title: Exploitation and Scaling-Up Report for the Erasmus+ Project 3C4Life / WP7 Exploitation and Scaling-up

Project Information

Agreement no. 626139-EPP.I-2020-2-DE-EPPKA3-PI-POLICY

Project title: Perspectives for Lifelong STEM Teaching - Career Guidance, Collaborative Practice and Competence Development

Project acronym: 3C4Life

Start date of project: 28/02/2021

Duration: 36 months

Program: ERASMUS+ Key Action 3: Support to policy reform-European Policy Experimentations

Contact Information

Coordinating Institution: University of Education Freiburg

Coordinator: Prof. Dr. Katja Maaß

Project Manager: Laura Wanckel

Authors: Laura Wanckel, Oliver Straser, Katja Maaß

Lead partner for this report/WP: University of Education Freiburg

Website: www.icse.eu/3c4life

© 3C4Life project (grant no. 626139-EPP.I-2020-2-DE-EPPKA3-PI-POLICY) 2021-2024, lead contributions by University of Education Freiburg, Prof. Dr. Katja Maaß, University of Education Freiburg. BY-CC-NC-SA 4.0 license granted.



This report is based on the work within the project Perspectives for Lifelong STEM Teaching - Career Guidance, Collaborative Practice and Competence Development (3C4Life). Coordination: Prof. Dr. Katja Maaß, International Centre for STEM Education (ICSE) at the University of Education, Freiburg. Partners: • University of Education Freiburg, Germany • Vilnius University, Lithuania • Utrecht University, The Netherlands • University of Lisbon, Portugal • University of Jaen, Spain • Hacettepe University, Turkey • Zentrum für Schulqualität und Lehrerbildung, a Landesoberbehörde of the Ministry of Culture, Youth and Sports, Germany • National Ministry of Education, Science and Sport of the Republic of Lithuania, Lithuania • Directorate-General for Education (DGE) of the National Ministry of Education, Portugal • VOHO Netwerken, a network funded and trusted by the Ministry of Education, The Netherlands • Conselleria d' Educació, Investigació, Cultura i Esport, Spain • Ministry of National Education, Turkey.

Perspectives for Lifelong STEM Teaching - Career Guidance, Collaborative Practice and Competence Development (3C4Life) has received co-funding by the ERASMUS+ grant program of the European Union.

The creation of these resources has been co-funded by the ERASMUS+ grant program of the European Union under grant no. 626139-EPP.I-2020-2-DE-EPPKA3-PI-POLICY. The project's funding body, the European

Commission, is not responsible for the content or liable for any losses or damage resulting of the use of these resources.

Abstract

This report presents the exploitation and sustainability strategies of the Erasmus+ project 3C4Life, focusing on enhancing STEM education and addressing the teacher shortage in Europe. It details actionable guidance for future projects and outlines the successes in engaging STEM teachers through the innovative Teach4Life platform, professional learning communities, and collaborative practices. The project's effectiveness is validated through national reports, peer learning, and strategic partnerships, ensuring long-term impact. It emphasizes the importance of aligning with educational policies, continuous monitoring, and adapting to the needs of the target demographic, setting a precedent for future exploitation planning.

Executive Summary

This report outlines our strategies for exploitation and sustainability within the Erasmus+ project 3C4Life, titled "Perspectives for Lifelong STEM Teaching – Career Guidance, Collaborative Practice, and Competence Development". It offers actionable guidance for the consortium beyond the project's duration and serves as a foundational resource for subsequent initiatives. All project partners have reported on their exploitation activities in the country reports with illustrative examples. They reported on to the effectiveness, impact and suitability of the target groups and we run exploitation workshops on each project meeting. This allowed us to form the base for targeted exploitation and up-scaling activities in future.

The 3C4Life project represents a critical effort to enhance STEM education across Europe by addressing the notable shortage of STEM teachers. The project supports educational systems that empower STEM teachers for career-long success, underscoring our commitment to strengthening the teaching profession and fostering educational excellence. 3C4Life focuses on raising the attractiveness of the teaching profession by offering a positive image, using innovative teaching approaches, and establishing professional learning communities. The [teach4life](#) platform, an all-digital platform for pre-service and in-service STEM teachers, has been developed to increase the profession's appeal and encourage dialogue and collaboration between STEM teachers. The platform offers a variety of career options, up-to-date teaching materials, and educational opportunities and an area of collaboration. The project includes a policy experimentation with digital field trials in six partner countries, following a mixed methods approach to evaluate the effectiveness of motivating STEM teachers to pursue lifelong occupational advancement. 3C4life includes twelve partners from six European countries, with each country having an educational authority working closely with a research partner to connect with their respective education systems. The project's main result is a comprehensive set of robust data on how to motivate STEM teachers to pursue lifelong occupational advancement from the beginning of their careers. This main result sets the direction for the exploitation planning.

All in all, special features of the 3C4life project have been identified during the whole project duration as being very effective regarding a successful dissemination and sustainable exploitation:

- The university-ministry tandems, cooperating on a national as well as on the European level;
 - The 3C4life European External Evaluation Board (EEEB) as well as the National External Evaluation Boards (NEEB), providing expertise and advice as well as extra dissemination support with their contacts and networks to policy makers and important stakeholders in the field of STEM education;
 - Peer learning, viewed within the project as an effective means to overcome challenges as well as develop plans and strategies.
- Furthermore, it is very supportive to have a work package (WP8) especially to quality assurance: The continuous monitoring of the dissemination strategies and activities by this work package ensures that all measures are carried out through appropriate channels that are directed at precisely identified target groups at the right time. Additionally, the project gains advantages from the contributions of the Strategic Leader Board (SLB), which unites all educational authorities under the guidance of the strategic coordinator. The directing function of the accountable public authorities in European policy experimentation is crucial for this project: (1) to guarantee complete alignment between national political objectives and the project's specific aims, (2) to ensure proper project monitoring and sustainability, including the expansion of results, and (3) to integrate the project outcomes into the policy process at both the national and EU levels.

These aspects have been crucial in achieving the highest possible impact of the 3C4life project and should be considered when planning and applying for a new project.

Drawing from the insights of national workshops, activities, and feedback from Work Package 7 (WP7), this report outlines a unified approach to exploitation and sustainability strategies beyond the project's lifespan. It evaluates the strategic approaches to exploitation and scaling-up, assessing their effectiveness, impact, and alignment with the target demographic's needs. The report underscores the importance of ongoing monitoring and optimization of these activities post-project and highlights successful dissemination efforts.

Table of Contents

Abstract	4
Executive Summary	4
1. Introduction	8
1.1 Project Summary	8
1.2 STEM Teacher Shortages Across Europe and Worldwide	9
1.3 About This Guide – Aims and Purpose	11
1.4 Introduction to the 3C4life Project Dissemination and Exploitation	12
2. Guide for Implementing Successful Exploitation Activities	15
2.1 Background information Sources and Obligations for Dissemination and Exploitation 15	
2.2 Establish and Sustain Common Ground	16
2.3 Continuous Monitoring as a Quality Element	17
2.4 Exploitation Planning: 10 Steps	18
2.4.1 First Step - Objectives of Your Measures	19
2.4.2 Second Step – Content	20
2.4.3 Third Step – Target Groups	21
2.4.4 Fourth Step – Channels and Tools	23
2.4.5 Fifth Step – Schedule	26
2.4.6 Sixth Step – Sustainability Plan	27
2.4.7 Seventh Step – Implement Policy Measures	28
2.4.8 Eighth Step – Responsibilities	28
2.4.9 Ninth Step – Develop a Training Program & Assess it	28
2.4.10 Tenth Step – Opening up New Pathways	29
3. Exploitation and Sustainability	29
3.1 Examples and Tools for Exploitation and Sustainability on European level	31
3.1.1 How to Sustainably Explore the Measure in Partner Countries and Beyond?	33
3.2 Scaling-up and Exploiting the Teach4life Platform in European Countries Beyond Partnership	36
3.3 3C4life Country Reports – Examples of Effective Exploitation	38
3.3.1 Netherlands	38
3.3.2 Lithuania	41
3.3.3 Germany	43
3.3.4 Spain	48
3.3.5 Portugal	54

3.3.6 Turkey	59
4. Conclusions and Recommendations for the 3C4Life Project	67
5. References	69

1. Introduction

1.1 Project Summary

Policy measures, as part of the KA3 funding programme, support the testing of relevance, effectiveness, potential impact, and scalability of specific measures aimed at improving given conditions. This occurred through field trials that ran concurrently in different countries, utilizing quasi-experimental approaches and joint evaluation protocols.

3C4Life (2021-2024), which stands for “Perspectives for Lifelong STEM Teaching – Career Guidance, Collaborative Practice, and Competence Development,” aimed to empower teachers to rapidly adapt to changes in educational conditions, continually update their competences, operate digitally, and act self-efficiently. Over the past three years, these requirements became more evident than ever, demonstrating that top performance necessitates optimal conditions.

The project gathered 12 partners from 6 European countries, with an educational authority in each country teaming up with a research partner to work in close connection with the systemic levels of education within each country. These partnerships addressed a dormant issue that hindered optimal conditions in STEM education across Europe: The lack of capacity within STEM education systems to fully support teachers throughout their careers.

The objective of the project was to address this issue through:

- An all-digital STEM teacher environment featuring an innovative concept aimed at facilitating the occupational advancement of STEM teachers. Key innovative features included (OUR MEASURE):
 - A sequential process of motivational triggers, such as ads and pop-up windows in digital teacher environments popular in partner countries. This process ranged from low-threshold attraction to shared advancement, guiding STEM teachers to the platform, and encouraging them to engage in cooperative and career development activities.
 - An enhancement-propelled collaboration through Communities of Practice, providing options for teachers to gather, exchange, and support each other across Europe, benefiting from everyone’s experiences.
- The HYPOTHESES that guided the completed field trials focused on the key features described above, revealing that:
 - A sequential arrangement of motivational triggers effectively increased the involvement of STEM teachers in occupational advancement programs.
 - Multi-directional advancement perspectives significantly elevated teachers’ motivation to shape their optimal personal paths as educators.
 - Targeted community-building features successfully enhanced teachers’ participation in Communities of Practice.

The digital field trials, which took place in Germany, Lithuania, the Netherlands, Spain, Portugal, and Turkey, followed a quasi-experimental design. The evaluation adopted a mixed-methods approach, combining quantitative before-after comparisons and qualitative case studies.

Through the project, robust data was generated on how to motivate STEM teachers to pursue lifelong occupational advancement from the beginning of their careers.

The measure demonstrated a high capacity for up-scaling and mainstreaming across Europe, thanks to its all-digital nature, research-based foundation, contextualization within educational systems, and strategic alignment with policy.¹

1.2 STEM Teacher Shortages Across Europe and Worldwide

According to a [UNESCO report](#), teacher shortages represent a significant challenge in global education policy. This issue arises partly from demographic shifts in aging societies, which necessitate the replacement of retiring educators, and from population growth in other regions, which requires the establishment of numerous new teaching positions by 2030. Both scenarios underscore substantial policy challenges, as the recruitment of qualified education professionals remains difficult. In some developing areas, the demand for new hires might even surpass the existing educational workforce. New teacher projections for meeting universal primary and secondary education in 2030 reveal a global gap of 44 million additional teachers worldwide, see Fig. 1.²

Region	Teachers (in thousands) 2022	Recruitment targets for 2030 (in thousands)			Current target as a share of the 2016 Target (%)
		Replacing staff attrition	New teaching posts	Totals	
Central Asia	1 206	404	343	747	m
Eastern Asia	15 499	2 252	1 028	3 280	50
Europe and Northern America	12 637	4 519	310	4 829	m
Latin America and the Caribbean	7 197	2 846	361	3 207	59
Northern Africa and Western Asia	6 197	2 506	1 751	4 257	68
Oceania	m	196	79	275	m
South-eastern Asia	6 757	4 015	524	4 540	72
Southern Asia	14 982	3 063	4 714	7 777	52
Sub-Saharan Africa	8 459	5 638	9 411	15 049	88
Total	73 133	25 439	18 521	43 961	64

Source: UNESCO and Teacher Task Force, 2023.

¹Figure 1 Total numbers of additional primary and secondary teachers needed by region for 2030 (in thousands)

¹ Cf. Cakmakci, Gultekin et al., Midterm Report on Dissemination, 2022, p. 6-7.

² unesdoc.unesco.org/ark:/48223/pf0000387001/PDF/387001eng.pdf.multi, Feb. 2024, page 3.

In the context of education policy in Europe and North America, these regions are expected to have the third-largest demand for teachers among the seven world regions analysed, with an estimated need for 4.8 million new teachers by 2030. Predominantly, these positions will fill vacancies left by educators who retire or exit the profession for other reasons. Collectively, the required new hires by 2030 will represent 38% of the educational workforce recorded in 2022 in these regions.³ A major reason identified by the ET2020 Working Group on Schools is that teachers no longer see teaching as an attractive career option (Carlo et al., 2013; EC, 2018; Katsanova, 2020). Addressing this perception requires overcoming several challenges:

Many Member States perceive the teaching profession as having low societal value, discouraging young people from choosing it as a career. Concurrently, practicing teachers often feel undervalued by society in various situations throughout their careers.

- It is essential to establish a positive image of the teaching profession among both teachers and society.

Many teachers lack the competencies needed to teach in today's high-demand education system, facing challenges like Europe's aim for climate neutrality, gender gaps, heterogeneity, and digital learning tools (ET2020, 2015).

- The teaching profession should be seen as a lifelong development process that includes the use of innovative teaching approaches.
- Professional development offerings must meet the needs of teachers.

Collaborative professional learning is still rare in terms of systemic implementation in official programs, with a significant number of teachers reporting they never engage in deeper forms of collaboration (Schleicher, 2018; OECD, 2020).

- Teachers need to understand the importance of developing collaborative and teamwork competencies and experience the benefits of collaborative practices in educational contexts.
- Promoting and anchoring collaborative practice and professional learning communities is crucial.
- Career guidance for teachers across Europe is rare, yet it is necessary from the beginning and throughout their careers to support professional growth.

The project's dissemination and exploitation strategies contributed to address these challenges by:

- Establishing a positive image of the teaching profession among teachers and society, with specific measures highlighting positive aspects or demonstrating the relevance of successful education and teachers' roles.

³ <https://www.forbes.com/sites/katharinabuchholz/2024/02/02/where-the-global-teacher-shortage-is-hitting-hardest-infographic/?sh=67e575515d41> 19.02.2024

- Perceiving the teaching profession as a lifelong development process, including innovative teaching approaches, and showcasing role models to make teachers aware of the options to enrich their careers.
- Making teachers understand the need for collaborative and teamwork competencies and allowing them to experience the benefits of collaborative practices in educational contexts by providing digital environments that enable collaboration and sharing.
- Supporting teachers from the beginning and throughout their careers to facilitate professional growth, with communication, dissemination and exploitation activities providing career information and support to lower the engagement threshold with career advancement.

These challenges and project objectives guided the development and execution of all planned dissemination, exploitation, and sustainability activities, aiming to address the overarching issue of teacher shortages in Europe by enhancing the attractiveness and support of the teaching profession.

1.3 About This Guide – Aims and Purpose

Within the framework of the European project 3C4life, we provided a European communication, dissemination, and exploitation strategy, which lies within the responsibility of the lead partner from WP7 and WP6 leader. This strategy is based on a European and six national dissemination and exploitation plans (every partner country is – supported by the leader - responsible for national dissemination and exploitation).

The European dissemination and exploitation plan aims to align with European policy levels and ensure a comprehensive approach, extending beyond the partner countries to include additional nations. This plan strategically connects each national effort to a purposeful collective outcome that meets the criteria of "initiatives for policy innovation." The goal is to develop an innovative and evidence-based teaching approach that fosters systemic and policy-level changes. Given the diversity in educational systems, infrastructure, and policies, each partner country faces unique challenges in their national dissemination and exploitation activities. Therefore, the national plans are tailored to maximize the effectiveness of planned measures and address the specific needs of national stakeholders and target groups.

To enhance our impact and ensure the sustainable dissemination and exploitation of each project output, this guide serves as a foundational template for all 3C4life partners and for future projects involved in dissemination or exploitation activities. It provides fundamental guidelines on planning and structuring exploitation activities and includes examples that illustrate national specificities. The responsibility to pinpoint these national particularities and specific needs, and to select appropriate

measures for their respective countries, rests with each partner, supported by the lead partner or coordinator's office.

Additionally, the purpose of this guide is to summarize the achievements in dissemination and exploitation over the past three years at the project's conclusion, thereby establishing a basis for future sustainable dissemination and exploitation. It presents lessons learned about communication and dissemination strategies, as well as challenges faced and strategies for overcoming them within the 3C4life project. This guide aims to support sustainable dissemination and exploitation activities and to provide ongoing guidance to partners beyond the project's completion.

1.4 Introduction to the 3C4life Project Dissemination and Exploitation

Dissemination and exploitation activities are key components of the 3C4life project, with exploitation focusing on the practical use of research results. To maximize the benefits, exploitation activities have been implemented throughout the project's duration, with an emphasis on field trials. During the project lifetime, strategic planning for national and European exploitation took place, with workshops, the identification of Key Exploitable Results (KER): 1. the teach4life platform, 2. results of case studies and 3. the policy recommendation; and the development of exploitation strategies.

