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MODELLING AND REFLECTION ON INSTRUCTIONAL ACTIVITIES (MARIA) FRAMEWORK: THE VOICE OF PARTICIPANTS IN THE TAP-TS PROJECT

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Abstract

The EU Teacher Academy Project – Teaching Sustainability (TAP-TS), running from June 2022 until July 2025, aims to strengthen the sustainability education competences of European primary and secondary level student teachers, teacher educators and teachers, according to the GreenComp framework (Bianchi et al., 2022). This was achieved through the co-creation, piloting, and implementation of Learning and Teaching Packages (LTPs), participation in international teacher development courses, and engagement in an international community of practice. This communication presents an experimental framework developed within the project, called MaRIA (Modelling and Reflection on Instructional Activities), designed to foster a reflective approach based on experiences around teaching sustainability within the activities integrated in the LTPs. The TAP-TS MaRIA' framework includes three levels of engagement – students, schools and wider community – and seven dimensions of reflection transversal to the three levels. This framework guides the follow-up activities in each LTP to encourage a focused reflection on the learning experiences about sustainability that are provided, but can also be used in other moments of the LTP creation process. By using various data collection methods in the LTPs implementation - such as participant-produced materials and videos - reflections from teacher educators, in-service teachers, school leaders and future teachers regarding teaching sustainability were gathered. In the present communication a diversified set of reflections of participants about the TAP-TS project driven by the use of the framework will be also presented. The results of the application of the MaRIA framework within the context of the TAP-TS activities, suggest that it is a relevant tool for promoting deeply reflections across different dimensions of instructional activities for teaching sustainability. In the future, creating more opportunities to use the MaRIA framework will enhance our understanding of its impact on educational material creation and broaden leaders, teachers' and future teachers' perspectives on teaching sustainability.

Keywords: *Framework, reflection, sustainability, teacher education.*

1. Introduction

The EU Teacher Academy Project – Teaching Sustainability (TAP-TS, n.d.), running from June 2022 until July 2025, aim to strengthen the sustainability education competences of European primary and secondary level student teachers, teacher educators and teachers, according to the GreenComp framework (Bianchi et al., 2022). This was achieved through the co-creation, piloting, and implementation of learning and teaching packages (LTPs), participation in international teacher development courses, and engagement in an international community of practice. The LTPs were organized into seven themes: A Sustainable Europe; Sustainability and Digitality; Sustainability & Environmental Education; Climate Crisis Resilience; Dealing with Climate Disinformation; Green Citizenship in/for Europe; Sustainable Entrepreneurship Education (SEE). Additionally, a LTP compendium was created, with additional information about the LTPs design process, methodological underpinnings, validations processes and lessons learnt at policy, institutional and personal levels. The project partners, along with other teachers and student teachers, engaged with that set of materials during four Active Learning Events, which included both online and in-person components.

Within that project, an experimental framework called MaRIA (Modelling and Reflection on Instructional Activities) was developed and integrated in the follow-up activities of each LTP. The participants were involved in reflection moments oriented by the framework, mainly in project events for piloting the materials. This paper presents a diversified set of reflections on teaching sustainability of participants driven by the use of that framework.

2. Theoretical background

Reflective thought in education can be traced back to Dewey (e.g., Dewey, 1933). However, it was not until the 1980s that the term 'reflection' gained prominence in discussions surrounding practitioner development, including that of teachers (Anderson, 2020). Teacher reflection can be understood as the process of thinking one's professional work and engaging in self-evaluation, whether by an individual preparing for a teaching career or by an experienced educator (Wieseman, 2009). Korthagen (2010) study shows that teacher reflection can have positive outcomes on the quality of teachers' interpersonal relationships with students, adequacy of perception of these relationships, and job satisfaction.

