Integrated Science 8

Delfín Ortega-Sánchez *Editor*

Controversial Issues and Social Problems for an Integrated Disciplinary Teaching

Springer

Integrated Science

Volume 8

Editor-in-Chief

Nima Rezaei, Tehran University of Medical Sciences, Tehran, Iran

The **Integrated Science** Series aims to publish the most relevant and novel research in all areas of Formal Sciences, Physical and Chemical Sciences, Biological Sciences, Medical Sciences, and Social Sciences. We are especially focused on the research involving the integration of two of more academic fields offering an innovative view, which is one of the main focuses of Universal Scientific Education and Research Network (USERN), science without borders.

Integrated Science is committed to upholding the integrity of the scientific record and will follow the Committee on Publication Ethics (COPE) guidelines on how to deal with potential acts of misconduct and correcting the literature.

Delfín Ortega-Sánchez
Editor

Controversial Issues and Social Problems for an Integrated Disciplinary Teaching

Springer

Editor
Delfín Ortega-Sánchez
Department of Specific Didactics
University of Burgos
Burgos, Spain

ISSN 2662-9461 ISSN 2662-947X (electronic)
Integrated Science
ISBN 978-3-031-08696-0 ISBN 978-3-031-08697-7 (eBook)
https://doi.org/10.1007/978-3-031-08697-7

This Springer imprint is published by the registered company Springer Nature Switzerland AG
The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

Acknowledgment

This publication has been made possible by the support of the Integrated Science Association (ISA), Universal Scientific Education and Research Network (USERN), and funding from the Ministry of Science and Innovation—Government of Spain, through the projects 'Future Education and Democratic Hope. Rethinking Social Studies Education in Times of Change' (PID2019-107383RB-I00), and 'The Nature of I-STEM (NOSTEM) for Citizenship Education' (PID2020-118010RB-I00).

Contents

1 Teaching Controversial Issues and Social Problems from an Integrated Perspective

Delfín Ortega-Sánchez

Abstract

The purpose of working on social problems in education is based on the need to critically understand reality, to apply the concept of social justice, and to learn and teach how to participate actively, committedly and responsibly in the construction of answers or alternatives to a naturally problematic reality. Dealing with social problems appears to be linked to the development of critical social thinking, to the acquisition of social competences and, consequently, to education for a participatory democratic culture. Educating for social intervention therefore requires the curricular incorporation of relevant social problems, controversial issues or socially live issues from an integrated transdisciplinary perspective, and the acquisition of the competences to teach in and for a democratic, inclusive and truly egalitarian citizenship.

We find ourselves in a world with growing economic, political, environmental and social problems, which justify the educational need to teach controversial issues and social problems.[1] The teaching of controversial issues, defined as opposing view-

[1] Considering its natural relational and conceptual interdependence, in this introduction we use the terms "controversial issue" and "social problem" equivalently. However, we refer to one or the other term depending on the contextual specificities that require, necessarily, their explicitness.

D. Ortega-Sánchez (✉)
Department of Specific Didactics, University of Burgos, Burgos, Spain
e-mail: dosanchez@ubu.es

Universal Scientific Education and Research Network (USERN), Integrated Science Association (ISA), Tehran, Iran

D. Ortega-Sánchez (ed.), *Controversial Issues and Social Problems for an Integrated Disciplinary Teaching*, Integrated Science 8,
https://doi.org/10.1007/978-3-031-08697-7_1

points that generate rational disagreements, aims to increase critical awareness of social problems and to develop the civic competences necessary to address them. Indeed, curricular problematisation or the didactic treatment of social problems favours the comprehensive deepening of social reality, the contrast of argued perspectives in the critical analysis of sources, the elective rationality for decision-making in problematic contexts and social commitment as an inherent part of the democratic process.