Exploitation and scaling-up activities have begun in each partner country, with varying approaches tailored to their specific contexts. International efforts for example included the participation in the [ETE IV International Conference](#) and a [policy seminar](#) at the ESERA Conference in August 2023. Early evidence suggested that the teach4life platform is appealing to a broader education sector, both nationally and internationally. The project aims to continue exploiting the platform for various target groups and evaluate policy measures to ensure sustainability and transferability of the measures to other countries and regions. The ministry-university tandems in the project served as a template for addressing the need for better cooperation between policy, research, and practice in European STEM education. To this end, communication, dissemination, and exploitation are important tasks as the project aims at mainstreaming and scaling-up a policy measure.

A [midterm report](#) for implementing successful communication, dissemination, and exploitation activities (D6.1 / WP6) was written to complement the European scaling-up strategy. The midterm report explains the basics and examples of successful communication and dissemination for the 3C4life project. Additionally, central terms and concepts are defined and explained there in detail.

3C4life is a policy experimentation measure, which is funded within Erasmus+ Key Action 3. The aim is to scale-up successful measures across Europe. Thus, the 3C4life project aims to inspire STEM teachers to commit to lifelong professional development from the onset of their careers, addressing the critical shortage of STEM teachers in Europe and enhancing STEM education. It seeks to empower STEM teachers for career-long success, thereby strengthening the teaching profession and

promoting educational excellence. By presenting a positive image of the teaching profession, employing innovative teaching methods, and fostering professional learning communities, 3C4Life enhances the profession's appeal. To reach this goal we developed the teach4life platform, a digital resource for both pre-service and in-service STEM teachers, to facilitate dialogue, collaboration, and access to diverse career paths, contemporary teaching resources, and educational opportunities.

In order to reach this goal, we identified for example in our first dissemination and exploitation workshops different target groups which have to be addressed with different objectives. In-service and pre-service teachers are the project's main target group. Winning teachers for the field trials in the part of the project and winning teachers for interviews to serve as examples for the platform was an important task. Further stakeholders are policy makers, educational authorities, Higher Education Institutes/Research Centers, teacher educators and influential networks. Here we differentiate between European level, Consortium countries, and beyond. In Consortium countries, the focus of dissemination and exploitation is on mainstreaming the measure (to promote the teach4life platform and the comprehensive set of robust data on how to motivate STEM teachers to pursue lifelong occupational advancement from the beginning of their careers). In countries beyond the Consortium, the focus is on establishing contacts with high-level authorities, to secure that they have knowledge of the measure and on its potential use in the country. At European level, target groups are high-level networks providing exchange about innovative approaches and on the potential to leverage scaling-up.

To reach these goals, an extensive and successful dissemination strategy, supplemented by suitable measures for a sustainable exploitation of the project outcomes and results, is crucial. From the beginning, the 3C4life Consortium recognized that dissemination and exploitation activities are an essential and pervasive task throughout the project's life and especially with the integration of exploitation in a work package (WP7). To ensure that the dissemination and exploitation strategy is clear, always raises awareness, and keeps target groups' needs at the forefront, our dissemination and exploitation process comprised four phases: Setting up the targeted (National and European) dissemination/exploitation plan(s), execute the plan(s), monitor goal achievement, and reflect and revise.

Furthermore, we have developed an effective, manifold reporting and monitoring system to ensure highest quality project dissemination/exploitation activities through continuous evaluation of the selected dissemination means and exploitation activities at the end of the project. Based on previous research and literature, personal exchange with diverse stakeholders, and fruitful discussions in the consortium, "criteria to evaluate the selected dissemination means" were developed by WP 6 (Dissemination) and summarized in a monitoring report by WP8, available as an online resource restricted to partners. In order to maximize the project's impact, the project consortium carefully planned the type and the timing of any activity focused on dissemination and exploitation. Further, the consortium focused on choosing the most appropriate period for dissemination, depending on national priorities, availability of resources, and opportunities.

We disseminate before, during and after the project's lifetime. Even after the project's end, every partner is fully committed to further promote the project's results and goals on a national basis using their raised knowledge on how to motivate STEM teachers to pursue lifelong occupational advancement from the beginning of their careers. The project will influence the relevance of the university and ministry partners the teach4life platform offer. Especially the 3C4life ministry partners will use its extensive channels to reach teachers, teacher educators and researchers, policy makers, and spread the word to further promote the platform, its evidence and its importance. ICSE plays an important role in the dissemination and exploitation of 3C4life after the project's end: Committed to the transfer from research into practice, the centre contributes to sustainably link stakeholders from research, practice, policy and industry, nationally as well as internationally, and serves as the international hub for this aim. ICSE has an extensive network which is continually used to further promote 3C4life with the teach4life platform and its aims and results.

Our dissemination strategy targets both broad outreach and impactful engagement, as outlined in report 6.1. We aim to reach a wide audience within our target groups through numerous dissemination activities, while also focusing on the significant impact of engaging key stakeholders. For instance, the participation of individuals responsible for teacher development and career counselling across a region in events like '1h4teachers in STEM' can have a profound effect, serving as a catalyst for further dissemination. The collection of follow-up feedback, newsletter sign-ups, and other forms of engagement are crucial for assessing the effectiveness and impact of our dissemination efforts.

Throughout the project duration, all consortium partners conducted various dissemination and exploitation activities. In line with the main objectives previously outlined, the project consortium has successfully achieved the following:

- Engaged and recruited teachers to participate in the 3C4life field trials.
- Informed teachers about the 3C4life project.
- Communicated with stakeholders—including policymakers, educational authorities, professional development providers, teacher educators, researchers, and influential educational networks—about the project's teach4life platform, materials, and evaluation outcomes.
- Mainstreamed the project measures across the Consortium countries (for example, integrating the platform into teacher professional development programs in Spain, Lithuania, Portugal, and Turkey that address teacher needs in alignment with project findings).
- Consulted and informed high-level authorities in countries outside the consortium about the initiative and its potential application in their contexts, particularly targeting policymakers and research communities.
- Promoted the project's objectives and outcomes within high-level European networks.
- Established a policy-research-practitioner triangle to enhance the exchange among diverse stakeholders, thereby fostering new collaborations and sustaining existing ones to bridge the gap between research and practice.
- Increased public awareness of the need for more opportunities in teacher career development.

In collaboration with ICSE and the ICSE consortium, we presented the 3C4life project and its significant outcomes at the [Educating the Educators IV](#) conference held in Leiden in May 2023. This conference was notably successful, characterized by a high participant turnout of over 200 individuals and the engagement of key stakeholders, along with the high quality of contributions related to the 3C4life project. It is a common practice within EU projects to organize a large-scale final conference aimed at disseminating the project results to a wide audience. In deviation from this practice, our 3C4life project opted not to organize such a final event. Instead, we utilized the opportunity to present our project findings at the prestigious [ESERA](#) conference in August 2023, held in Turkey. This event also featured a [policy seminar](#), designed as an international forum for discussing and sharing experiences on cooperation among diverse stakeholders. The seminar successfully brought together policymakers, researchers, and influential stakeholders from thirteen European countries, facilitating a productive dialogue.⁴ These accomplishments not only defined the conference as a successful event but also as a crucial convergence that effectively connected researchers, practitioners, and policymakers on an international level, thereby highlighting its significance and impact.

2. Guide for Implementing Successful Exploitation Activities

Drawing on the insights gained from planning and initiating the exploitation of project results in the final phase of the project, we propose the following approach for future exploitation activities. This section prioritizes exploitation activities; therefore, we will not discuss the specifics of dissemination, as the methodologies and strategic framework for the project have already been thoroughly outlined in the Dissemination Report D6.1. This deliberate focus allows us to concentrate on detailing the exploitation processes, thereby maintaining a clear distinction between these two critical aspects of the project. To achieve the objectives set forth, it is essential to treat dissemination and exploitation as continuous processes that begin in the early stages of the project (primarily focusing on communication and dissemination) and extend well beyond its conclusion (focusing on exploitation). Additionally, this chapter aims to provide a framework to the consortium for sustainable exploitation and scale-up strategies post-project, as well as guidance for subsequent projects.

2.1 Background information Sources and Obligations for Dissemination and Exploitation

When planning exploitation activities, it is crucial to adhere to the Erasmus+ Programme Guide (European Commission, 2021a) and the obligations outlined in the Grant Agreement. The Grant Agreement specifies the requirements for the dissemination and exploitation of results by beneficiaries as follows: *Beneficiaries of grants under the Erasmus+ Programme have the duty to ensure that the work undertaken within the framework of this grant agreement and the results accruing from it receive substantial visibility. The co-ordinator must pay specific attention to the importance of*

⁴ [ESERA 2023: Teach4Life](#)

dissemination, exploitation of results of the action and to their visibility at a transnational level (Article I. 12). In this respect, the co-ordinator must:

- a) create and maintain (at least during the project lifetime) a website for the action. The website must be kept up-to-date with at least: a description of the project, the contact details of the co-ordinator, the list of beneficiaries, mention of the European Union's financial support with the relevant logo (see Article I.11), and access to all results, as and when they become available.
- b) update the project summary in accordance with the instructions provided in Annex V.
- c) provide during the project lifetime the Agency and/or the Commission with the information requested in order to promote the Erasmus+ Programme and disseminate the results. This may include answering questionnaires and entering data into databases.
- d) use Erasmus+ Project Result Platform, on the website <https://erasmus-plus.ec.europa.eu/projects> to disseminate project results and deliverables in accordance with the instructions provided therein. The approval of the final report will be subject to the upload of the project results/deliverables on the aforementioned platform by the time of its submission.

In line with the Erasmus+ Programme Guide (European Commission, 2021a), the project's online presence was established through the development of the International Website (WP6, Month 6) and national websites (WP6 Month 9), as detailed at <https://icse.eu/international-projects/3c4life/> and the project platform at <https://www.teach4life.eu>. The project website features an overview of the project, contact information for the coordinator, a list of beneficiaries, links to the national project websites, acknowledgment of the European Union's financial support with the appropriate logo, and direct access to the latest results available on the platform website. Our project results will also be available at the Erasmus+ Project Result Platform. Important milestones in regard to the work package exploitation were the development of European and National Strategies for Exploitation and Scaling up (M21) as well as this Exploitation Report (M36).

2.2 Establish and Sustain Common Ground

To ensure the success of any project, it's crucial that all partners have a shared understanding of three key aspects: the rationale behind the project, the planned activities and outputs, and the expected outcomes and impacts, including those in the long term. Project meetings and bilateral exchanges among partners are valuable opportunities to discuss these matters. The [Erasmus+ Impact + Exercise tool](#), for example, serves as an effective tool in helping projects articulate their expected outcomes. However, it's essential to continuously verify that all partners maintain a common understanding and to facilitate internal exchanges whenever necessary, such as when optimizing workflows.

The objectives of the 3C4life policy measure are threefold: firstly, to inspire STEM teachers to commit to lifelong professional development from the onset of their careers; secondly, to address the critical shortage of STEM teachers in Europe; and thirdly, to enhance the quality of STEM education. In pursuit of these goals, we have developed and delivered the teach4life platform, a high-quality and evidence-based, all-digital resource for pre-service and in-service STEM teachers. This platform aims to increase the profession's appeal and encourage dialogue and collaboration between STEM teachers by offering a variety of career options, up-to-date teaching materials, educational opportunities, and a collaboration area.

2.3 Continuous Monitoring as a Quality Element

To ensure the suitability and quality of planned activities towards achieving their intended goals, continuous monitoring, reviewing, and revising of their effectiveness and impact are essential. It is recommended to maintain a revision and progress log for each measure. This practice facilitates an easier overview, early identification of discrepancies, and simplifies the sharing of experiences, especially during discussions with partners.

In the 3C4life project, Work Package 8 (WP8) is dedicated to quality control, including the monitoring of dissemination and exploitation activities by partners. At the beginning of the project, the "Monitoring Grid for Project Activities" document was provided to support the monitoring of project management, field trials, and dissemination, communication, and exploitation activities. This document outlines expectations, measurement criteria, and optimization strategies, guiding partners to monitor and evaluate their activities both during and beyond the project's duration.

To ensure that activities align with a clear strategy, WP8 regularly collected data on dissemination and exploitation activities through its monitoring grid. This data was analysed to assess alignment with the overall strategy and to identify any needs for procedural adjustments or intensified efforts. Feedback and constructive optimization recommendations were provided during reflective workshops on quality control. This process facilitated oversight of the overall dissemination and exploitation strategy, allowing for comparison with the national plans outlined in Work Packages 6 (WP6) and 7 (WP7), thereby ensuring effective communication, dissemination, and exploitation.

During project meetings, work package leaders in WP6 and WP7 shared updates on their communication, dissemination, and exploitation activities and their impact through dedicated workshops. Monitoring of these activities was conducted using an electronic form as part of the monitoring grid, ensuring adherence to project dissemination, communication, and exploitation targets. Feedback was provided via emails or orally during consortium meetings. This exchange of information and monitoring by WP8 enabled partners to refine their strategies. Recommendations for optimization included regular reporting on dissemination activities, adherence to promised targets, and drawing inspiration from the successful practices of other partners. Lessons learned were shared among

partners during project meetings and will inform the planning of future projects, ensuring a long-term exchange of knowledge and strategies.

2.4 Exploitation Planning: 10 Steps

Dissemination and exploitation are key to promoting the project, presenting, and spreading results, and ensuring they are utilized to their full potential. In the 3C4life project, we pursued a strategic approach by following a 10-step procedure, which is crucial for maximizing the project's impact. A cornerstone of our strategy was the development of a European scaling-up strategy. This strategy was instrumental in broadening the project's impact beyond the initial partner countries, aiming to reach a wider audience across Europe.

The European scaling-up strategy represented a critical milestone for the project, contributing to its sustainability and the effective exploitation of its outcomes. It outlined the necessary steps to enhance the project's reach, with a particular focus on upscaling policy measures. These measures are designed to improve teaching skills, competences, digital operations, and self-efficacy on a broader scale.

By adopting this strategy, the 3C4life project emphasizes on:

- **Upscaling Policy Measures:** Targeting an expansion of the project's impact through improved educational policies and practices.
- **Improving Teaching Skills and Competences:** Focusing on the professional development of educators to adopt innovative teaching methods and digital tools.
- **Enhancing Digital Operations:** Utilizing technology to enhance the administration and accessibility of education.
- **Boosting Self-Efficacy:** Encouraging educators to recognize and develop their capabilities, leading to better educational outcomes.

The 10-step procedure we follow is integral to this strategy, ensuring a systematic and effective approach to dissemination and exploitation. This process includes identifying key outcomes, analysing target audiences, setting scaling-up objectives, formulating strategies, allocating resources, and more, all aimed at achieving a significant and lasting impact.

The European scaling-up strategy not only aims for broader dissemination but also ensures that the project's results are effectively exploited for long-term benefits. This approach underscores our commitment to enhancing STEM education across Europe, making a lasting contribution to teaching and learning practices.

2.4.1 First Step - Objectives of Your Measures

Analyse in detail, why you intend to set up your measures, e.g. raise awareness? Attract teachers? Get input from peers? Keep in mind, what reaction or change is expected from the target audience, for example receiving feedback, win over teachers for participation, influencing the attitudes of decision makers. Based on the defined goals and objectives you can easily monitor whether you achieved what you planned.

In our 3C4life project it is very important to win over an adequate number of teachers participating in the field trials (testing the teach4life platform in every partner country). To support the advertisement of the platform, we created a big social media campaign, and standardised announcements were provided, dedicated to the field trials (see fig. 2 and 3.). These announcements introduced the content and aim of the teacher platform, included the purpose of the policy experimentation and its evaluation, and gave the rationale for the need for such a career platform. These announcements served as templates that partner countries could tailor them to specific teacher needs and national conditions.



Figure 2 Flyer promoting the platform



Figure 3 Social media promotion for field trials

2.4.2 Second Step – Content

Define precisely and clearly what will be exploited (fig. 4.).

- Project promotion, easily understandable by a non-scientific audience: introduction, activities, expected outcomes, benefits...
 - Outputs and outcomes (linked to timetable for deliverables)
 - Internal data such as results from evaluation data, case studies and user behaviour
 - Internal data such as expert knowledge, scientific information, agreements, meeting minutes
- When editing your content, think of what is new, what solution you are offering, what are the consequences, if no action is taken. Also try to connect to what your audience already knows respectively wants to know about the topic.