The growing interest in teacher reflection led researchers to create conceptual frameworks designed to promote teacher reflection, in the following decades. For example, the conceptual framework proposed by Colton and Sparks-Langer (1993) is built upon four key attributes: efficacy, flexibility, social responsibility, and consciousness. Central to this framework is the professional knowledge base of teachers, which, when combined with their actions focused on planning, implementation, and evaluation, enhances the conscious process of reflection and decision-making. A significant outcome of this framework is that teachers create new mental representations and meanings as they interpret reality through the lens of their professional knowledge (Colton & Sparks-Langer, 1993).

Some frameworks for specialized teachers were also created to promote their reflection. One example is Farrell (2015)' frameworks to foster teacher reflection in second language education. This framework describes five levels of reflective practice (Philosophy; Principles; Theory-of-Practice; Practice; Beyond Practice) and specific techniques for teachers, alone, in pairs, or in a group, to implement each level of reflection in their work, using a deductive or an inductive approach. Moss et al. (2018) developed a reflective practice framework that was applied to mathematics teachers. The daily framework created was constituted by six daily reflective questions based in the mathematical meaning of the lesson, misconceptions that emerged during the process of task resolution from students, comments and reflection shared by students and lessons learners that could be applied to other classes of the same subject (Moss et al., (2018). The daily framework filled by the teacher was read and commented on by a mathematics education researcher. According to the authors, this process, in addition to promoting teacher reflection, led to other advantages, such as the reduction of the teachers' sense of isolation and the establishment of a community of practice.

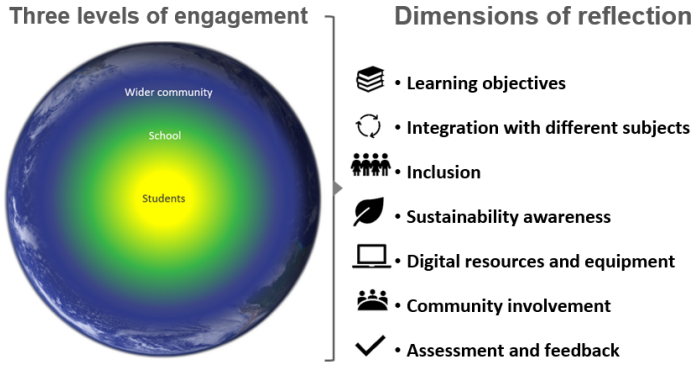
In literature can also be found frameworks to foster teacher reflection on their competences. One example is the Reference Frameworks of Competence for Democratic Culture (RFCDC) which presents a tool for teacher self-reflection (Lenz et al., 2021). This framework seeks to assist teachers and other educators in enhancing their competencies related to democratic culture and fostering a 'democratic professional ethos,' grounded in the values of democracy, human rights, and intercultural dialogue (Lenz et al., 2021). Specifically, about sustainability, Warren et al. (2014) created the Sustainability Education Framework for Teachers (SEFT) (2014). The SEFT framework aims to empower educators to grasp the broad and complex nature of sustainability, emphasizing its problem-oriented and solution-driven aspects (Warren et al., 2014). It incorporates four interconnected ways of thinking - futures, values, systems, and strategic - which can be used to help novice teachers link seemingly unrelated sustainability topics. As a self-reflection conceptual framework, SEFT provides organizing principles for addressing sustainability challenges and encourages self-reflection and independent inquiry through real-world contexts. It fosters collaboration in various interpersonal settings while prompting critical inquiries about societal values, equity, and future visions, ultimately guiding pathways toward a sustainable future (Warren et al., 2014). The GreenComp framework (Bianchi et al., 2022) was also used to foster teacher reflection on sustainability. The compendium of case studies on GreenComp by Javorka et al. (2024) presents examples demonstrating how GreenComp has encouraged teacher reflection across various educational levels, including primary and secondary education, higher education, vocational education and training, and non-formal education. Sourgiadaki and Karkalakos (2023) also used the GreenComp framework as a foundation to promote reflection and enhance VET teachers' readiness in creating learning opportunities for the green transition, while maintaining a critical perspective on its application.