This educational problematisation or controversial 'thematisation' of the curriculum incorporates conflict in its definition and refers to social problems of diverse nature and interest for society as a whole, and is constructed through the confrontation of opposing beliefs, values or interests. It is therefore an indispensable element for anticipating, intervening and solving social problems peacefully. Indeed, Meral et al. [19], based on Dewhurst [9] and the National Council for Social Studies (NCSS), conclude that

> The topic of controversial issues is an effective tool for learners to think about real-life problems, evaluate different perspectives, produce versatile solutions to problems, and put forward their own ideas with justifications. In addition, discussing over controversial issues helps develop students' attitudes and skills such as learning about social problems, critical thinking, and willingness to compromise. [21, p. 144]

The educational inclusion of social problems and controversial issues represents, consequently, one of the most relevant axes for the education of a committed, responsible and truly democratic citizenship. The scientific literature has shown that the teaching of controversial issues is one of the most powerful tools for the promotion of active citizenship, and for the development and acquisition of critical-reflective thinking skills [20]. This type of content, inherent to increasingly heterogeneous societies, has been and continues to be part of the body of concerns of educational research from a multidisciplinary perspective [31].

However, the complexities, risks and interference of emotional reactions to learning about sensitive, controversial or contentious historical, geographical or social issues have also been highlighted [14, 16, 28, 29]. In this regard, there is frequent research evidencing the difficulties both in including controversial issues and social problems in schools [5] and in teachers' teaching plans [7]. These obstacles, explained by the most recent international scientific literature because of its multifaceted and multifactorial nature (personal, socio-political, cultural, historical and identity) [6], tend to be reinforced and therefore prevent curricular problematisation or the explicit inclusion of social problems and controversial issues in education.

We agree with [22, 25] and Aynuz [3] in affirming the widespread avoidance of this type of content during teaching, and the methodological and self-efficacy shortcomings of teachers in teaching it. In this regard, research by Pollak et al. [27] identified the existence of Israeli teaching positions aimed at avoiding social controversy; a position also identified by Ortega-Sánchez and Pagès [23] in Spanish Secondary School Social Sciences teachers, and by Kello [17] in Estonian and Latvian History teachers. In the latter study, the concealment or avoidance of

controversial topics in the classroom was one of the approaches observed, along with others aimed at finding common ground and enhancing heterogeneity, similar to those also recognised by Pollak et al. [27] and Ortega-Sánchez and Pagès [23].

There seems to be clear agreement that the development of communicative (dialogical and argumentative) and deliberative skills is at the core of the most appropriate teaching strategies when discussing problematic or controversial content [2]. In this line, recent studies have advanced in the analysis of the strategies employed by teacher educators in teaching controversial topics [22, 24], and in their curricular decisions on this teaching [15]. These developments confirm the desirability of working on deliberative skills, based on conversational learning, for the didactic treatment of controversial issues.

The promotion of discussion around specific social justice issues [12] has also been addressed through the use of controversial or documentary images in teacher education contexts, in order to question what is happening or has happened in present and past societies [13]. Other pedagogical approaches using forum theatre are also beginning to be proposed, based on the theoretical principles of critical, artistic and theatrical pedagogy [11]. These approaches are based on the concept of critical education, which "works theoretically and practically toward social change". [18, p. 143]

In contemporary broadly multicultural democratic societies, the acquisition of communicative competence on controversial cultural issues also emerges as a key training element for future teachers. As [8] study of South Korean primary school teachers' experiences explores, teachers' critical cultural awareness conditions their professional judgement in teaching these controversial cultural issues.

The promotion of the teaching of controversial and sensitive topics, which is prominently recognised in Anglo-American societies, aims to contribute to education for active citizenship, based on democratic and therefore inclusive values. To this end, we agree with [1] on the need to consider students' experiences and interests in the selection of a controversial topic, to prepare them before dealing with it by means of appropriate information and argument resources, to encourage equal participation and multiperspective in its discussion, and to promote an assessment based on the use of arguments that justify and define the rationality of the positions-decisions adopted.

We agree with [30] in considering the affective dimension of teaching controversial or sensitive topics with historical content. This dimension derives from the need to work on students' representations of the past, particularly influenced by contemporary political polarisation, to reflect on the potential imbalance between rationality and emotion that sustains them, and to redirect the purpose of teaching towards the acquisition of skills in democratic culture.