Figure 4 Social media campaign advertisement

2.4.3 Third Step – Target Groups

To scale up the project, it is necessary to identify target groups / potential partners who can help expand its reach. These partners could include government agencies, non-governmental organizations, and educational institutions. Partnerships can help increase funding, provide access to resources and expertise, and enhance the project's overall impact. Define precisely and clearly to whom you will exploit the project outcomes, for example:

Within the Consortium:

- Higher education institutes (HEI) (appointed WP leader, their staff, curriculum designers, PR, ...)
- Business partners (representatives working on the project, public relation, non-governmental und non-profit organisations, ...)
- Members of the National External Evaluation Boards (NEEB) – a panel which was set up in every partner country to guarantee large impact, exploitation, and project scale-up. They are also asked for advice and feedback about project activities.
- Members of the European External Evaluation Board (EEEB) – a panel of representatives from countries outside the Consortium and of European networks relevant to scaling-up. The members ensure exploitation beyond the Consortium and contribute specific advice and expertise to ensure the highest possible quality of work.
- Project Office
- Coordinator

21

Target groups beyond the Consortium, for example:

- Pre-service secondary STEM teachers
- In-service secondary STEM Teachers/Schools and their teachers
- Director of schools/Principals/
- School Leaders
- Scientific Community /Higher Education Institutes/Research Centers
- Teacher Educators and Researchers
- Policy makers, public authorities involved in education
- Industry / Businesses or other related organisations Relevant initiatives and networks
- International Associations
- Influential organizations and projects
- Non-formal education providers: STEAM centres
- General Public

It is important to precisely identify all target groups and wider audiences with importance ranking, using keywords such as regional, national, European level; non-scientific and scientific audience. For

each target group, working on a distinct strategy using purposeful messages, means and language is important.

In regard to 3C4life, target groups have been identified as follows (in detail see the midterm report D6.1.):

Teachers (main target group are Pre-service secondary STEM teachers, in-service secondary STEM Teachers/Schools and their teachers): The aim of the exploitation activities for our main target group is attracting teachers to use the teach4life platform.

- **Stakeholders** (policy makers, public authorities involved in education, non-formal education providers: STEAM centres, international associations, influential networks): The aim of the exploitation activities are the integration of the teach4life platform in their dissemination structure (via links and prominent mentions on website) to disseminate it on a large scale.

Here we differentiate between European level, Consortium countries, and beyond.

In **Consortium countries**, the focus of exploitation measures is on using the platform to maximize its impact and benefits.

- In **countries beyond the Consortium**, the focus is on collaborating with high-level authorities to ensure they are aware of the measure and its potential use in their respective countries. This is to facilitate the adoption and adaptation of the measure to meet local needs and demands.

At the **European level**, target groups are high-level networks that facilitate the exchange of innovative approaches and discuss the potential for scaling-up initiatives. The aim of the exploitation measures is to engage these target groups to capitalize on our measure, encouraging its adoption and integration into various sectors.

Public at large: The aim of exploitation activities is to raise awareness of the benefits to use our teach4life platform. This will be achieved by demonstrating the success and impact of the measure, fostering public support, and encouraging further implementation and adoption in various contexts.

A detailed identification and analysis of the stakeholders addressed in the 3C4life project was presented to the project partners in the midterm report on “Dissemination, Communication, Exploitation and Sustainability” ([D6.1](#)).

2.4.4 Fourth Step – Channels and Tools

Define precisely and clearly which media channels and tools are best suitable for achieving your objectives.

There are many possibilities, and we list a few of them here:

Information based dissemination and exploitation means:

- - international project website
 - national project websites
 - social media: posts on, for example, Twitter, Instagram, Facebook, LinkedIn
 - digital and printed newsletters
 - promotion kit with templates for fact sheets, presentations, posters, and leaflets in different languages
 - articles in regional newspapers
 - articles in (peer-reviewed) academic journals
 - bachelor's thesis
 - articles in newsletters (e.g. ICSE Newsletter)
 - poster exhibition, for example, at conferences
 - policy briefings

23

Face to face exploitation means regarding project findings:

- workshops about project findings
- roundtables/face-to-face meetings/interviews
- contact via E-Mail, telephone, zoom
- presentations at conferences
- pilot measures
- presentation of a pitch deck

Face to face exploitation activities is interpersonal, characterized by two-way communication. This offers the opportunity to be responsive to the audience, clarify topics and open new pathways. This approach is interactive and good for acquiring input as well as being flexible – tone, strategy and content can be easily adapted if necessary. A well-crafted pitch deck for example can effectively convince policymakers or decision-makers of a project's potential impact. It is presented as a series of slides, often in PowerPoint format, and is ideal for face-to-face meetings or video calls. The deck allows you to present your ideas visually while delivering an oral presentation that makes a strong first impression. The slides should be creative, well-researched and effectively convey your message to external stakeholders (fig. 5).



Figure 5 Pitch Deck Slide

Pitch Deck

Our 3C4life project is at a crucial stage where the creation of an effective pitch deck is vital to securing post-project exploitation and funding. A pitch deck, often referred to as a startup or investor deck, is a business presentation used to pitch ideas or raise capital. Typically presented as a series of slides during face-to-face or video meetings, pitch decks allow you to visually and verbally share your project concept and results with potential investors and policy makers to generate interest and investment. This clarity of the format not only makes it easier for stakeholders to understand and evaluate, but also increases the persuasiveness of the presentation, making it an effective tool for gaining support for your ventures.

Components of a Strong Pitch Deck

To create an influential pitch deck, include the following elements:

1. **Overview:** Start with a clear statement of what your project entails, using visuals like images or logos to draw attention.
2. **The Need:** Identify and articulate a problem in your area, supporting your statements with facts and stakeholder quotes.
3. **The Opportunity:** Use data to demonstrate the need.

4. **The Solution:** Compare your solution to competitors', highlighting its unique benefits and potential impact.
5. **The Product:** Provide detailed information about your product (for 3C4life, the teach4life platform), its development stage, and future projections.
6. **Value:** Discuss the value of the project, emphasizing how your solution outperforms others.
7. **The Team:** Introduce your team with details of their expertise and how they contribute to the project's value.

Presentation Tips

For a successful pitch, consider these tips:

- - Keep your presentation brief and readable.
 - Use visuals like charts and graphics to maintain engagement.
 - Narrate your project story in simple terms, minimizing jargon.
 - Provide a PDF of your presentation for easy reference.
 - Include supporting materials such as papers or technical documentation.
 - Ensure your presentation is well-edited and proofread.
 - Practice your pitch to refine your delivery and adjust based on feedback.
 - Be clear about your needs and funding requirements at the end of your presentation.
 - Maintain consistent visual themes throughout the deck.⁵

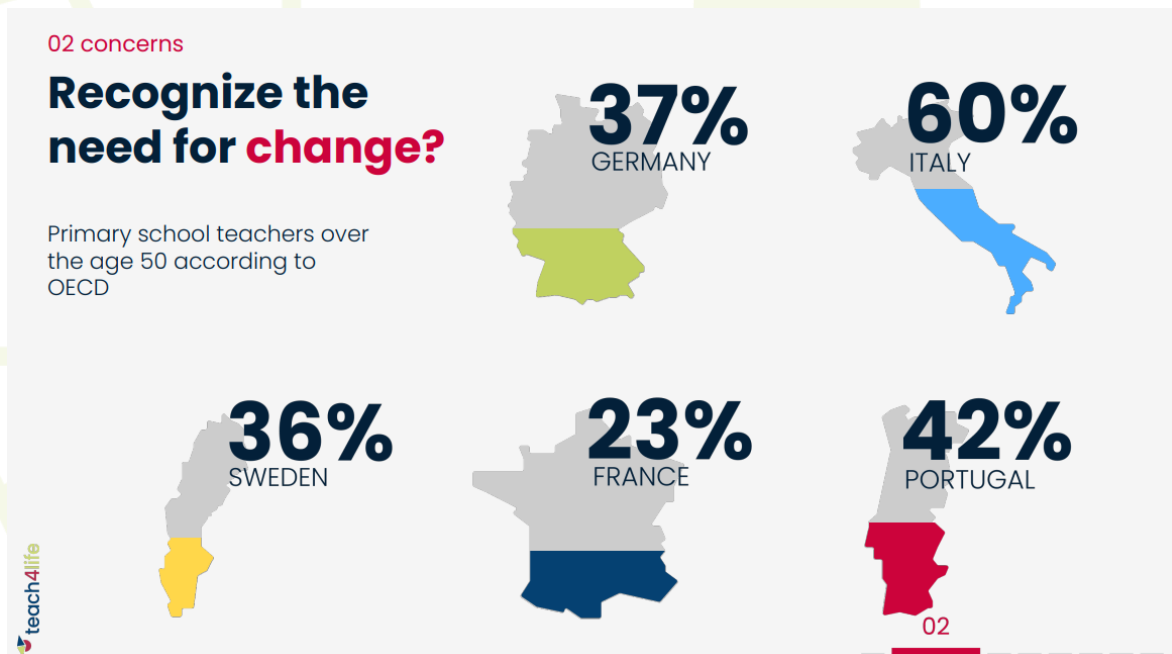


Figure 6 Example of a pitch deck slide

⁵ [What is a Pitch Deck \(With Benefits and Tips to Create One\) | Indeed.com Canada](https://www.indeed.com/career-advice/landing-pages/what-is-a-pitch-deck)

In the 3C4life project, we use a wide range of channels and means to disseminate and then exploit the project. Personal contacts, meetings, and round tables with higher educational authorities as well as policy briefings are good opportunities to reach out to our target groups in order to ensure systemic impact. Presentations at conferences, fairs, and scientific festivals on both the national as well as the European level have and will have a great impact on researchers, in-service teachers, and further stakeholders in the field of career guidance, collaborative practice, and competence development. In addition, information-based activities, for example reporting on different aspects of the project in the ICSE newsletter (using ICSE`s extensive contact list as well as contact lists from partner HEIs), proves to be very successful.

2.4.5 Fifth Step – Schedule

Develop an exploitation plan: To expand the project's reach, it is essential to develop an exploitation plan that reaches a broader European audience. This plan should focus on raising awareness of the project's results, outcomes, and benefits. It should also highlight the opportunities for collaboration and engagement with the project.

Align your measures with the other project activities and key stages of the project (see project`s timetable). It is important to keep a close contact to the management team as management staff holds an overview of all ongoing activities.

The communication, dissemination and exploitation strategy of the 3C4life project implied the following key phases:

2021 **Preparing the ground: Strategic planning of dissemination, communication, and exploitation** (month 3 to 6)

- Detailed identification and analysis of stakeholders
- Development of criteria to evaluate the selected dissemination means
- Setting up European and National dissemination & communication plans
- Setting up European External Evaluation Board (EEEB) and National External Evaluation Boards (NEEB) and meeting twice
- Setting up of international and national project websites
- International newsletters

2021 – 2024 **Execution of dissemination plan, exploitation strategy and monitoring of plan** (from month 7 onwards)

- Advertising the teach4life platform through all channels
- Carrying out dissemination activities on national and European levels
- Workshops with focus on dissemination
- Workshops with focus on exploitation

- Strategic planning for national and European exploitation
- Development of national strategy on scaling up
- Connecting with relevant networks
- NEEB and EEEB meetings
- International newsletters

2022 – 2024 **Prepare for exploitation, sustainability and scaling-up** (from month 18 onwards)

- Carrying out dissemination activities on national and European levels
- Writing midterm report on dissemination, communication, exploitation, and sustainability (D6.1)
- European plan for scaling-up in countries beyond partnership
- Workshops with focus on exploitation and sustainability
- EEEB activities beyond consortium
- Informing European ministries via formal letter on the policy measure
- Connecting with relevant networks (ongoing)
- Mainstreaming the measure through Ministry and University channels (including accreditation of courses, certificates for teachers)
- Dissemination activities to prepare scaling-up
- Ongoing execution and refining of scaling-up strategies
- Planning and holding a policy seminar
- Writing exploitation report based on country reports written under the lead of the educational authorities (D7.1).

The key deliverables have been listed in the project's timetable.

2.4.6 Sixth Step – Sustainability Plan

Establish a sustainability plan: To ensure the project's sustainability, it is necessary to develop a plan that outlines how the project will continue to function after the funding period ends. The sustainability plan should identify potential funding sources, partnerships, and other resources needed to keep the project operational.

The sustainability plan bases upon three main pillars:

- (1) The establishment of conditions to ensure exploitation to tackle the issue of external and changing factors.
- (2) A long-term monitoring to keep track of the (impact on the) sample population over a longer period:
 - a. Several digital Communities of Practice (CoP) operating on national level, as well as via the European platform in English.

- b. Each partner tandem continues moderating the Communities of Practice (CoP), that have been established.
 - c. CoP participants are: the sample population plus staff from our project partners, more STEM teachers from across Europe.
 - d. Long-term monitoring results will be fed to relevant policy actors, education authorities or research peers via our partners' networks, and our partners activities in the OMC.
- (3) Follow-up activities to allow for exploitation and systemic improvement long beyond project duration:
- a. The main target group of the measure (pre- and in-service secondary STEM teachers) continues their engaging in the established digital Communities of Practice
 - b. Partner tandems continue operation of the platforms and maintain the established Communities of Practice

In this case, the coordinator (ICSE) is responsible for keeping the teach4life platform updated and in contact with the project partners for their national sites. We can ensure this by integrating the platform into current and future projects. A sustainable human resources policy and knowledge transfer play a central role at ICSE.

2.4.7 Seventh Step – Implement Policy Measures

Policy measures help scale up the project by ensuring its integration into existing educational systems. Policy measures could include integrating the project's outcomes into national curriculum frameworks, providing professional development opportunities for teachers, and establishing partnerships with industry professionals (see examples in chapter 3.2. country reports).

2.4.8 Eights Step – Responsibilities

For each measure, a responsible person/party must be named, and the tasks have to be clearly assigned. It is recommended to stay in contact to monitor the progress throughout performances and to enhance the quality of the activities and products of the project.

2.4.9 Ninth Step – Develop a Training Program & Assess it

To enhance teaching skills, competences, digital operations, and self-efficiency, it is essential to develop a training program that addresses these areas. The training program should be designed for teachers and should be available online to reach a wider audience. The program should be

interactive, engaging, and aligned with the project's objectives and outcomes. This could be possible because our project partners are all experienced in the development of training programs. To ensure the effectiveness of the training program, it is necessary to establish a quality assurance system that evaluates the program's impact. The system should involve feedback from teachers, students, career guidance experts, and industry professionals. The system should also assess the program's sustainability and identify areas for improvement.

2.4.10 Tenth Step – Opening up New Pathways

- Pathways that cannot be foreseen during initial project planning might open up. It is therefore required to review planned measures, target groups, exploitable results, etc. continuously during the project to respond to the needs of the target groups as well as wider developments in policy and practice. During the project lifetime the coordinator contacts each partner regularly to find out if there is a need to discuss further steps. Additionally, it is essential that each partner contacts the coordinator's office or management team if new options or further ideas arise on how to maximize the success of our exploitation activities and maximize our project's impact. It is also essential to evaluate the impact of the scaling-up strategy regularly. This evaluation should assess the project's impact on students, teachers, career guidance experts.

The ten crucial steps include defining objectives, content, target groups, channels and tools, schedule, sustainability plan, policy measures, responsibilities, development of a training program, and exploring new pathways. By following these steps, the project will not only address the needs of its primary target audience but will also foster collaboration with stakeholders at various levels and sectors, ultimately contributing to the improvement of teaching skills, competences, digital operations, and self-efficiency across Europe.

3. Exploitation and Sustainability

In advance, some words about the definition of exploitation, sustainability and its interconnection:

Exploitation “is (a) a planned process of transferring the successful results of the programs and initiatives to appropriate decision-makers in regulated local, regional, national or European systems, on the one hand, and (b) a planned process of convincing individual end-users to adopt and/or apply the results of the programs and initiatives, on the other hand.”⁶ This means that related exploitation actions aim to ensure that the results of our project will be used at different levels, during and after the implementation of the project. These actions further aim to involve the target groups, end-users

⁶ Erasmus + Guide, Annex II – Dissemination and exploitation of results, page 2

and stakeholders, convincing them to use the main products and results of the project and transfer it in their professional scope.

Sustainability “is the capacity of the project to continue and use results beyond the end of the funding period.”⁷ This means that the project results are used and exploited continuously and in the long term.

Exploitation is closely connected with the sustainability of the project after its lifetime, since exploitation activities should ensure that the results of the project are used by its target groups and possibly transferred to other contexts. In terms of exploitation, it is important to think about how results can make a difference to the project, end-users, peers or to policy makers. In 3C4life, for example, it is important to differentiate if we address a teacher, a policy maker or a researcher to disseminate our results. For teachers, we highlight the benefits of our platform for their professional development or in search for an alternative career path. A policy maker is interested in the evaluation results (if the measure is well tested and effective), whilst a researcher may be much more interested in the experimentation itself.

The effects of successful exploitation activities will imply an increased awareness of innovative ways of learning STEM subjects, in particular of the approach of team teaching or other formats. Successful exploitation will also include a raised positive reputation for the institutions of the project consortium as well as an increased influence on policy and practice.⁸

30

Consequently, dissemination and exploitation isn't finished at the end of the project's lifetime. At the end of our project, we want to give recommendations how to maximize our project's impact in longer term. This should encourage and guide partners and other project partners to

- make the project's outputs and results known and used outside the consortium
- develop new ideas for new partnerships and further cooperation in the future
- create new opportunities to extend the project and its results
- further inform policy and practice
- further promote the teach4life platform and include it in teacher professional development courses
- evaluate achievements and impact
- provide useful input to dissemination and exploitation efforts of the European Commission
- share the results and serve as examples to inspire others

⁷ Erasmus + Guide, Annex II – Dissemination and exploitation of results, page 2

⁸ Erasmus + Guide, Annex II – Dissemination and exploitation of results, page 4

3.1 Examples and Tools for Exploitation and Sustainability on European level

In this chapter, we will give the 3C4life partners as well as institutions beyond 3C4life a useful tool, a direction and some perspectives which will allow them to carry on the development of sustainability & exploitation activities.