3. MaRIA Framework

The Modelling and Reflection on Instructional Activities (MaRIA) framework was designed to foster a reflective approach based on experiences around teaching sustainability within the activities integrated in the learning and teaching packages of the TAP-TS project (Revyakina et al., 2024). The TAP-TS MaRIA' framework includes seven dimensions of reflection in three levels of engagement – students, schools and wider community (Figure 1). This framework was developed to assist in creating both innate or spontaneous opportunities for reflection and ex-post reflection opportunities, both of which are essential components of teacher reflection (Revyakina et al., 2024).

The three levels of engagement in the MaRIA framework progress from the micro level (reflecting on students' learning about sustainability) to the meso level (reflecting on the school's impact on sustainability learning), and finally to the macro level (reflecting on the influence of the wider community on sustainability and sustainability learning) (Revyakina et al., 2024).

Figure 1. Levels of engagement and dimensions of reflection of MaRIA' framework (Credits: Authors).



MaRIA framework comprises seven dimensions of reflection which are prompted by specific questions presented in the LTPs. The learning objectives focus on reflecting on the relationship between proposed activities and curriculum goals, ensuring alignment with the GreenComp framework for sustainability competences (Bianchi et al., 2022) and identifying gaps to enhance the integration of Sustainable Development Goals (SDGs) in education. Reflection on integration emphasizes connecting sustainability across subjects to strengthen its role as a transdisciplinary focus. Inclusion reflections aim to maximize student participation and meaningful engagement, recognizing the necessity of action to realize educational inclusion. In TAP-TS learning events, teachers reflect on how activities enhance sustainability awareness and responsibility, crucial for informing younger generations' actions. While TAP-TS isn't a digital pedagogical project, it incorporates digital resources to support meaningful learning experiences. Community engagement reflections extend learning beyond classrooms, encouraging connections with local sustainability issues and diverse community involvement. Assessment and feedback are challenging yet essential, requiring reflection on effective evaluation methods that meet both formative and summative needs. This includes monitoring students' knowledge and skills while also seeking feedback to inform teaching practices and resource use. Overall, reflective practices in TAP-TS support comprehensive teaching approaches aimed at fostering sustainability awareness, inclusion, and effective community engagement (Revyakina et al., 2024).

4. Methods

The MaRIA framework was applied in different moments of the LTPs development and implementation, allowing to collect different evidences of educators' reflections. The participants were school leaders, in-service teachers, future teachers and teacher educators that participated in the Active Learning Events of the TAP-TS project. In those Active Learning Events they experienced different LTPs and gave their contribution to their improvement. Written reflections of teachers are commonly instruments used to collect teacher's reflective thinking (Hayden et al., 2013) and were also used to collect teacher reflections during Active Learning Events. Sound and video are also popular ways to collect teachers' thoughts. Accordingly, various data collection methods in the LTPs implementation, such as participant-produced materials and videos, with reflections about teaching sustainability, were gathered. The participant-produced materials during the Active Learning Events were collected to analyse their impact in the LTPs development. Additionally, in the present work, the analysis of a set of reflections that represents the diversity of participants is presented: a school leader, an experienced in-service teacher, a future teacher. Participants were asked to reflect about the contribution of the TAP-TS project and Active Learning Events to their professional development, choosing one or more dimensions of reflection of MaRIA framework. The ideas of all participants were collected using video recording.

5. Results

5.1. MaRIA impact on LTPs development

Participant-produced materials during the LTPs piloting showed that MaRIA framework contributed to identify elements and ideas that could be improved in the LTPs developed within the project.

For example, activities designed for teaching sustainability in primary schools were refined based on the participants' reflections facilitated by MaRIA, particularly focused on the students' level of engagement, to more specifically contribute for the development of sustainability competences in young students. For instance, comparing with the first LTPs version, a teaching approach for primary school students focused on preservation of ecosystems was enhanced to incorporate different levels of analysis on human impact and prevention and protection actions. This process encouraged participating primary school students to reflect on sustainability and contributed to develop several GreenComp competencies within them.