Educating to intervene in local and global social problems requires a transdisciplinary didactic approach. In this sense, integrated STEAM education favours the development and acquisition of competences for the intervention and resolution of contemporary problems (Fig. 1.1). Indeed, "while STEM can offer some solutions, it is the critical thinking, problem-solving, and socially conscious based approaches that make these solutions a reality. Social studies, and the goals of social studies

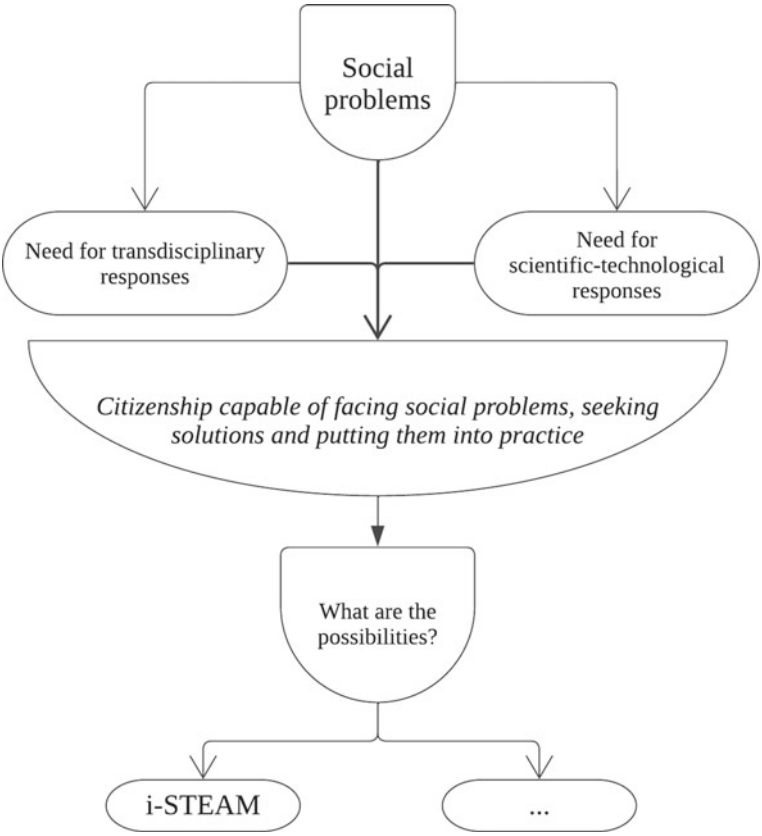


Fig. 1.1 Source own preparation based on Greca [10]

education, can bridge the gap between the technical aspects and the human requirements" [26, p. 37].

From an integrated science education perspective, Meral et al. [19],

> Science plays a major role in finding solutions to many issues that are considered controversial in all societies. Regarding the solution process, despite the clear impact of controversial issues in the field of social sciences and socio-scientific issues including both scientific and social issues in the field of science, they are often avoided while teaching. (p. 143)

From this approach, and in order to guide the teaching of controversial topics, Pace et al. [25] has proposed a framework for action for curriculum design and the promotion of reflective practice. Underlying this catalogue of guidelines for teaching controversial topics is argumentation [4, 19] as a basic didactic procedure:

1. Cultivate a supportive environment through community building, norms, openness to dissent, individual affirmation, and humour.

2. Prepare thoroughly with attention to student identity and development, teaching contexts, subject matter, purposes, and methods.
3. Think through teacher stance including pedagogical roles, positions on issues, and pros and cons of disclosing teacher views.
4. Communicate proactively with students, parents, colleagues, and administrators about issues that will be studied.
5. Select authentic issues and frame questions to promote student engagement and inquiry, progressing from cooler to hotter issues.
6. Choose resources and pedagogies that challenge assumptions, include diverse voices and perspectives, and foster participation.
7. Guide discussion with tools for analysing sources, exchanging ideas, moving from small groups to whole group, and attending to equity.
8. Address emotions by creating space for processing them, using de-escalation moves as needed, and developing self-awareness.

In this context, the general aims of this monographic volume are, on the one hand, to understand teachers' discourses and decision-making on social problems and controversial issues in transdisciplinary educational contexts. On the other hand, it aims to offer studies focusing on the analysis of the levels of coherence between teachers' attitudes, stances and practices for teaching and learning about social problems and controversial issues from an integrated disciplinary perspective.