All project partners are strongly committed to the 3C4lives approach and objectives and to sustain the project achievements we will use different means and channels. Based on their prior 3C4life expertise, but also on the rich experiences from the 3C4life dissemination activities, partners have further evolved strategies for sustainability and scaling-up.

On the **European level**, we plan to exploit and ensure the sustainability of our project outcomes and results through the following channels and measures:

- Enter the project summary and update the project results on the **Erasmus + Project Results Platform**⁹ and make deliverables available so that researchers and practitioners can access it.
- Contribute to systemic communication with relevant **ET2020 Working Groups**, in particular the Working Group on Schools¹⁰, which identified that teachers do not perceive teaching as an attractive career option anymore and incorporating our results into their strategy. The aim is to support policymaking at the EU and national levels and discuss policy solutions. The results of our 3C4life project are of high interest as we contribute to the important objectives as set in ET2020: Its main strategic elements being the Open Method of Coordination (OMC) with a wide set of national policy actions to fight shortages of qualified teaching staff. 3C4Life seeks to support these strategic policy actions. In case of conclusive findings, education policy makers can use our results to improve their education systems by using the measure as such or e.g., applying the motivational trigger procedure. Therewith they can improve their education system in accordance with national and European strategies, by means of establishing a self-evident culture of lifelong advancement among Europe's STEM teachers.
- Link the project to the **OECD initiative *Future of Education and Skills 2030***¹¹ by providing insights from the 3C4life project, to the framework *Teaching and learning for 2030*. The framework provides a common taxonomy for policy makers and practitioners and establishes some underlying principles for education systems. The first step is to contact the project team to share the 3C4life project results, connect the teach4life platform, connect via newsletters, website, and social media.

⁹ <https://erasmus-plus.ec.europa.eu/projects>

¹⁰ European Commission, Directorate-General for Education, Youth, Sport and Culture, Supporting teacher and school leader careers: a policy guide: report, Publications Office, 2020, <https://data.europa.eu/doi/10.2766/972132>

¹¹ <https://www.oecd.org/education/2030-project/>

- Link the project to the **EU Youth strategy 2019 – 2027**¹²: Core areas of action of the new EU Youth strategy are around the three words engage – connect –empower. The first step will be to send information on the project and its results to the EU Youth Coordinator in order to contribute to knowledge development and exchange on youth issues.
- Continue to incorporate the 3C4life measure and results in **European networks** like Erme, Educe and Eurashe to raise awareness on our teach4life platform and evaluation results. Through the ICSE webpage as well as through personal contacts, the project is already linked to European Networks such as Science on Stage¹³, the European Schoolnet¹⁴ and Scientix¹⁵ (a promotion of the 3C4life outcomes via the Scientix community will make them easily available and visible to the thousands of teachers who use this online portal).
- **EU funding programs**: With the end of ET2020 and thus upcoming successor programs, new future policy actions on national and European level might open further funding sources like Horizon Europe: The EU's research and innovation funding program that supports large-scale projects, including those that aim to scale up innovations in education.
- **Policy frameworks and strategies** like the **European Education Area**¹⁶: A policy framework that aims to create a common education space across Europe, fostering cooperation, mutual learning, and the sharing of best practices. The Digital Education Action Plan¹⁷ is an EU strategy that supports the digital transformation of education systems and promotes the scaling up of digital innovations.
- **Cross-border initiatives and partnerships** like the **European Training Foundation (ETF)**¹⁸ is an EU agency that supports education and training reform in EU neighboring countries, promoting the scaling up of successful practices. The **European Institute of Innovation and Technology (EIT)**¹⁹ is an EU body that fosters innovation and entrepreneurship by promoting collaboration between higher education institutions, research organizations, and businesses across Europe.

¹² https://youth.europa.eu/strategy_en

¹³ <https://www.science-on-stage.eu/>

¹⁴ <http://www.eun.org/>

¹⁵ <https://www.scientix.eu/>

¹⁶ <https://education.ec.europa.eu/>

¹⁷ <https://education.ec.europa.eu/focus-topics/digital-education/action-plan>

¹⁸ https://european-union.europa.eu/institutions-law-budget/institutions-and-bodies/institutions-and-bodies-profiles/etf_en

¹⁹ <https://eit.europa.eu/>

- **Conferences and events:** European conferences on education and training, such as the European Association for International Education (EAIE) conference²⁰, the Online Educa Berlin (OEB) conference²¹, and the European Distance and E-Learning Network (EDEN)²² conference, the European Science Education Research Association (ESERA)²³ provide opportunities for networking, sharing best practices, and discussing strategies for up-scaling.
- **Peer learning and exchange:** The Open Method of Coordination (OMC) in Education and Training: A voluntary process that allows EU member states to cooperate, share best practices, and learn from each other in the field of education and training.
- **Thematic Working Groups:** Groups of experts from EU member states that collaborate on specific topics related to education and training, facilitating the sharing of knowledge and experiences.

By using these examples and channels, European up-scaling activities can effectively reach out to countries beyond the partnership and promote the implementation and integration of successful practices into policies and education systems.

3.1.1 How to Sustainably Explore the Measure in Partner Countries and Beyond?

All partner countries developed in the first project month national strategies to exploit project results and outcomes as well as ensuring sustainability. These strategies are based on the single national context and experiences. To provide peer learning, the different strategies as well as the approaches and channels are comprised in the following overview. These recommendations should inspire partners to further work on successful up-scaling activities and sustainable exploitation beyond the project's end, but also to take the advantage of profiting from partners' experience in different approaches. This can also be taken as a template for the exploitation in countries beyond the consortium, especially countries represented in the project by members of the European External Evaluation Board.

In the partner countries as well as in countries beyond the consortium, we plan to exploit and ensure the sustainability of our project outcomes and results through the following channels and measures:

²⁰ <https://www.eaie.org/>

²¹ <https://oeb.global/>

²² <https://30.eden-online.org/>

²³ www.esera.org/about-us/

- Continue to work with high level educational authorities, stakeholders and those that have been informed about the 3C4life project, with the members of the National External Evaluation Board as well as the countries represented in the European External Evaluation Board.
- Further cooperate and incorporate the 3C4life message into national, regional, and local networks in the field of STEM education.
- Develop a one-pager PDF with infographic(s) illustrating the project aims and later the project results in a very simple, visual way, like a pitch-deck (need for clear and simple communication material to convey messages about the project).
- Create videos to explain the 3C4life project in the local language, create electronic brochures for online events, recorded presentations, videos, tutorials, etc.
- Keep informing further teachers about the teach4life platform, by using the international network of Higher Education Institutions which has been established under the lead of ICSE, Freiburg.
- Make sure that 3C4life project information stays available on the national websites keep links up to date to connect teachers with the teach4life platform, ensuring that people who will look online on national website will be redirected to the international project website and the platform.
- Establish teacher networks for mutual exchange on the platform or on eTwinning which is a platform that connects schools, teachers, and students across Europe, fostering collaboration and sharing of good practices. This makes it easier for teachers to exchange experiences.
- Use social media groups (Facebook, Instagram, LinkedIn) for the above-mentioned working groups for teachers.
- Prepare reports for the national ministries, accompanied by recommendations for integrating 3C4life ideas in their networks and Advisory Boards.
- Link and exploit the 3C4life measure to ongoing initiatives and projects.
- Collaborate with groups that organize science fairs and other informal education actions, offering our expertise and participating with stands, talks, workshops, and such. The German team, for example, presented related tasks on the science days in October 2022, which is visited by students and their teachers to draw attention to the links between fundamental values and science.

- Social media channels, newsletters, and webinars can be utilized to share project results, best practices, and up-scaling strategies with a wide audience, both within and beyond the partnership.
- Use social media and continue to link all stakeholders. Social media (Facebook, Instagram, X, LinkedIn) are also good channels to communicate with teachers, establish networks and guide them online. Create social media materials such as readymade posts, GIFs, etc. The Turkish team, for example, uses social media intensively and strategically. They use Instagram, Facebook and X regularly and successfully, with over 30,000 Followers on both channels combined. In Germany, ICSE aims to improve STEM education through presence on Instagram, X and LinkedIn.
- Maximizing existing channels: Use existing channels with their large communities of Erasmus+ on X and Facebook. Umbrella accounts, such European Youth or EUSport on X, often host information about Erasmus+ too. In this case, extra attention should be given to the Erasmus+ branding elements, to ensure the audience immediately recognizes that the post is related to the Erasmus+ program and then to the 3C4life project.
- Tell real stories: The power of the reality factor for a program that puts experiences at its heart goes without saying. Stories about the projects content and outcomes are stronger when real people, real environments and real experiences are shared. Real stories can be disseminated at national or European level. The recommendation is to focus on sharing the real, exciting experiences that people have had thanks to the 3C4life project. Moreover, a script and/or structure for how these stories can come to life (both in terms of content and shape) can help content creators develop more consistent stories from one opportunity to another, or from one country to another. These stories must be put in the limelight. People from similar walks of life will relate to their stories and be inspired to use the teach4life platform as well.²⁴

²⁴ https://ec.europa.eu/assets/eac/promo/Erasmusplus-Communication%20Strategy_2023.pdf

3.2 Scaling-up and Exploiting the Teach4life Platform in European Countries Beyond Partnership

The teach4life platform (<https://www.teach4life.eu/>) is a key component of the 3C4Life project, designed to support STEM teachers in their professional development journey. This online resource offers a wide range of tools, including videos, informational materials, ready-to-use tasks, and details about further training and career opportunities for STEM teachers. As an innovative and comprehensive solution, the platform has the potential to enhance the professional lives of educators across Europe. This chapter outlines strategies to exploit and scale up the results of the teach4life platform in partner countries beyond the partnership, enabling teachers to access and utilize the platform effectively.

Localization and Adaptation of teach4life Content:

- **Language Translations:** To ensure that teach4life's resources are accessible to STEM teachers in different countries, the platform should provide localized translations of its content. This adaptation will enable educators to engage with the materials in their native language, promoting widespread adoption of the platform.
- **Curricular Alignment:** Adjust and adapt the teach4life content to align with the national curricula and educational standards of different countries. This alignment will ensure that the resources are relevant and applicable to local contexts, increasing the platform's appeal and usefulness to STEM educators.

Building Awareness and Outreach:

- **Collaboration with Local Educational Authorities:** Partner with local educational authorities and ministries of education to promote the teach4life platform in their respective countries. These collaborations will help to establish the platform as a trusted resource for professional development, endorsed by national educational organizations.
- **Teacher Training Workshops and Webinars:** Organize teacher training workshops and webinars to introduce the teach4life platform to educators in targeted countries. These events will provide educators with hands-on experiences and practical guidance on using the platform, encouraging its adoption in their professional practice.

Integration with existing learning environments:

- **School and District Partnerships:** Establish partnerships with schools and districts in target countries to integrate the teach4life platform into their professional development programs. This integration will ensure that the platform becomes a regular component of teacher training and support, reaching a broader audience of educators. Identifying perspectives and developing new working models at schools for teachers.

- **Connection with Teacher Networks and Communities:** Engage with existing teacher networks and communities to promote the teach4life platform and foster a sense of shared ownership among STEM educators. By connecting with these communities, the platform will become a valued resource for peer-to-peer learning and collaboration.

Monitoring, Evaluation, and Continuous Improvement:

- **User Feedback and Analytics:** Collect user feedback and analyse platform usage data to understand how teachers are engaging with the teach4life platform. This information will help identify areas for improvement and guide the development of new features and resources to better meet the needs of educators in different countries.
- **Research and Case Studies:** Conduct research and develop case studies highlighting the impact of the teach4life platform on STEM teachers' professional development and classroom practice. These findings will help demonstrate the platform's effectiveness and build credibility among potential users and partners.

Financial Sustainability and Funding Opportunities:

- **Subscription Models and Sponsorships:** Explore the development of subscription models or sponsorships to generate revenue and support the continuous improvement and expansion of the teach4life platform. These funding sources will help ensure the platform's long-term sustainability and growth.
- **Grant Applications and Funding Proposals:** Pursue grant opportunities and submit funding proposals to support the scaling-up efforts of the teach4life platform. By securing additional financial resources, the platform will be able to expand its reach and continue to develop innovative features and resources.

3.3 3C4life Country Reports – Examples of Effective Exploitation

The following chapter provides an overview of the strategic activities and significant impacts achieved by our six international project partner countries under the 3C4Life project. Each country section outlines how the project has been used to improve STEM education in different national contexts - the Netherlands, Lithuania, Germany, Spain, Portugal and Turkey. These accounts highlight the different approaches taken to disseminate and integrate the project's results into educational practice and policy, and the role of the innovative teach4life platform and professional development programmes in advancing teacher training and addressing current educational challenges. Through workshops, conferences, strategic partnerships and teacher development programmes, each country team has made a unique contribution to the overall goals of the 3C4Life project, fostering an international community of practice that supports continuous professional growth and systemic improvements in education.

3.3.1 Netherlands

Project partners from Utrecht University and VOHO Networks in the Netherlands have taken proactive steps to maximize the project's impact through strategic exploitation activities, with more planned for the future to ensure sustained momentum.

To raise awareness and promote engagement, Utrecht University and the VOHO Networks conducted workshops during the Regional VOHO Networks Conferences in 2022 and 2023. These events served as an ideal platform to inform key stakeholders, including public officers from the Ministry of Education, advisory boards, higher education staff, and secondary education teachers, particularly those involved in STEM, about the project's aims. The workshops effectively encouraged the target audience to visit the project platform and share it with their colleagues.

Additionally, during meetings of the Regional VOHO Networks, directors were encouraged to involve teachers and disseminate information about the platform through newsletters or websites. These meetings also provided updates on the project's progress, engaging directors and public officers in STEM and reinforcing their roles as facilitators.



Figure 7 Photo: © VOHO Netwerken, Leiden

For example, at the VO-HO conference on 23 November 2023, the theme was "Learning & Innovation", and the Dutch partners presented the exciting potential of the teach4life platform to enhance teachers' careers and improve education. During this conference, keynote speaker Dr. Marco Snoek, Lecturer in Learning & Innovation at the Hogeschool van Amsterdam, captivated the audience with his insights into the professionalism and leadership of teachers and educators. Dr. Snoek emphasized the importance of having enough well-

trained teachers, which is crucial for students' successful learning careers and for maintaining high quality education. He posed thought-provoking questions such as "As a teacher, how do you manage your own career?" and "What role can colleagues play in supporting each other on this journey?"

The 3C4life project explored in a European context how an online platform can support teachers in their career development. Over a period of 8 months, more than 600 teachers actively engaged with the teach4life platform. During the conference, key findings on the use of the platform and its impact on teachers' motivation and career prospects were shared, providing valuable insights into the potential of digital platforms in education.

- Throughout the duration of the project, Utrecht University has implemented a comprehensive exploitation strategy at the national level. They actively disseminated information about the platform to STEM teacher educators, some of whom have introduced the platform to their students, particularly prospective teachers. These educators have encouraged their students to explore specific sections, such as the career videos, with the aim of broadening their perspectives on teaching careers. The goal was to emphasize that teaching is not a "dead end" but rather offers several options for enhancing their work through various "side functions." Additionally, UU has integrated the lesson activities from the competence section into the Freudenthal Institute's repository of teaching materials. In turn, this has allowed them to link appropriate activities from their repository to the platform, creating a mutually beneficial relationship between the two resources. Moreover, UU has distributed flyers at a teacher conference for schools within their U-talent network, further promoting the platform.

The Dutch team has established contact with VELON, the Association of Teacher Educators in the Netherlands, and the Interdisciplinary Committee for University Teacher Education (ICL). The aim is to explore how they can support the dissemination of the platform and how they can incorporate the project results into their policies on teacher shortages.

Utrecht University plans to use the results of the project in several contexts. One of their key strategies is to share the link to the platform, especially the career section, with the Graduate School of Teaching at UU. This will serve as an example of how future teachers can be made aware of career opportunities. In addition, UU aims to incorporate the results into its research activities, foster collaboration with other stakeholders and possibly develop new courses. The materials, platform, skills, lessons learned and recommendations from the project will serve as valuable resources for these initiatives.