5.2. MaRIA impact on TAP-TS participants

5.2.1. Reflections of a school leader. The school leader considered TAP-TS one of the most important projects it as participated in, focusing on sustainability and methodologies. He highlighted the importance of the project events to improve and disseminate teaching sustainability and expressed the possibility of mobilization of the LTPs resources to involve local schools and community on projects to promote sustainability competences. The value for teachers, students, and local partners was emphasized, noting the participation of teachers from local schools. He mentions the opportunity to strengthen connections between the school of education and local institutions, as well as an opportunity to internationalization and strengthen ties with European partners. The opportunity of discussion and reflection in the international network reinforce the cooperation stablished as a European learning community, that should continue beyond the project. He recognised the value of the LPTs created in the project, which will allow student teachers, teacher educators and teachers to use them in local contexts. Overall, the school leader's reflections indicated a focus on the school level of engagement and in the "sustainability awareness" and, primarily, "community involvement" dimensions of the MaRIA framework.

5.2.2. Reflections of an in-service teacher. The science in-service teacher expressed that she had no doubts about the relevance of participating in the TAP-TS project, because sustainability is a very important issue nowadays, and it was a rewarding experience. She learned new methods and activities for teaching sustainability in all its aspects. She found most of the activities to be very innovative and appealing to students, and noticed their engagement when developing them with her own students. She also noted that the sharing of ideas and progress between project participants was an added value. The in-service teacher reflections indicated a focus on the students' level of engagement and in the integration of the resources experienced in her own practice, mainly considering "learning objectives" and "integration with different subjects".

5.2.3. Reflections of a future teacher. The future primary teacher described her participation in the TAP-TS Project as a rewarding experience with a significant impact on her professional development. Through both synchronized sessions and face-to-face meetings, she expanded her knowledge of teaching sustainability. The workshops organized by the project partners allowed her to create a significant collection of innovative and reflective activities to use with her students. Por example, some activities increase reflection on the human impact on the planet, addressing common problems such as the harmful effects of digital technologies on the environment and the responsible use of natural resources. She considered the experience at the Active Learning Events in Portugal as a privileged moment for exchanging knowledge and reflection. She had the opportunity to collaboratively, in an international group of teachers and student teachers, experience and discuss some activities of LTP for primary education and also reflect about the development of the activities with students based on the MaRIA framework. She implemented one activity with students and present and discussed their work with the participants in a hybrid moment of the Active Learning Event 4. The MaRIA framework also was import for the final reflection about the contributes of the work for students' developing sustainability competences, identifying some of their ideas shared in the classroom related with raising awareness of sustainability (Figure 2). She emphasizes her commitment to working actively with students to achieve sustainable development goals by 2030, promoting concrete actions that ensure a more balanced and sustainable future for all. In summary, the future teacher reflections indicate a focus on the students' level of engagement and in the "sustainability awareness" and "integration with different subjects" dimensions of reflection.

Figure 2. Students' conclusions shared by the student teacher in the ALE4 final session (Credits: Student teacher).

6. Conclusion

The MaRIA framework facilitated the refinement of LTPs and fostered reflection to prepare educational resources. This process resulted in enhanced activities for teaching sustainability in primary and secondary schools, as well as a deeper analysis of student work and the development of sustainability competences among students. The collaborative work provided a common understand of the MaRIA framework facilitating the reflection and discussion of ideas to promote teaching sustainability. Additionally, the results of the application of the MaRIA framework within the context of the TAP-TS activities, based on three levels of engagement: students, schools, and the wider community, suggest that it is a promising tool for promoting deeply reflections across different dimensions of instructional activities and moments of teachers practice for teaching sustainability. Further application of the MaRIA framework is needed to fully understand its impact on creating educational materials and to broaden leaders, teachers' and future teachers' perspectives on teaching sustainability.

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