Funding This chapter has been financed by the Ministry of Science and Innovation—Government of Spain, through the projects 'Future Education and Democratic Hope. Rethinking Social Studies Education in Times of Change' (PID2019-107383RB-I00), and 'The Nature of I-STEM (NOSTEM) for Citizenship Education' (PID2020-118010RB-I00).

References

1. Asimeng-Boahene L (2007) Creating strategies to deal with problems of teaching controversial issues in social studies education in African schools. Intercult Educ 18 (3):231–242. https://doi.org/10.1080/14675980701463588
2. Avery P, Levy S, Simmons A (2013) Deliberating controversial public issues as part of civic education. Soc Stud 104(3):105–114. https://doi.org/10.1080/00377996.2012.691571
3. Aynuz A (2020) The perceptions, attitudes and opinions of teacher candidates of social studies towards teaching controversial topics [Master Thesis]. Bolu Abant İzzet Baysal University
4. Baki-Pala Ç (2020) Exploring controversial and sensitive issues in the context of social studies educatıon: an action research [Unpublished Doctoral Dissertation]. Marmara University
5. Byford J, Lennon S, Russell W (2009) Teaching controversial issues in the social studies: a research study of high school teachers. Clearing House: J Educ Strategies Issues Ideas 82 (4):165–170. https://doi.org/10.3200/tchs.82.4.165-170
6. Cassar C, Oosterheert I, Meijer P (2021) The classroom in turmoil: teachers' perspective on unplanned controversial issues in the classroom. Teachers Teach 27(7):656–671. https://doi.org/10.1080/13540602.2021.1986694

7. Chikoko V, Gilmour J, Harber C, Serf J (2011) Teaching controversial issues and teacher education in England and South Africa. J Educ Teach 37(1):5–19. https://doi.org/10.1080/02607476.2011.538268
8. Cho H (2018) Professional judgement and cultural critical consciousness: the dynamics of teachers' decision-making for teaching controversial cultural issues. Multicultural Educ Rev 10(4):253–273. https://doi.org/10.1080/2005615x.2018.1532709
9. Dewhurst DW (1992) The teaching of controversial issues. J Philos Educ 26(2):153–163. https://doi.org/10.1111/j.1467-9752.1992.tb00277.x
10. Greca IM (2021, November 8) Presentation of the first international seminar integrated teaching in specific didactics: potentialities and challenges of transdisciplinary integration for the resolution of the contemporary social problems [Video file]. Youtube. https://bit.ly/3upaTkt
11. Hammer A (2021) Using forum theatre to address homosexuality as a controversial issue in religious education. British J Religious Educ, 1–11.https://doi.org/10.1080/01416200.2021.2010652
12. Hand M, Levinson R (2012) Discussing controversial issues in the classroom. Educ Philos Theory 44(6):614–629. https://doi.org/10.1111/j.1469-5812.2010.00732.x
13. Hawley T, Crowe A, Mooney E (2016) Visualizing social justice: using controversial images in social studies classrooms. Clearing House: J Educ Strategies Issues Ideas 89(3):85-90. https://doi.org/10.1080/00098655.2016.1181046
14. Ho L, Seow T (2015) Teaching controversial issues in geography: climate change education in Singaporean schools. Theory Res Soc Educ 43(3):314–344. https://doi.org/10.1080/00933104.2015.1064842
15. Hung Y (2019) To teach or not teach controversial public issues in Taiwan? Asia Pacific J Educ 39(4):1–15. https://doi.org/10.1080/02188791.2019.1671807
16. Jerome L, Elwick A (2019) Teaching about terrorism, extremism and radicalisation: some implications for controversial issues pedagogy. Oxf Rev Educ 46(2):222–237. https://doi.org/10.1080/03054985.2019.1667318
17. Kello K (2015) Sensitive and controversial issues in the classroom: teaching history in a divided society. Teachers Teach 22(1):35–53. https://doi.org/10.1080/13540602.2015.1023027
18. Mathison S, Ross E (2022) Critical education. In: Maisuria A (ed) Encyclopaedia of marxism and education. Brill, pp 129–146. https://doi.org/10.1163/9789004505612_009
19. Meral E, Kayaalp F, Başçı-Namlı Z (2022) The role of argumentative writing in teaching controversial issues: a mixed methods research. Int J Contemp Educ Res 9(1):143–163. https://doi.org/10.33200/ijcer.103341
20. Misco T (2013) 'We do not talk about these things': the promises and challenges of reflective thinking and controversial issue discussions in a Chinese high school. Intercult Educ 24(5):401–416. https://doi.org/10.1080/14675986.2013.842663
21. National Council for Social Studies [NCSS] (2016) Academic freedom and the social studies educator. Soc Educ 80(3):186. https://bit.ly/3j1cLJz
22. Nganga L, Roberts A, Kambutu J, James J (2020) Examining pre-service teachers' preparedness and perceptions about teaching controversial issues in social studies. J Soc Stud Res 44(1):77–90. https://doi.org/10.1016/j.jssr.2019.08.001
23. Ortega-Sánchez D, Pagès J (2022) Enseñar temas controvertidos en Ciencias Sociales: actitudes y prácticas del profesorado de Educación Secundaria. In: Bel JC, Colomer JC, de Alba N (eds) Repensar el currículum de Ciencias Sociales: prácticas educativas para una ciudadanía crítica. Tirant Lo Blanch (In press)
24. Pace J (2019) Contained risk-taking: preparing preservice teachers to teach controversial issues in three countries. Theory Res Soc Educ 47(2):228–260. https://doi.org/10.1080/00933104.2019.1595240
25. Pace JL (2021) Hard questions: learning to teach controversial issues. Rowman & Littlefield Publishers