There are several opportunities and projects where the Dutch team can deliver teacher training workshops or webinars. The regional VOHO networks act as intermediaries for the ministry on the issue of STEM teacher shortage. One of the main activities of the networks is to offer STEM teachers workshops to improve their teaching practice and to provide materials for use in the classroom. These networks can be used as an additional infrastructure to direct teachers to the materials provided by the project and, where possible, incorporate these materials into their training sessions. In

In addition, VHOH networks can be invited to develop complementary training on career opportunities within STEM education, further promoting the use of the platform among educators in the target countries. Organising such teacher training workshops and webinars will introduce the teach4life platform to educators, provide them with hands-on experience and practical guidance, and thereby encourage its adoption in their professional practice. Over the past two years, the networks have been regularly informed about the project through their meetings and national conferences and have been encouraged to share news and content from the platform. Some of these networks have strong links with teacher training programmes and STEM teacher associations. By engaging with these networks, UU aims to promote the teach4life platform and foster a sense of shared ownership among STEM educators, making it a valued resource for peer-to-peer learning and collaboration.

The Dutch partners also have significant links with school and district partnerships through the regional VOHO networks, which consist of partners in secondary and higher education. There are currently nine such networks, and partner schools are kept informed through websites and newsletters, and their teachers regularly attend their workshops. The number of partner schools in each network varies from 10 to over 80. Participation has declined over the last five years, partly due to factors such as teacher shortages and the impact of COVID-19. However, the infrastructure and links remain intact. Through these partnerships, UU aims to integrate the teach4life platform into professional development programmes, ensuring that it becomes a regular part of teacher training and support, reaching a wider audience of educators. They also focus on identifying perspectives and developing new models of working in schools for teachers.

The Netherlands has a strong national network of institutions involved in international cooperation for STEM education. In particular, Utrecht University and the Freudenthal Institute have a long history of participation in European and international networks. In both mathematics and science, they are involved in WALs (World Association of Lesson Study). In mathematics they participate in ICME (International Congress on Mathematical Education) and ICMI (International Commission on Mathematical Instruction). In science, they are active in ESERA (European Science Education Research Association).

The ICSE consortium, especially the partners not involved in 3c4life, serves as an ideal platform for cooperation and exploitation of results. In the Netherlands, the ICL (Interdisciplinary Committee for University-Based Teacher Education) is currently campaigning for more teachers in teacher training programmes. There is a growing need for a stronger focus on career options for teachers, which is in line with the aims of this project.

Utrecht University and the VOHO networks in the Netherlands have proactively maximised the impact of the project through strategic exploitation activities and have further plans to maintain this momentum. They have effectively engaged stakeholders, promoted the teach4life platform and integrated it into professional development programmes, while exploring new opportunities for collaboration and enhancing teachers' careers.

3.3.2 Lithuania

In Lithuania, the 3C4Life project has significantly advanced STEAM education through a series of carefully planned workshops and presentations. These events were strategically designed to address the needs of a diverse group of educational stakeholders, including pre-service and in-service secondary STEM teachers, school directors, principals, and policy makers. This approach has ensured a broad impact across the educational spectrum.

Strategic Initiatives and Workshops

Partners from Lithuania have implemented a multifaceted exploitation strategy to disseminate the outcomes of the 3C4Life project nationally. Throughout the duration of the project, they have organized workshops to present and utilize the project's platform effectively. For instance, a significant workshop was conducted on February 7, 2023, where the platform's content was detailed extensively. During this session, participants engaged in exercises that mirrored those on the platform and were assigned homework to incorporate the platform's competency area content into their teaching. This workshop involved 15 participants, including pre-service and in-service secondary STEM teachers, as well as school directors and leaders, aiming to impact key decision-makers in the educational landscape. Additionally, letters were sent to teachers encouraging them to share their experiences on the project's forum. Continuing their efforts, another event, an online workshop named "Idea generation using the collaborative learning tool JamBoard," took place on May 31, 2023. This session reminded participants of the teach4life platform's utilities and discussed ethical considerations in technology, exemplified by the topic "Do cars have a moral responsibility?" Engaging 30 participants, this workshop focused on head teachers and educators, further strengthening the project's role in shaping educational policy.

Furthermore, the project results are systematically presented at key institutional events. Annually, these results are reported to the university's project managers with the intention of compiling data that could be shared with representatives from the Ministry of Education. This ensures that the outcomes reach decision-makers who can further the project's impact on a broader scale. Similarly, the results are showcased during annual report presentations to faculty members, integrating the project's insights into academic discussions and planning.

Lastly, the outcomes are also presented to members of the National Education and Economics Board (NEEB) for national exploitation. This strategic presentation to various influential bodies within the education sector ensures a comprehensive dissemination and application of the project results, enhancing the educational framework at multiple levels. Partners from Lithuania plan to use the results of the project in various educational contexts, emphasizing the integration of the teach4life platform into ongoing educational activities and curriculum development. The content from the teach4life platform has been made readily accessible by being published on the website of Lithuanian STEAM centers, ensuring it is continuously available to educators.

In addition, the University of Vilnius is using the project through its department, the Vilnius Methodological STEAM Centre. This center focuses on developing methodologies and scenarios for implementing STEAM education. As part of its strategic objectives, the center plans to utilize content from the teach4life platform and adapt it to fit the Lithuanian curriculum. This adaptation process is aimed at enriching the local educational frameworks and enhancing the effectiveness of STEAM education across various learning environments. Through these activities, the institution not only contributes to the academic advancement of teachers but also ensures that the project's outcomes have a lasting impact on educational practices in Lithuania.

- Through these activities, the Lithuanian partners have demonstrated a strategic commitment to engaging educational policy makers and broadening the impact of their innovative approaches to STEM education. These efforts not only targeted a variety of educational stakeholders, but also aimed to cultivate a broader understanding and adoption of advanced teaching methods within the education sector.

Practical Impacts of the Teach4life Platform on Teaching Methods in Lithuania

Partners from Lithuania emphasize the importance of sharing authentic experiences related to the 3C4life project, focusing on real stories involving people, environments, and teaching scenarios. These narratives significantly impact national and European levels by demonstrating the practical effects of the project on educational practices.

Teachers interviewed about their experiences with the teach4life platform shared insights into how it has positively influenced their teaching methods. For example, one teacher described integrating the platform's content into their subject area, using it to make lessons more engaging and relevant. This integration included the use of various devices to enhance student participation in learning activities. During Safe Internet Week, another teacher utilized teach4life to instruct students on creating and remembering complex passwords, an effective and enjoyable exercise that directly addressed common issues like password forgetfulness.

The teach4life platform is noted for its user-friendly interface and minimal requirements, making it accessible and practical for teachers. This ease of use is vital as it enables teachers to explore and utilize the platform without additional demands. The inclusion of practical examples and robotics was particularly valued as these features facilitate hands-on learning, allowing students to apply knowledge in practical ways, thus enhancing the learning experience. The platform's emphasis on STEAM education is evident through its support for engineering and interdisciplinary projects. Teachers appreciated the platform for providing practical insights for student projects, especially relevant for older students engaged in complex research and project work. Additionally, the clear description of competency levels and career guidance on teach4life was highlighted, benefiting

teachers by providing clear progression steps and supporting both self-promotion and professional development.

In summary, the 3C4life project has been well received by teachers, who foresee its continued relevance for enhancing educational practices through project-based and problem-based learning. Despite some challenges with updated content, the platform remains a reliable resource for teachers seeking to enrich their teaching and provide more engaging learning experiences for students.

Expanding the Teach4life Platforms Reach through Workshops and Erasmus Visits

- Partners from Lithuania are developing opportunities to run teacher training workshops and webinars to promote the teach4life platform and facilitate its integration into educational practice. These initiatives are designed to provide teachers with practical experience and guidance to encourage the adoption of the platform in professional settings. One notable initiative is the Erasmus teaching visit to the University of South Bohemia, where future STEAM teachers engaged with the content and pedagogical theories of the platform (September 21-25, 2023). This visit allowed pre-service teachers to work on their projects using the platform's resources, preparing them to implement these methods in their future teaching. In addition, broader workshops, such as the 'Design Thinking and Computational Thinking' session at the 'STEAM, the Power of Learning' conference in Spain, introduced pre-service teachers to the platform and improved their teaching methods (May 23, 2023). These efforts by the Lithuanian partners aim to expand the platform's impact on STEAM education at different levels and in different settings.

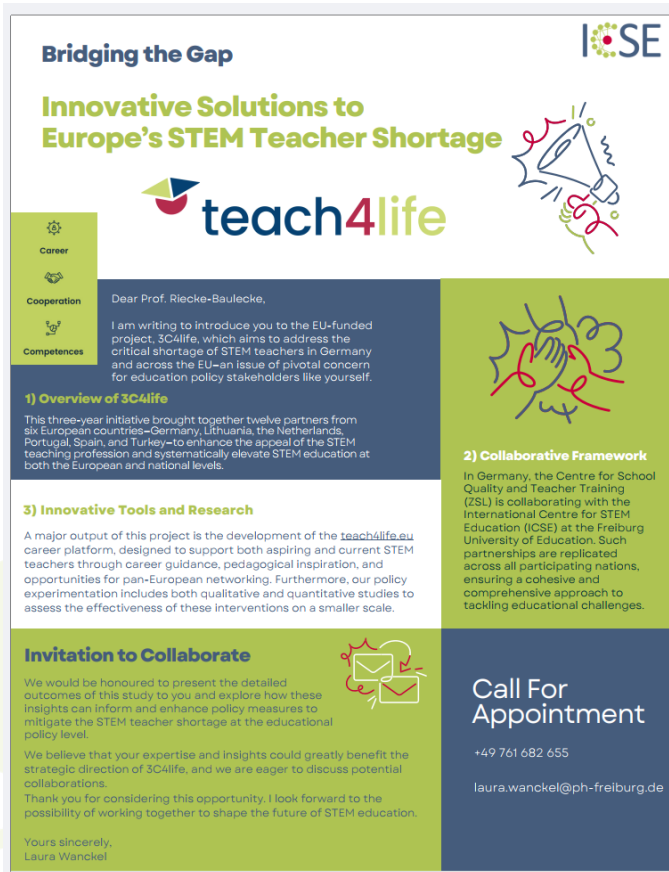
3.3.3 Germany

The University of Education Freiburg, as the coordinator of the 3C4Life project, has undertaken a detailed exploitation strategy to ensure the project's outcomes significantly impact the educational sector in Germany, engaging a broad spectrum of stakeholders at both national and international levels.

Strategic Integration of the Teach4life Platform in German Educational Policy and Practice

The initiative began with strategic evaluation sessions, bringing together stakeholders from various sectors, including representatives from the German Zentrum für Schulqualität und Lehrerbildung, educators, and academic experts. These sessions were instrumental in aligning the project's objectives with the specific needs of the German educational system, fostering discussions that highlighted the project's potential for integration and application within Germany.

Engaging with high-level policy makers was a central part of the strategy. This included presenting the project's findings to key figures within the German education policy landscape to ensure that



the findings and the teach4life platform were taken into account in policy-making processes. Such engagement aimed to embed the project's contributions within national initiatives to improve education. To get in touch with political representatives, a template for a visually appealing letter to political decision-makers was created, which can be customized by each partner country in their local language using the Canva app (see fig. 8).

Teacher Engagement and Capacity Building

Teacher engagement was prioritized, with informational meetings conducted across various regions, including significant educational hubs. These sessions targeted STEM teachers in public schools, intending to equip them with the knowledge and tools from the teach4life platform, thereby enabling them to act as multipliers within their professional communities.

Figure 8 Letter to inform policy makers

The University of Education Freiburg also actively participated in discussions around curriculum reform, collaborating with the German Zentrum für Schulqualität und Lehrerbildung (ZSL). This involvement underscores the institution's proactive approach to embedding the project's insights into the national curriculum, ensuring the innovations are helping contribute to shaping the future of STEM education in Baden-Württemberg, Germany.

Furthermore, the platform has been incorporated into several courses at the University of Education and will be continuously used in initial teacher education, including subject-specific lectures and interdisciplinary seminars. To be more specific the platform is used in the lectures Statistics (Winter Term 2022 and Winter Term 2024), Didactics of Mathematics (Summer Term 2023, Winter Term 2023, Summer Term 2024) and an interdisciplinary seminar about didactics of STEM education-seminar. The study advice service has also utilized the platform and will continue to do so in specific cases since October 2023.

In Germany, there is a one-and-a-half-year, on-the-job training phase for teachers (Referendariat), where graduates from teacher education programs gain practical teaching experience and receive

additional theoretical training beyond the primarily scientific content provided at universities, in what is known as a teacher seminar.

After a PD course for teachers in May 2023, where the platform introduced, teachers in the local area began to use the platform for career advice for prospect teacher students, for example at the Wentzinger High School in November 2023.

Regionally, the platform has been used in seminars in didactics courses since April 2023. The Freiburg team, in collaboration with the Ministry of Education (ZSL), will promote the platform in other regions within the state of Baden-Württemberg.

Promoting Career Development and Professional Growth

Outreach efforts extended to career centers at universities, aiming to illuminate the diverse career paths within the teaching profession and encouraging emerging educators to explore innovative roles in education. The feedback from community practice groups, which included both pre-service and in-service STEM teachers, has been overwhelmingly positive, highlighting the project's resources as central in enhancing teaching practices and professional development. Teachers particularly valued the comprehensive provision of information on various career paths within the teaching profession. The platform offers detailed descriptions of career possibilities and competencies, clear role categorizations, and structured information that help teachers explore potential career developments within and outside the traditional teaching profession.

45

The resources provided by the platform, including videos and the innovative concept of "controversial contexts," were seen as highly beneficial for learning, providing realistic insights and encouraging critical thinking. However, teachers expressed a desire for more personalization and realistic insights into career pathways. They suggested enhancements in personalization and guidance, such as more tailored advice and enhanced interaction with professionals in various educational roles.

Future Plans and Digital Engagement

Looking ahead, the strategy includes the use of digital platforms to extend the reach of the project. This includes disseminating information through well-established educational websites and launching targeted social media campaigns to engage with a wider audience, with a particular focus on stakeholders involved in non-formal education.

In Germany, feedback and recommendations for the exploitation of the teach4life platform were provided by the National External Evaluation Board (NEEB) among other things. It was observed that after utilizing the platform, visitors often sought additional information on career opportunities from external websites. To enhance engagement, the German team established the workshop series "1h4teachers in STEM" on a European level. *1h4 Teachers in STEM* is an online event series aimed at uniting educators and educational stakeholders to collectively enhance STEM education. It features hour-long workshops where experts provide short insights on a variety of current STEM



Figure 9 Picture created by ChatGPT

education topics every three months. The first 1h4teachers in STEM session took part in January 2024, titled "AI in the Classroom? How ChatGPT Can Support STEM Teachers," led by Dr. Oliver Straser from the International Centre for STEM Education at the University of Education in Freiburg. This event attracted 115 educators from across Europe, focusing on the integration of AI in education. Dr. Straser discussed the transformative potential of AI, like ChatGPT, in revolutionizing educational processes by automating administrative tasks and creating personalized educational content, which allows teachers to devote more time to teaching. He highlighted how AI can generate dynamic lesson plans that adapt to individual student needs, thereby improving learning outcomes and engagement. The session also facilitated interactive group activities where participants explored practical applications of AI in their teaching practices.

This collaborative environment helped foster a community of educators eager to apply AI innovations in STEM education. Attendees of the session are eligible for a certificate recognizing their participation and commitment to enhancing their teaching methodologies.

On 28 March 2024, another "1h4teachers in STEM" session took place, aiming to promote the project and unite teachers from across Europe. Titled "Sustainability Education for Environmental Citizenship," it gathered STEM educators from various disciplines, eager to acquire new teaching ideas and exchange experiences. Specifically designed to meet the growing demand for integrating sustainability education into school curricula, the session focused on fostering environmental citizenship. Dr. Michiel van Harskamp, a post-doctoral scientist at Utrecht University, led the workshop. Drawing from his recent PhD research, Dr. van Harskamp provided a compelling theoretical perspective on sustainability education. He highlighted the critical importance of developing environmental awareness among young students and outlined foundational concepts that are essential for nurturing an informed and responsible citizenry. The practical component of the workshop included an interactive discussion of lesson modules

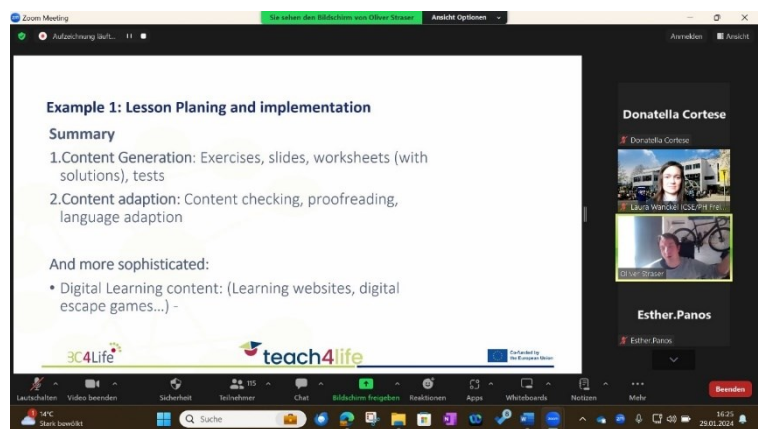


Figure 10 Screenshot from the 1h4teachers in STEM session

that Dr. van Harskamp and his team of six science teachers had developed and implemented at the lower secondary level. These modules, which are freely available in English, were designed to engage students actively in sustainability issues, prompting them to think critically about environmental challenges and solutions. Furthermore, Dr. van Harskamp shared valuable implementation strategies, offering insights into the do's and don'ts of integrating sustainability topics into teaching practices. These strategies are crucial for educators looking to effectively convey complex environmental concepts in a manner that is both engaging and educational. Participants left the workshop equipped with not only theoretical knowledge and practical tools but also inspired by the shared experiences of fellow educators. This session proved to be a significant step towards empowering teachers to incorporate sustainability education into their classrooms, thereby contributing to the broader goal of developing environmental citizenship among students. This workshop is a reflection of the 3C4Life project's ongoing efforts to provide educators with the resources and support they need to adapt to the developing demands of STEM education and to foster an educational environment that values and prioritizes sustainability.

The 1h4teachers in STEM format has been so well received by teachers that we will continue the sessions and integrate them into other EU projects.

The best content from the teach4life platform is also published in ICSE's national and international [Quarterly Problems](#) series, whose main audience is teachers. This series is disseminated through the national and international ICSE newsletter and the networks of the ICSE consortium of 14 partner countries.

Nationally, the German team is planning to establish regular online meetings like the German 'Science on Stage' format, where a regular's table occurs every four weeks and serves as a networking hub for teachers across Germany. Topics at these meetings vary, ranging from subject-specific discussions to broader exchanges. Together with the ZSL, the German team is exploring the possibility of setting up a 'round table' for trainee teachers, as trainee teachers in particular, who are about to complete their training, could benefit greatly from regular interaction with like-minded people in combination with experienced teachers. Especially in Germany, trainee teachers are under a lot of pressure to perform and the dropout rate among trainee teachers is very high. In this exchange format, the content of the teach4life platform can provide important impulses for prospective STEM teachers in terms of their timetable and also their professional development. For Germany's national teach4life website, they plan to highlight the platform's potential as a resource for attracting career changers and lateral entrants to the teaching profession who may not have considered it before. In addition, the German team will integrate the platform into universities' Open Educational Resource (OER) platforms, present it on state education websites and ensure ongoing quality assurance.

The German approach to the 3C4Life project has been both strategic and inclusive, ensuring deep engagement with policy makers, educators and the wider education community. By integrating the outcomes of the project into the German education system from Baden-Württemberg and using

various dissemination and engagement channels, the institution aims to enrich STEM education and ensure the lasting impact of the teach4life platform in Germany.

3.3.4 Spain

The Spanish team has implemented a comprehensive exploitation strategy for the duration of the 3C4Life project, focusing primarily on enhancing teacher professional development across various career stages, from initial education to lifelong learning. Initially, they sought to thoroughly understand the main outputs of the project and recognize their value in advancing teachers' professional development. The Spanish partners acquired a deep understanding of the national structures and key actors involved in teacher initial education and professional development in Spain. They identified different target groups that could benefit from the project's outcomes and potentially use the project's outputs beyond its lifetime. This understanding was important for using strategic connections to effectively communicate, share, and exploit the project's results with all potential stakeholders and interest groups. In particular, the Spanish team used their links with different educational institutions such as CEFIRE-CTEM (Valencian STEM Teacher Training Centre), CEP-JAÉN (Jaén Teacher Training Centre), ÁPICE (Association of Teachers and Researchers in the Didactics of Experimental Science) and INTEF (Spanish Ministry of Education). Through these relationships, they offered a Teacher Professional Development (TPD) programme that addressed teachers' needs in line with the project results. From the collaboration with CEFIRE CTEM, the project presented an exceptional opportunity to integrate its governing principles into current training initiatives. Following the preparation and delivery of the main course, which produced significant research findings, these findings have been used to inform the design processes of subsequent training activities, ensuring that the impact of the project extends into future educational practice.

48

Internationally, the Spanish team, as well as other project partners, has actively contributed to conferences organised by educational networks and is committed to publishing articles in peer-reviewed journals in order to reach educational researchers worldwide. These publications are aimed at an audience that includes teacher educators who can incorporate the project's findings into their educational practice and their training of pre-service teachers.

In particular, the Spanish team has made use of strategic links with international networks and professional associations related to teacher education and educational research, such as SCIENTIX, ES-ERA and EERA. These partnerships are designed to disseminate the project results widely among educational researchers, both in-service and pre-service teachers, and school principals. This approach ensures that the project's findings are accessible to a broad spectrum of educational professionals, thereby extending its impact beyond national borders and fostering an international community of practice around STEM education and teacher development. Through ongoing collaboration with Agueda Gras on various initiatives, the Spanish team has built strong working relationships with Scientix and European Schoolnet.

To enhance teacher professional development across multiple dimensions the Spanish team is strategically using the outcomes of the 3C4Life project. This includes making research data on the project's effects—such as impacts on teacher collaboration, motivation, career advancement, and professional development—publicly available on repositories like Zenodo. This approach facilitates further scientific analysis and development of effective teacher enhancement strategies. To disseminate scientific knowledge, the team is committed to publishing open access publications and reports that detail the project's findings. They are also developing policy recommendations based on these results to influence key policymakers at local, regional, and national levels who play a significant role in teacher professional development. Furthermore, executive summaries and policy recommendations are translated into Spanish and distributed to teacher centers and through the Spanish National Association of Teachers and Researchers in Science Education to ensure widespread accessibility within the educational sector.

Additionally, the national Spanish teach4life platform is featuring valuable teaching resources and triggers for professional growth. This platform is shared with higher education institutions, teacher centers, and policy-making bodies like INTEF and The CEFIRE CTEM in Valencia, a center specializing in STEM teacher development. This platform acts as a primary channel for disseminating project outcomes and enhancing STEM education. The project also introduces "3C4Life triggers" designed to boost teacher motivation and collaboration, aid the development of specific teaching competencies, and support career advancement. These triggers are disseminated through targeted social media channels and groups, such as the ÁPICE network, and made available on the CEFIRE CTEM national website and its social media outlets. In addition, the team is developing a professional development course using the platform within the curricula of teacher training centres. This course will be tailored to link the content to specific teacher needs and training requirements, focusing on both in-service and pre-service teachers.

Finally, the Spanish team is exploring synergies with other ongoing projects to extend the lifespan and impact of 3C4Life outcomes. Through these efforts, they aim to embed the project's outcomes deeply into the education system, significantly enhancing the professional development of educators within Spain and potentially beyond. The project has generated significant expertise on the implementation of Teacher Professional Development (TPD) programmes. It has emphasised that any TPD programme should be closely aligned with the real needs of teachers and supported by ongoing advice and mentoring. This approach ensures that programmes are not only relevant but also supportive throughout teachers' professional careers.

ROCK THE CURRICULUM THROUGH THE TEACH4LIFE PLATFORM – The Spanish Story

The curriculum is always an imperative to follow in the teaching daily practice. Therefore, it is key for teachers that educational resources and TPD programs are linked to these legislation requirements. In the case of Spain, we live in changing times for teachers in terms of curriculum adaptations

and the teach4life platform is a great chance to pave the way towards an efficient approach to the new Spanish curriculum.

The teach4life platform offers a broad variety of competence resources to address STEM in the classroom through different enriching teaching methodologies: authentic contexts, socio-scientific issues and inquiry-based learning. These resources have been designed by experts from different STEM fields following guidelines based on research evidence to increase students engagement and learning are perfectly aligned with the requirement of the new Spanish curriculum for teaching programming conceptualized in the term “learning situations”.

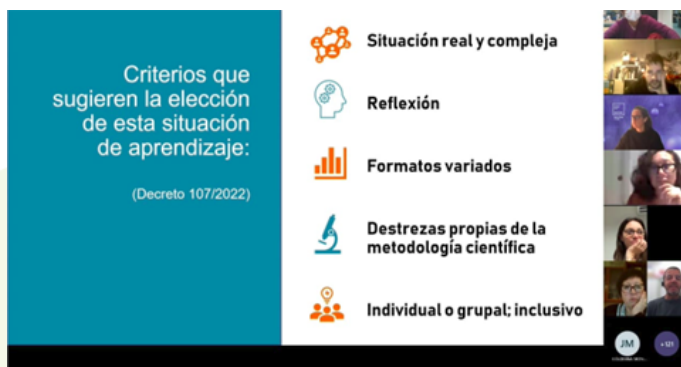


Figure 11 Screenshot TPD course, Spain

In a specific TDP course linked to the teach4life platform, teachers in Spain explored these competence resources and adapted them to learning situations by considering a curricular framework. They created their own competence materials (learning situations) and shared them with their colleagues to receive/give improvement feedback. This task contributed to promote teachers' design skills and teaching competences, in fact, the competence material available in the teach4life platform were perceived as highly useful and inspiring for their teaching.

It has also been learned that not all virtual resources and tools are equally beneficial, especially those related to teacher collaboration. Instead, teacher cooperation might be more effectively fostered through spontaneous and unstructured mechanisms that arise from their own needs and the common challenges they face.

Moreover, all training advisors at CEFIRE CTEM have been involved in the project to some extent and have assimilated its principles and findings. This involvement has transformed the advisory services provided by CEFIRE CTEM, making the advisors more attuned to the challenges and issues that in-service teachers encounter. This enriched understanding guides their current advisory practices, enhancing the support they offer to educators.

Highlighting 3C4LIFE's Impact Through Educational Outreach

Two illustrative examples of effective dissemination activities from the 3C4LIFE project include engagements with pre-service teachers and a significant presentation at an international conference. Firstly, at the University of Jaén, the project was incorporated into "ICT resources for teaching science" lectures and other relevant courses. This integration provided pre-service teachers with a comprehensive introduction to the mission and vision of 3C4LIFE and the teach4life platform. These sessions effectively highlighted the platform's key features—career, collaboration, and competence

development—sparking interest and understanding among future educators about the various professional growth opportunities available through the platform.



Figure 12 Photo © Hacettepe University, ESERA, Policy Seminar

Secondly, the project's impact extended to a broader academic audience through its presence at the European Science Education Research Association (ESERA) 2023 Conference. A presentation by Quesada et al., titled "Bridging Research, Practice, and Policy to Improve STEM Learning Through Teacher Professional Development," played a pivotal role in the 3c4life policy seminar. The seminar focused on addressing the challenges and opportunities in STEM education by bridging science, practice, and policy across Europe. This talk emphasized the project's role in aligning research with practical teaching applications and educational policy, showcasing the project's broader impact on enhancing STEM education through strategic teacher professional development efforts.

These activities underscore the project's commitment to disseminating knowledge and engaging a diverse range of educational stakeholders, from upcoming teachers to seasoned educational researchers and policymakers.

Strategic Adaptation of 3C4life Resources to Enhance Spanish Educational Reform

The coinciding of the 3C4LIFE project with a significant change in educational legislation provided a unique opportunity for the Spanish team to align the teach4life platform resources with the new curriculum reform. This alignment allowed the team to support teachers in implementing the revised Spanish school curriculum effectively. Recognizing this alignment, the Spanish team offered a specialized teacher professional development (TPD) course designed to facilitate the use of the platform and integrate its resources into daily teaching practices.

To tailor the 3C4life resources to the Spanish context, the team translated various materials into Spanish and enriched the platform with videos featuring testimonials from individuals at different stages of their teaching careers in Spain. They also added specific guidelines and lesson plans, closely linked to the Spanish curriculum, to the Spanish version of the teach4life platform.

The adaptation process culminated in a 60-hour teacher training programme, delivered in collaboration with policy partner CEFIRE CTM. This programme focused on how to use and integrate the 3C4LIFE resources into classroom practice. The promotion of the platform, which ran from July to September 2022, received over 400 applications from teachers interested in the development programme, which included the use of the teach4life platform. Throughout the implementation of this TPD, based on the teach4life platform, the Spanish teachers were supported in exploring the various resources of the platform, linking them to their personal motivations and needs. They were

encouraged to adapt these resources to their own practices and the new curriculum. Additionally, they were invited to share their experiences through monthly forum discussions, and specific sessions were organized to provide targeted support and guidelines. Feedback from the teachers who participated in the TPD program underscores the effectiveness of this approach. One teacher highlighted the usefulness of the competence materials and learning situation examples, noting their direct applicability in daily classroom activities. Another teacher appreciated the career section of the platform, which provided insights into the professional lives of teachers who transitioned from other sectors. The testimonials and collaborative opportunities presented by the platform were also praised for stimulating creativity and encouraging collaboration among teachers. The platform's capacity to offer a space for sharing materials and fostering professional dialogue was especially valued, as it contributes to continuous personal and professional development, recognized as integral to teachers' regular schedules. This strategic use and adaptation of 3C4LIFE resources not only facilitated the integration of the new Spanish curriculum, but also fostered a dynamic and supportive environment for ongoing teacher development and collaboration in Spain. The 3C4LIFE platform was integrated into an officially accredited Teacher Professional Development (TPD) course at the STEM Teacher Centre (CEFIRE-CTEM), which is recognised by the Spanish Education Ministry. This TPD course was specifically designed to meet the needs of Spanish teachers in the context of changes in national education legislation that advocate a more integrated and cross-curricular approach. This new approach emphasises 'learning situations' that require contextualised and active learning strategies. In response to a perceived lack of training for Spanish teachers in relation to these new educational requirements, the teach4life platform provided resources that were well aligned with these legislative changes. To ensure the platform's relevance and utility, all resources were translated and culturally adapted to the Spanish context. New video content was created featuring Spanish teachers who discussed their diverse professional paths and growth within the teaching profession. These resources were integrated into the platform used by the STEM teacher center in Valencia (CEFIRE-CTEM), which is linked to the teach4life platform. Additionally, the platform includes detailed presentations, guidelines, and examples of teaching and learning sequences that align explicitly with the Spanish school curriculum while adhering to the pedagogical approaches advocated by teach4life.

Expanding Teach4Life's Impact through Strategic Partnerships and Continuous Development

Looking ahead, there are several promising opportunities and projects where the Spanish team can continue to deliver teacher training workshops and webinars focused on the teach4life platform. One such initiative is the ongoing ICSE Academy project, which provides a valuable opportunity to seek synergies between projects. This includes using the results of the 3C4Life project to enhance the ICSE Academy materials and, conversely, using the results of the ICSE Academy to enrich the teach4life platform. In addition, the team should explore other funding opportunities to support the long-term sustainability of the platform. In addition, CEFIRE CTEM actively incorporates the learning outcomes and results of the teach4life project into its training catalogue whenever possible. The project's resources and developed methodologies serve as useful examples that significantly influence the design and delivery of training activities at the CEFIRE Training Centre. This continuous

integration ensures that the knowledge and tools from the teach4life project remain an integral part of the professional development offerings for educators. There is ongoing communication with several local teachers' associations and teachers' working groups, including APTCV, the Construction Group, PFQCV and ByLinedu. Together, they develop training activities that are in line with the objectives and content of the teach4life project, either through joint efforts or by synchronising objectives and materials. This collaborative approach ensures that the platform and its resources are continuously integrated into training activities, increasing their relevance and effectiveness for teachers' professional development.

- The Spanish team has established strong partnerships with key educational institutions and organisations that have direct links to teachers and schools, facilitating the integration of the teach4life platform into professional development programmes. Over the years, productive relationships have been developed with institutions such as the Centre for Teacher Training in Jaén, Ministries of Education at regional and national level - including INTEF - and specialised centres for STEM teacher training such as CEFIRE. These institutions are instrumental in engaging teachers and schools and have a significant impact on the development and delivery of training programmes.

- These collaborations enable the Spanish team to tailor the teach4life platform to the specific training needs and initiatives of these educational institutions. By integrating the platform into established training courses, the team ensures that it becomes a regular part of teachers' professional development, thereby extending its reach and impact to a wide range of educators. These partnerships also help to identify new perspectives and develop innovative ways of working in schools to meet the evolving needs of teachers. This strategic approach not only strengthens the usefulness and relevance of the platform, but also enhances its potential to have a significant impact on educational practice in Spain.



Figure 13 Photo © UJA, ETE IV, Leiden

The Spanish team suggests improving the dissemination of project results by using interactive formats at conferences, such as round table discussions, symposia or workshops, rather than limiting themselves to one-way oral presentations or posters. These interactive formats encourage direct engagement with the audience and facilitate more effective use of project results by allowing for discussions, questions and exchanges that can lead to deeper insights and applications. In addition, the team emphasises the importance of participating in

events that are not exclusively academic, but directly focused on practitioners in the field of education. Events such as the Educating the Educators (ETE) conference or the National Scientix conference are aimed at schoolteachers, teacher trainers and others directly involved in educational practice, making them ideal venues for reaching out to stakeholders who can directly benefit from and

contribute to the exploitation of project results. The Spanish team, for example, has already used such opportunities to present their project results effectively. At the "Educating the Educators IV: STEM & Open Schooling for Sustainability Education" held in Leiden, the Netherlands, on 11-12 May, they presented a paper entitled "*STEM education through real-life contexts and sustainability issues: the teach4life case in Spain*". This presentation was not only a display of their work, but also, in line with the conference's focus on practical and sustainable education, a demonstration of the relevance and applicability of their findings to current educational challenges.