26. Penner A (2019) STEAM and social studies: creating an integrated classroom [Master Thesis], DigitalCommons@Hamline. https://digitalcommons.hamline.edu/hse_cp/288
27. Pollak I, Segal A, Lefstein A, Meshulam A (2017) Teaching controversial issues in a fragile democracy: defusing deliberation in Israeli primary classrooms. J Curric Stud 50(3):387–409. https://doi.org/10.1080/00220272.2017.1397757
28. Reiss M (2019) Evolution education: treating evolution as a sensitive rather than a controversial issue. Ethics Educ 14(3):351–366. https://doi.org/10.1080/17449642.2019.1617391
29. Swalwell K, Schweber S (2016) Teaching through Turmoil: social studies teachers and local controversial current events. Theory Res Soc Educ 44(3):283–315. https://doi.org/10.1080/00933104.2016.1201447
30. Tribukait M (2021) Students' prejudice as a teaching challenge: how European history educators deal with controversial and sensitive issues in a climate of political polarization. Theory Res Soc Educ 49(4):540–569. https://doi.org/10.1080/00933104.2021.1947426
31. Washington E, Humphries E (2011) A social studies teacher's sense making of controversial issues discussions of race in a predominantly white, rural high school classroom. Theory Res Soc Educ 39(1):92–114. https://doi.org/10.1080/00933104.2011.10473448

Delfín Ortega-Sánchez holds a Ph.D. in Social Sciences Education from the Autonomous University of Barcelona, a Ph.D. in Educational Sciences from the University of Burgos, and a Ph.D. in History from the University of Extremadura. His research interests focus on the construction of social and cultural identities from a pedagogical and anthropological perspective, gender mainstreaming in initial education and training for teachers, the relevant social problems and controversial issues in social and human sciences education, and the application of educational technology in the specific field of social sciences. He is currently a social sciences education teacher and researcher at the University of Burgos (Spain).

On Integrating Mathematics Education and Sustainability in Teacher Training: Why, to What End and How?

2

Ángel Alsina

Abstract

This chapter presents a line of research which examines the integration of mathematics education and sustainable development in teacher training with the aim of enabling both pre-service and in-service teachers to gain the necessary knowledge, understanding and skills in order to contribute towards building a more inclusive, sustainable and resilient future for people and the planet. First of all, via an approach which promotes sustainable development in university education as a key strategy for the transformation of policies, investment and practice in the field of education, a description is provided of the main challenges in advancing towards the integration of sustainable development in teacher training in the field of mathematics and the elements of a profile of a mathematics teacher in who is connection with sustainable development. Secondly, sustainable development is integrated into the Model of Mathematical Literacy in Childhood with the aim of offering guidelines to teachers so that they can plan and carry out mathematics teaching practices in connection with sustainable development and, in this way, play their part as agents of social change.