3.3.5 Portugal

The Portuguese team has engaged in a series of strategic exploitation activities to enhance the visibility and impact of the 3C4Life project across various educational sectors. These activities are aimed at disseminating the project's outcomes and integrating its resources into professional development programs for educators.

At the national level, the strategy focused on using teachers as the main channels for disseminating the project's findings and methods. Teachers were actively involved in a variety of activities, including workshops, meetings and email distributions, which enabled them to bring the project's activities into the classroom. This approach not only facilitated the expansion of the project's educational network, but also promoted the development of specific skills highlighted within the 3C4Life project framework. At an academic level, the strategy included participation in national conferences where project outcomes were presented in different formats to educational researchers and teacher educators, thereby fostering deeper academic engagement and discussion. For policy makers, the collaboration with the Ministry of Education (DGE) proved to be crucial. This partnership facilitated the institution's participation in targeted events and supported dissemination efforts through publications in the Ministry's bulletin and participation in webinars. In addition, efforts were made to extend the reach of these exploitation activities to the general public through the strategic use of social networks, thereby extending the impact beyond traditional education stakeholders.



Figure 14 Photos © IE-ULIS, II National STEM Education Conference, Lisbon

One notable initiative was their participation in the II National STEM Education

Conference in Lisbon, Portugal, on June 3rd, 2023. The team presented up to 60 poster communications, showcasing the work carried out under the 3C4Life project and discussing national strategies for scaling up under the leadership of educational authorities. This event targeted a diverse audience including higher education institutes, business partners, members of the National External Evaluation Boards (NEEB), academics, educational authorities, educational experts, teachers, non-formal education providers, teachers' centers, teacher educators, and the general public.

Workshop 18th April 2023



Figure 15 Photo © IE-ULIS

Throughout December 2022 to June 2023, the team organized 13 workshops at the University of Lisbon as part of a professional development program. These workshops were designed to disseminate the activities and outcomes of the 3C4Life project to in-service teachers, encouraging them to share this knowledge within their respective schools and with other STEM educators.

On 14 October, the team attended the Encontro Nacional de Clubes Ciência Viva na escola, one of the largest national meetings on science education in Portugal. This meeting provided an excellent opportunity for the team to share the activities of the 3C4Life project with education experts, representatives of education authorities, teachers, non-formal education providers, teacher centres and teacher trainers.

In April 2023, the Portuguese team conducted information workshops in local schools and ULIS to inform STEM teachers about the project's activities and preliminary results. These workshops also presented materials that could be used as classroom resources. In addition, the team used a mailing list established during the professional development programme to disseminate project activities to teachers. In addition, information about the 3C4Life project was included in the ULIS newsletter distributed in September 2023 and made available to both the academic community and the general public via the institutional website.

Looking ahead, the Portuguese team is planning to participate in the ENEC conference in January 2024 in Covilhã, Portugal, where they will share the project results through oral presentations and posters. They are also preparing an article for Boletim NOESIS, which focuses on education news and events, to summarise the project results. They are also planning a social media campaign to share the project results more widely.

Internationally, the institution's strategy included using major educational forums such as ESERA 2023 to disseminate the project's results on a global stage. In addition, the upcoming XX ENEC and

VI ISSE Seminar, scheduled for January 2024 in Covilhã, Portugal, represents a strategic opportunity to continue presenting and discussing the project results with an international audience. This forum will facilitate the exchange of ideas and methodologies developed within the 3C4Life project, promoting a wider application of these findings and fostering international collaboration in educational practice. The team's continued efforts to collaborate with other projects is exemplified by their partnership with the ICSE Science Factory project, where they will present the results of the 3C4Life project in early 2024, further ensuring the sustainability and impact of their initiatives.

Integrating and Sustaining 3C4Life Project Outcomes in Portuguese Education

Throughout the duration of the 3C4Life project, the Portuguese partners undertook several academic studies to evaluate the results of the project, with the aim of integrating these findings into its ongoing research activities. These results have already been presented at various conferences, highlighting their relevance and applicability to current educational debates. There are plans to make further use of the materials developed during the project. Specifically, these resources will be integrated into an upcoming teacher training programme starting on 27 January 2024 and 3 February 2024. This integration will focus on fostering teacher collaboration and enhancing competencies in areas such as Socio-Scientific Issues (SSI), Inquiry-Based Learning (IBL) and Context-Based Learning (CBL), which are critical for developing effective teaching strategies. The adaptation of the content of the teach4life platform to the national curriculum and educational standards was facilitated by the curriculum's emphasis on flexibility and interdisciplinarity. The curriculum guidelines prioritise the development of competences that go beyond the mere acquisition of knowledge and advocate student-centred learning approaches such as IBL and CBL. These methods often incorporate SSI, are well aligned with educational standards and contribute to the holistic development of students' competences.

From the professional development program developed through the 3C4Life project, ULIS has gained significant expert knowledge, particularly regarding the critical role of teacher training in sustaining engagement with the teach4life platform and promoting collaboration among educators. Additionally, the alignment of the proposed competencies with Portugal's curriculum reforms has greatly increased their perceived value among teachers, enhancing the practical impact of the project's outcomes. Throughout the program, teachers were tasked with implementing activities from the 3C4Life platform and collecting data from students. This approach was essential for evaluating the effectiveness of the competencies taught and for emphasizing their importance. Furthermore, the recognition by the Ministry of Education of the teachers' efforts in this project provided a significant motivational boost, encouraging continued investment in the teach4life platform.

Regarding future sustainability, ULIS recognizes the need for continued support and is looking towards the national agency Fundação para a Ciência e a Tecnologia (FCT) for potential funding. This support will be crucial for maintaining the national part of the platform and ensuring the ongoing operation of the project's initiatives.

Demonstrate the Impact of 3C4life Through Authentic Stories from Educators

The importance of authentic storytelling in educational programmes cannot be overstated. By focusing on real experiences, environments and people, the narrative surrounding the outcomes of a project like 3C4Life gains significant strength and relevance. These stories can be shared at both national and European levels, highlighting the tangible impact of the project on the individuals and communities involved. It is recommended that these genuine, impactful experiences form the core of the project's dissemination strategy in order to truly convey the benefits and transformative potential of the 3C4Life project.

One illustrative story involves "João" (a pseudonym), an elementary school teacher who participated in the professional development program facilitated by the teach4life platform. João, already applying STEM methodologies in his classroom, sought to further enhance his knowledge and skills in this area. As part of his training, he engaged with a group of seven other teachers from various schools, disciplines, and grade levels, working collaboratively on a project centered around the Autonomous Cars activity, which is part of the Engineering/Socio-Scientific Issues (SSI) curriculum.

This collaborative effort among the teachers serves as a compelling example of effective educational cooperation. João described the process in his own words: "(...) I visited five schools, and I was very well received. We completed all the activities. I created a space on my drive with documents and some guidelines for us to work on. So, we've had evening meetings. Today we're having one. Therefore, we've been collaboratively working on the poster. We distributed the work, each one taking a part. Then we'll share our tips for improvement, and we'll have meetings again tonight at 9:30, which is when we can manage. Regarding time, we only meet when we can, and it's only at 9:30 at night, after everything is taken care of – dinner, kitchen tidied up, and the family on the sofa – and then we gather!"

João's story not only underscores the dedication and commitment of teachers to enhance their professional capabilities but also highlights the practical challenges and realities of collaborating outside of regular school hours. This narrative vividly illustrates how the 3C4Life project facilitates meaningful professional development and community among educators, ultimately enriching the educational experience for both teachers and their students.

Strong connections with various teacher networks and communities have been established by the Portuguese team, significantly enhancing the dissemination and integration of the teach4life platform. The team members are affiliated to prominent scientific associations such as APEduC (Portuguese Association for Science Education), SPF (Portuguese Society of Physics) and SPQ (Portuguese Society of Chemistry). They actively contribute to the events organised by these associations, using them as platforms to present the products and results of the teach4life project. A notable example of this involvement is their planned participation in the XX ENEC (National Meeting on Science Education) and the VI ISSE (International Seminar on Science Education), scheduled for 18-20 January 2024 in Covilhã, Portugal, organised by APEduC.

In addition, several team members play coordinating roles in Redescola, a collaborative platform at ULIS involving numerous organisations and professionals in education and training at national, regional and local levels. Redescola aims to promote the emergence and consolidation of innovative practices in the education system. This network actively produces, disseminates and supports the mobilisation of educational information and knowledge among its partners, with the aim of developing new and improved educational practices and ensuring their sustainability. In terms of school and district partnerships, the team uses Redescola as a key tool for maintaining and building these relationships. This platform not only facilitates direct engagement with schools and districts, but also supports the integration of the teach4life platform into their professional development programmes. This strategic integration helps to ensure that the platform becomes an integral part of teacher training and support, extending its reach and impact to a wider range of educators. In addition, the team's extensive experience in teacher training has enabled them to build and maintain strong links with different schools, enhancing their ability to effectively implement new working models and educational practices.

In the future, the Portuguese team plans to continue offering teacher training workshops and webinars, building on the successful model established by the 3C4Life project. The knowledge and experience gained during this project will inform the design of new professional development programmes, which will continue to emphasise the findings and achievements of the 3C4Life initiative. Specifically, upcoming engagements include presentations at a school on 21 February 2024 and at the Fundação Vox Populi on 17 February 2024. These events have been organised at the invitation of educators who have participated in the 3C4Life professional development programme and aim to disseminate the results and findings of the project widely. By sharing these findings, the Portuguese partners hope to promote the impact of the project within the educational community and encourage a deeper understanding and wider adoption of the teach4life platform methodologies.

In conclusion, the Institute of Education at the University of Lisbon remains committed to exploiting the results of the 3C4Life project through a multi-faceted approach that combines academic dissemination, professional development and strategic partnerships. Their aim is to maintain the momentum generated by the project and ensure its lasting impact on STEM education in Portugal and beyond. Through continued collaboration, innovation and engagement, they aim to enrich the teaching and learning experiences of educators and students alike, fostering a future where STEM education is dynamic, inclusive and aligned with the evolving needs of our society.

3.3.6 Turkey

The Turkish project partners have engaged in a series of exploitation activities to evaluate and disseminate the results of the 3C4Life project, effectively integrating the findings into various educational contexts and discussions at both national and international levels.

At the national level, the Hacettepe University used a variety of exploitation strategies throughout the 3C4Life project, tailored to different audiences. The approach to engaging researchers and academics involved the use of academic congresses and meetings where data-driven discussions could take place. Specific forums such as national science and maths congresses and postgraduate seminars for university professors were prioritised to facilitate this scientific exchange. For policy makers, the strategy included a more targeted approach with presentations and one-on-one meetings, mainly at the ministerial level. These efforts were led by a project partner from the Directorate General for Lifelong Learning, ensuring that the policy implications of the project were effectively communicated and considered at a high level. Teachers and direct users of the project's results were engaged through every possible exploitation opportunity. The use of social media, community practice meetings, and other direct interactions provided continuous support to the teachers. Feedback mechanisms were notably emphasized, particularly through social media posts, which played a crucial role in evaluating how users applied the tools and resources provided by the 3C4Life project in their teaching practices. This comprehensive approach ensured that the project's resources were not only disseminated widely but were also effectively integrated into the educational practices at various levels. The National External Evaluation Board (NEEB) played a central role in these activities. The first meeting focused on evaluating the project process and discussing its relevance to the local context, involving stakeholders from the R&D unit of the Ministry of National Education, university board members and teachers. A subsequent meeting was dedicated to discussing the results of the project's field trials and strategizing on their exploitation, involving a diverse group of academics, science centre educators, special education consultants and teachers.

In addition, the Turkish team summarised the project results in progress reports that were presented to all directorates of the Ministry of National Education, including the General Directorate for Teacher Training and Improvement. These directorates, as the highest decision-making authorities for education in Turkey, played a crucial role in shaping educational policy based on the project's findings. The Vice Minister of National Education was also presented with comprehensive project findings, including questionnaires and details about the teach4life platform, ensuring high-level governmental support and recognition.

Regionally, the Turkish team organized information meetings for STEM teachers in Konya, Kırşehir, and Kocaeli. These meetings not only introduced the teach4life platform to a significant number of educators from densely populated STEM schools but also encouraged them to share the knowledge with peers, thus facilitating a cascade of training within the educational community. In efforts to align with ongoing curriculum changes across all grades and branches in Turkey, the 3C4Life Project and teach4life Platform were introduced in meetings led by the Head of the Department

(Monitoring & Evaluation Unit) at the Ministry of National Education. This centralized approach ensures that the project's tools and methods could potentially be integrated into the national curriculum, reaching educators and students in all 81 cities across Turkey. Meetings with significant educational figures such as the Director General of Basic Education further emphasized the project's influence on national educational programs, especially those that are skill-based. Suggestions were made to incorporate certain competencies from the project into the current programs. The project's results and methodologies were also highlighted in various academic settings, including the Science and Mathematics Education Congress organized by the Science Education Research Association, where oral and poster presentations provided solutions based on the project's outputs.

Internationally, the policy seminar at the [ESERA 2023 conference](#), held in Turkey, served as both an international and local platform for exploitation, well-attended by the Turkish Ministry of National Education and teachers. This seminar facilitated discussions on integrating research findings into teaching practices, thereby enhancing STEM education.

3C4Life Policy Seminar at the ESERA 2023 Conference



Figure 17 Photo © HU, ESERA, Policy Seminar

The 3C4Life Policy Seminar at the ESERA 2023 Conference brought together experts from different fields to discuss the "Challenges and Opportunities of STEM Education - Bridging Science, Practice and Policy in Europe". Around 60 participants, including representatives from ministries, education-focused companies, academia and educators, attended the event organised under the auspices of the 3C4Life Erasmus+ project. The structure of the seminar included keynote speeches followed by a panel discussion, which encouraged an interactive dialogue among the participants. Dr Monica Baptista opened the seminar with a presentation

entitled "Skills Development in STEM Education: How to Support Teacher Learning?" She discussed effective STEM education strategies based on best practices in science, practice and policy, and explained the integration of the teach4life platform. Her presentation highlighted a professional development programme in Portugal that enhances STEM teacher competencies through collaboration between local administrations and universities. Dr Antonio Quesada discussed the research tools developed within the 3C4Life project, focusing on data collected from teachers on platform usage, professional motivation and collaborative practices. His findings highlighted the different perceptions of teachers from



Figure 16 Photo © HU, ESERA, Policy Seminar

different countries and the significant impact of policies aimed at improving teachers' professional knowledge and self-efficacy. In his presentation "Being a STEM Teacher as a Career Choice", Dr Gökhan Kaya explored what motivates individuals to pursue a career in STEM teaching. Using career videos from the teach4life platform, he illustrated the influences from early childhood through to professional experience that draw individuals into the field. Brett Langenberg, member of the projects European external evaluation Board provided an external perspective, discussing the challenges teachers face, the support they need, and the importance of incentive schemes and integrated career guidance in sustaining educational platforms.

The panel session, chaired by Agueda Gras-Velazquez, addressed critical issues such as perceptions of STEM careers, teacher retention strategies and the search for quality educators. The discussion expanded to include the involvement of teachers in training programmes, the relevance of CPD materials and the application of research results at different administrative levels. It highlighted the multiple challenges and opportunities within STEM education in Europe.

The seminar proved crucial in shedding light on the complex landscape of STEM education in Europe, focusing on the career paths of STEM teachers and the capacity of tools such as the teach4life platform to address these challenges. The entire seminar has been recorded and is available on YouTube: <https://youtu.be/LqFBrkhhbqAs>.

Looking ahead, the Turkish project partners are planning to continue disseminating information through digital platforms. Updates on the project will be published on the website of the Directorate General for Lifelong Learning, which is followed by a large number of trainees, trainers and teachers involved in non-formal education. Similarly, the directorate's social media channels will play a crucial role in reaching a broader audience, ensuring that the project's impact extends beyond traditional educational frameworks. Through these diverse activities, the Turkish team is not only ensuring the dissemination and integration of the 3C4Life project results into current educational practice but is also setting the stage for the future sustainability and continued relevance of the project innovations. HU plans to use the results of the 3C4Life project in various contexts to enhance its research activities and educational offerings. Academic studies of the project outcomes are underway and will be incorporated into ongoing research processes. In addition, the materials developed during the project will be used in other projects and as part of course materials in various fields. This approach will support the revision or creation of teacher training programmes tailored to teachers' career expectations and informed by the feedback received during the project.

The 3C4life project has generated significant expertise, particularly in understanding the dynamics of teachers' interaction with online platforms. The structures that facilitate or hinder the effective use of such platforms have been identified by the project experts. A key outcome has been to identify the aspects of career development that teachers find most inspiring and their expectations regarding career opportunities. This knowledge is crucial for designing future educational tools and resources that meet teachers' needs and aspirations. Regarding the sustainability of the project, potential funding sources include the use of university infrastructures to support the long-term availability of the teach4life platform. In addition, fostering local partnerships with other projects and using materials developed during the project can contribute to its ongoing viability. Storing the content of the platform in a repository, such as the new one being developed in the ICSE Academy project, ensures that learners have access to these resources when they need them. In addition, the production of a [project 3C4life booklet](#) under the lead of the Turkish team (WP6), available in both printed and online formats, will help to effectively preserve and disseminate the project's resources and outcomes. These strategies will ensure the continuity of the project's impact and facilitate continued access to its valuable resources. We had very good experiences with similar books from former projects: It is very well accepted by teachers and will make a huge impact on the dissemination and sustainability of our project. How sustainable such a book can be is shown by the books developed within Primas (2010 – 2013), Mascil (2013 – 2016) and MaSDiv (2017-2022) as teachers still ask for them. The goal of this booklet is to enhance the professional development of STEM teachers by providing them with updated educational strategies and methods that foster lifelong learning. It aims to equip teachers with the tools and knowledge necessary to stay current in the rapidly evolving fields of science, technology, engineering, and mathematics (STEM). By integrating innovative pedagogical approaches, authentic learning activities, and addressing socio-scientific issues, the booklet seeks to improve the effectiveness of STEM education and prepare students to navigate and contribute to complex real-world problems. Additionally, the booklet offers career guidance to help teachers explore various professional pathways within and outside the traditional educational settings, thereby broadening their career opportunities and enhancing their professional growth. The book is completed with a general introduction to the 3C4life project, its partners, and objectives as well as results and evidence. It is available as an online publication for anyone interested in learning more about teaching career and competence development. The booklet links each section on pedagogical approaches and classroom activities to the teach4life platform. Educators are encouraged to visit the platform for additional content, such as comprehensive teaching materials and opportunities for professional exchange. This encourages teachers to engage in ongoing dialogue, share their experiences, and gain insights from their peers, thereby fostering a collaborative learning environment. The teach4life platform is highlighted as a resource for teachers seeking to explore various career paths within and beyond traditional educational settings. It offers information on different professional opportunities, showcases innovative teaching strategies, and

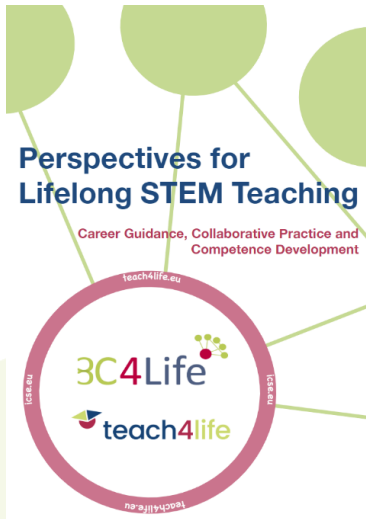


Figure 18 3C4life booklet, cover page

provides tools for enhancing pedagogical skills. By directing educators to the platform, the booklet ensures that they have access to a supportive community where they can continue to grow professionally.

Effective Dissemination Strategies of the 3C4life Project



Figure 19 Photo © HU, Webinar schedule

For example, the organisation of the first introductory webinar on the project by the Turkish project team was a very successful dissemination activity. This event consisted of three separate sessions held on the same day, each of which attracted between 60 and 70 participants. It marked one of the initial efforts to disseminate detailed information about the project, actively involving teachers, introducing the teach4life platform, and clarifying the project's objectives. The webinar effectively established direct engagement with the target audience, marking a significant step in the outreach efforts.

Another notable example of dissemination was the extensive sharing of project resources. All meetings, recorded videos, and supporting materials created during the project were uploaded to YouTube as open-source content, making them widely accessible. This effort was further amplified through the strategic use of social media tools, enhancing visibility and engagement with a broader audience. This approach not only expanded the reach of the project's outputs but also facilitated ongoing access to educational resources, contributing to the project's lasting impact on the educational community. The teach4life platform was launched in Turkey in September 2022 and received extensive promotion through various channels, particularly on social media. Promotional efforts primarily utilized accounts like Hacettepe STEM & Maker Lab and STEM PD. Additionally, the Ministry of National Education, a local project partner, promoted the platform through its extensive network. The snowball effect of teachers sharing the projects promotional flyers via their networks and social media platforms contributed significantly to the platform's visibility. This strategy proved to be highly effective as it garnered over 600 applications from educators interested in participating in the implementation of the teach4life platform, including many teachers outside the primary target group of STEM educators.

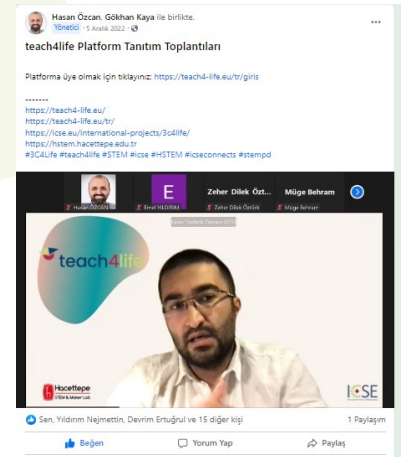


Figure 20 Photo © HU, Social Media screenshot

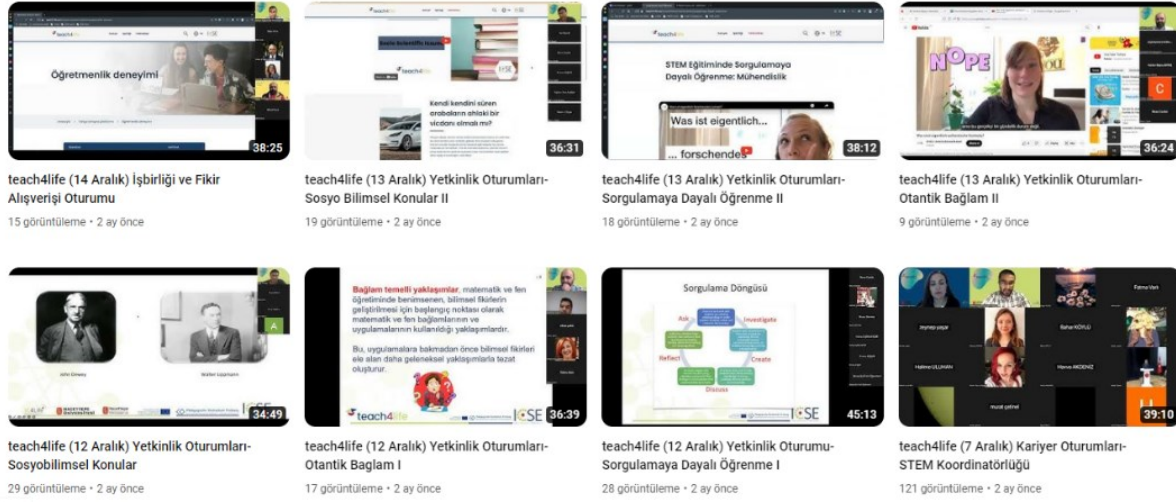


Figure 21 Photo © HU, Youtube channel

Real Impact: How Teach4Life Transforms Educator Careers

The power of storytelling in educational programmes is well recognised, especially when the stories are rooted in authentic experiences that resonate on a personal level. Such real stories, involving real people and real environments, greatly enhance the impact and relatability of project outcomes. Sharing these stories at national or European level not only highlights the transformative experiences of individuals involved in the 3C4Life project, but also serves as a powerful dissemination tool.

One such compelling story comes from Emel (anonymised), a teacher who engaged with the teach4life platform at the beginning of the field trial and became the subject of one of the case studies. Wanting to change her career path, Emel attended interviews for a STEM coordinator position. Despite a disappointing outcome due to salary restrictions - a common reality in many professions - her interest in the field was undeniably sparked. Emel shares her experience: "I went for an interview at a school that was looking for a STEM coordinator. The school had a vague idea of what they wanted from a STEM coordinator and were not prepared to offer a salary that would match the effort required. While money is not the only motivator in our profession, it is a necessary consideration. As a result, the interview did not lead to a job offer, but it ignited a spark of excitement in me. It was serendipitous when I discovered that the role of STEM coordinator was listed among the career opportunities on the teach4life platform. This prompted me to take a closer look at the responsibilities of a STEM coordinator and the qualifications required. I am now actively seeking to specialise in this area in my subsequent job applications, driven by the challenge and excitement it brings".

This story illustrates how the teach4life platform not only informs its users about potential career paths, but also supports them in pursuing new professional challenges that match their passions

and aspirations. Emel's journey illustrates the role of the platform in facilitating career exploration and development, thereby contributing to personal and professional growth within the education sector.

Expansion and Networking: Future Plans for the Teach4life Platform in Turkey

Looking ahead, the Turkish team plans to continue disseminating information through the National Ministry of Education's website, particularly via the Directorate General for Lifelong Learning, which is frequented by a vast audience of non-formal education trainees, trainers, and teachers. There are 1001 community colleges listed in the directory. The team aims to increase the visibility of the project by regularly sharing project products created using Canva. It is hoped that these efforts will further extend the reach of the project, particularly through the Community of Practice groups.

Regarding connections with teacher networks and communities, the Turkish team members are active participants in the Association for Science Education and Research and regularly contribute to the Science and Mathematics Education Congress organized by this association. These engagements have facilitated numerous dissemination activities and are instrumental in influencing curriculum renewal efforts from preschool to university levels. Notably, Assoc. Prof. Dr. Gökhan Kaya is actively involved in updating science programs, ensuring the integration of project products and results into new curricular frameworks.

In terms of school and district partnerships, Assoc. Prof. Dr. Gökhan Kaya's involvement in updating science programs exemplifies our team's commitment to integrating the teach4life platform into broader educational practices. This collaboration extends to various universities and schools associated with the STEM PD organization, with whom we maintain robust partnerships. These collaborative efforts are crucial for embedding the teach4life platform into professional development programs across schools and districts, ensuring that the platform is a staple component of teacher training and support, thereby reaching a broader audience of educators and facilitating the development of new educational models. Prof. Dr. Mustafa Hilmi Çolakoğlu, a member of the Turkish STEM PD team, previously participated in the ET2020 Working Group on Schools. His involvement in the group provides valuable insights, particularly concerning the challenges faced by the teaching profession today.

The Turkish project partners have effectively used the outcomes of the 3C4Life project and integrated them into various educational and policy sectors, both nationally and internationally. Overall, these activities have positioned the Turkish partners as leaders in the use of educational research to improve teaching practice and policy discussions, ensuring the sustainability and continued impact of the 3C4Life project outcomes in the education sector.

Maximizing Impact: The 3C4Life Project's Strategies for Sustainability and Broader Reach

In conclusion, the 3C4life project has successfully provided partners and institutions with valuable tools, direction, and perspectives for the development of sustainability and exploitation activities. By focusing on effective dissemination and exploitation, the project aims to create a lasting impact that goes beyond the project's lifetime. This includes raising the reputation of the participating institutions, influencing policy and practice, and fostering further cooperation and partnerships.

The partners have identified various channels and means for exploitation, both at the European level and within the partner countries. These strategies involve engaging with relevant stakeholders, networks, and initiatives to ensure the sustainability of the project outcomes and results. Through the use of social media, conferences, events and peer learning opportunities, the project aims to reach out to countries beyond the partnership and promote the implementation and integration of successful practices into policies and education systems.

Moreover, the project emphasizes the importance of sharing real stories and experiences to inspire others and maximize the impact of its outcomes. The teach4life platform has great potential to alter the professional development of STEM teachers across Europe. To ensure its success, it is crucial to focus on localization and adaptation of content, building awareness and outreach, integration with existing educational environments, monitoring, evaluation, continuous improvement, and financial sustainability. By following the outlined strategies, the teach4life platform can effectively scale up and extend its reach to countries beyond the partnership, ultimately enhancing the quality of STEM education and empowering teachers throughout Europe. Overall, the 3C4life project serves as a valuable model for up-scaling activities in Europe and beyond, with the goal of improving the quality of STEM teaching and the lives of teachers across Europe.

4. Conclusions and Recommendations for the 3C4Life Project

Dissemination and exploitation have been important tasks throughout the project as 3C4life is a research project aimed at scaling up and mainstreaming the policy intervention. Therefore, we disseminated before, during and after the project, using a wide range of channels and media to reach the well-defined target groups. A clear and awareness raising dissemination strategy and careful planning and implementation of dissemination activities tailored to different target groups were key factors in promoting the project's ideas and goals of inspiring STEM teachers to commit to lifelong professional development from the start of their careers, addressing the critical shortage of STEM teachers in Europe and improving STEM education. It aims to empower STEM teachers for career-long success, thereby strengthening the teaching profession and promoting educational excellence.

In terms of dissemination and exploitation, two aspects have been identified as crucial to increase the impact of our action: Collaboration within the project and the involvement of key stakeholders at national and European level. These contacts and collaborations open doors that a single institution would not be able to open. There are some features of the project design that have proved successful in this respect:

The ministry-university tandems: The project focuses on this cooperation. At the national level, the Ministry's leadership ensured that the project's outputs and outcomes were in line with national assumptions and highly relevant in the national context, which is very important to achieve a systemic impact. The ministries also have extensive channels for the promotion and implementation of the project's objectives and results. Without the Ministry, it would not have been possible to reach the large numbers involved in disseminating and exploiting the project (teachers, stakeholders). In addition, as the representatives of the ministries were very much involved in the project work, they were very committed to the dissemination of 3C4life and to paving the way for its further implementation.

Advisory Panels (EEEB and NEEBs): The National External Evaluation Board engaged various stakeholders in teacher professional development. It acted as a channel for advice and opened doors for further dissemination at local, regional and national level. It also facilitates to collaborate with policy makers at a regional and local level.

The European External Evaluation Board expanded the project's scope beyond the consortium countries, promoting the integration of the teach4life platform into educational courses and activities across Europe. Furthermore, they monitored the overall progress of the project. Dissemination at the European level was enhanced by promoting the initiative through networks such as the European Schoolnet and ESERA.

Peer Learning: Regular updates on dissemination efforts provided a platform for sharing experiences, best practices, and addressing challenges. This collaborative environment fostered the

exchange of strategies and approaches, enhancing participant engagement and the adoption of project outcomes.

Furthermore, each partner had specific approaches and used different means to disseminate the project's ideas and offer the project's results for exploitation. For example, the Spanish team set up a 3C4life TPD course. In Turkey, the project team worked with teacher webinars to implement the teach4life platform. The project meetings were also the forum to share these experiences and support partners to adapt these approaches.

- **Quality Control:** Dissemination activities were monitored, and feedback provided for optimization by a dedicated quality control work package (WP8). The dissemination and exploitation strategy, which was constantly reviewed and revised as necessary, was influenced by this continuous feedback. It also ensured that dissemination and exploitation would occupy a central position in the activities of the project throughout its duration, as the project aimed at mainstreaming and up-scaling of the action.

- These strategies were instrumental in maximizing the impact of the 3C4Life project. Future project planning should incorporate these approaches, together with a clear strategy for communication, dissemination and exploitation, underpinned by clearly defined roles and responsibilities. Finally, a clear distribution of tasks and responsibilities supports the achievement of project goals.

To ensure that the results of the project are continuously exploited and that the emerging collaborations are sustained and strengthened, the International Center of STEM Education (ICSE) at the University of Education Freiburg plays a central role as project coordinator. ICSE acts as a facilitator, mediating and connecting a wide range of stakeholders in the field of STEM education. As a forward-looking centre, ICSE keeps abreast of the latest educational and technological trends, while deeply valuing the past work and expertise of its members. Consequently, ICSE will continue to promote 3C4Life outputs and services through appropriate channels, targeting precisely identified audiences at optimal times.

5. References

https://ec.europa.eu/assets/eac/promo/Erasmusplus-Communication%20Strategy_2023.pdf (02.11.23)

<https://education.ec.europa.eu/focus-topics/digital-education/action-plan> 19.02.2024

https://european-union.europa.eu/institutions-law-budget/institutions-and-bodies/institutions-and-bodies-profiles/etf_en 21.02.2024

<https://eit.europa.eu/> 19.02.2024

<https://www.eaie.org/> 20.02.2024

<https://oeb.global/> 19.02.2024

<https://30.eden-online.org/> 15.01.24

www.esera.org/about-us/ 15.01.24

<https://www.oecd.org/education/2030-project/> 02.11.23

https://youth.europa.eu/strategy_en 16.01.24

<https://www.science-on-stage.eu/> 19.02.24

<http://www.eun.org/> 20.02.24

<https://www.scientix.eu/> 20.02.24

<https://education.ec.europa.eu/> 17.01.24

<https://erasmus-plus.ec.europa.eu/projects> 22.02.24

European Commission, Directorate-General for Education, Youth, Sport and Culture, Supporting teacher and school leader careers: a policy guide: report, Publications Office, 2020, <https://data.europa.eu/doi/10.2766/972132> 02.11.23

<https://ca.indeed.com/career-advice/career-development/what-is-pitch-deck> 20.02.24

Cf. Cakmakci, Gultekin et al., 3C4life Midterm Report on Dissemination, 2022, p. 6-7.
unesdoc.unesco.org/ark:/48223/pf0000387001/PDF/387001eng.pdf.multi, Feb. 2024, page

<https://www.forbes.com/sites/katharinabuchholz/2024/02/02/where-the-global-teacher-shortage-is-hitting-hardest-infographic/?sh=67e575515d41> 19.02.2024