Keywords

Mathematics education · Sustainable development · Connections · Teacher training · Teaching practices

Á. Alsina (✉)
Department of Subject-Specific Didactics, University of Girona, Girona, Spain
e-mail: angel.alsina@udg.edu

D. Ortega-Sánchez (ed.), *Controversial Issues and Social Problems for an Integrated Disciplinary Teaching*, Integrated Science 8,
https://doi.org/10.1007/978-3-031-08697-7_2

Introduction

The skills-based approach to mathematics [1–4] assumes that knowledge of mathematics is necessary, but it also stresses that knowing how to use mathematics appropriately whilst applying values in different contexts is essential. So, what does this perspective of mathematics and its use imply?

Mathematical competence requires thinking and doing mathematics more than memorising definitions and procedures [5]. In this regard, the Council for the Curriculum, Examinations and Assessment (CCEA) considers that using mathematics is one of the cross-cutting skills which form the nucleus of the curriculum, as it makes it possible to develop the ability to suitably apply mathematical knowledge, understanding and skills in different contexts and in different ways in order to communicate, manage information, think critically, resolve problems and take decisions. In order to achieve this aim, it is desirable for teachers to use relevant real-life situations which require mathematical thinking and to give children the possibility to transfer their knowledge, where appropriate, to other contexts [6].

This is, without a doubt, a challenge which extends beyond mathematics. On a global level, for example, social, economic, environmental and, recently, health crises coexist, which can be better understood via mathematics. However, these crises cannot be solved with mathematics alone, but rather via the sum of different disciplines. In other words, knowledge of different kinds must be integrated in order to confront and resolve these challenges. For this reason, the skills-based approach to mathematics refers to connections, one of the standards of processes which demonstrate how mathematical contents are acquired and used. Specifically, in Principals and Standards for School Mathematics, the National Council of Teachers of Mathematics refers to two types of connections [4]: (1) the connections between mathematical ideas, in order to understand how they interconnect and build upon each other to produce a coherent whole (intradisciplinary connections); (2) the recognition and application of mathematics in non-mathematical contexts, which may arise in topics from other subjects and also in the children's daily lives (interdisciplinary connections).

This chapter focuses on the latter type of connection and, more specifically, on the integration of mathematics and sustainability in teacher training, with the aim of providing teachers with the necessary knowledge, understanding and skills to be able to advance in this direction. Therefore, the intention is to actively participate, from mathematics education, in the acquisition of the Sustainable Development Goals and the Competencies for Sustainability [7, 8], in order to contribute towards a more inclusive, sustainable and resilient future for people and the planet.

The structure of this chapter is as follows: In the first section it is asked why it is necessary to integrate mathematics education and sustainable development in teacher training and what purpose this serves, taking into consideration the recommendations of organisations such as: the United Nations, the United Nations Educational, Scientific and Cultural Organization (UNESCO) and the European Union, which have published documents with guidelines of considerable impact in

the promotion of sustainable development [8–17]; international networks such as the COPERNICUS Alliance [18], which aims to help people and institutions in a higher education environment to creatively address the challenges of tomorrow in a collaborative way, to jointly build the knowledge and competences needed for global sustainable development, and to actively engage with policy-makers and community stakeholders; and also authors who have, for some time, been promoting sustainable development as a key strategy in transforming policies, investment and practice in the field of education, not only with the aim of seeking a change in education, but also in the quality of life of many people around the world [19–21]. The second part of the chapter addresses how to integrate mathematics and sustainable development into teacher training based on a line of research which has been developed by the Grup de Recerca en Educació Científica i Ambiental (Scientific and Environmental Education Research Group, GRECA in its Catalan acronym) of the University of Girona (Catalonia, Spain), and which has given rise to doctoral theses, presentations in congresses and both scientific and popular publications [22–26].

Why is It Necessary to Integrate Mathematics Education and Sustainable Development into Teacher Training? What Purpose Does It Serve?

Sustainable Development: A Key Strategy for Transformation

Global calls for initiatives promoting and supporting sustainable development first appeared in the 1980s with the idea of generating collective responsibility in order to make it possible to confront the problems and challenges faced by humanity which seriously threaten its future [20]. For example, in the *Brundtland Report* of the World Commission on Environment and Development (WCED), a first attempt can be noted to promote this objective from the point of view that it is development which satisfies the needs of the present generation without compromising the capacity of future generations to satisfy their own needs [27]. In the present day, it is considered a crucial challenge which must promote practical action so that all of us can build a better future together, making it possible to put an end to poverty and inequality, to achieve peace and justice, to protect human rights and the planet [13]. In this regard, three main dimensions for action in this field are recognised (economic, social and environmental), via which the 17 Sustainable Development Goals (SDG) are suggested [8] covering a broad range of relevant issues concerning relationships with the natural world, personal and collective welfare, a fair and balanced economy and education for a fairer society.

In order to achieve the SDGs, it is necessary for education to be holistic, inclusive and transformative and for it to consider [8]: (a) learning contents and results (integration of topics on sustainability into study plans); (b) pedagogy and learning environments (student-focused teaching and learning, oriented towards

action, based on interaction and exploratory learning); (c) learning outcomes (promoting competencies such as critical and systemic thinking, joint decision-taking, assuming responsibility for current and future generations); and (d) social transformation (empowering students of any age and in any educational environment to transform themselves and the society in which they live). Without a shadow of a doubt, this is a challenge which requires an evolution from teaching to learning in order to educate current and future generations in sustainability. In this regard, [28] states that it is necessary to learn to: "formulate critical questions; clarify one's own values; envisage more positive and sustainable futures; think systemically; respond via applied learning; and study the dialectics between tradition and innovation" (p. 8).

Within this context, [8] highlights the importance of "developing competencies that empower individuals to reflect on their own actions, taking into account their current and future social, cultural, economic and environmental impacts, from a local and a global perspective" (p. 7). In this way, it is hoped that, via education for sustainable development, current and future generations may be able to achieve cognitive, socio-emotional and specific behavioural learning and, above all, to develop key sustainability competencies, which are necessary for contributing towards the understanding and achievement of each of the different challenges of the SDGs. With regard to these competencies, which are key to achieving progress in terms of sustainable development [8, 29–31], proposes eight competencies: systems thinking competency; anticipatory competency; normative competency; strategic competency; collaboration competency; critical thinking competency; self-awareness competency; and integrated problem-solving competency.

Although these competencies are cross-cutting, multifunctional and independent, they should be developed by all students on a worldwide scale (at different levels according to age). They do not replace specific competencies for certain situations and contexts but they comprehend them and have a wider scope [32, 33]. In this regard, target 4.7 of SDG 4 (Quality Education) specifically contemplates that students should acquire knowledge and competencies for the promotion of sustainable development, as education for sustainable development [8] "does not only integrate contents such as climate change, poverty and sustainable consumption into the curriculum; it also creates interactive, learner-centred teaching and learning settings" (p. 7).

In order to achieve the purpose of implementing learning of the SDGs via sustainable development, it is necessary for it to be integrated into public policies, educational programmes, school curriculums, textbooks, etc., as "they are powerful change agents who can deliver the educational response needed to achieve the SDGs. Their knowledge and competencies are essential for restructuring educational processes and educational institutions towards sustainability" [8, p. 51]. From this perspective, taking sustainability criteria into account in the design of the academic curriculums of all fields of knowledge and all stages of education becomes a necessity of social commitment which contributes to a growth in alignment between what is studied in schools, how it is studied and what society demands.

These proposals have encouraged research groups from many universities throughout the world to take sustainability as a reference point and a guide for twenty-first century education. As stated by [19], in spite of all these attempts, the literature continues to show that higher education institutions (HEIs) do not fully understand the true nature of this challenge [11, 18, 34, 35]. The dominant focus has been on integrating content relevant to sustainability into the curriculum of different subject areas, or developing specialist courses on sustainable development, especially for those interested in pursuing careers in this area [21]. However, for [19], the higher education curriculum continues to be engineered and delivered without this questioning or seeking to influence the future capabilities of people to create change towards more sustainable patterns of living [36]. In the opinion of these authors, underpinning ESD is a commitment to reorienting the learning experiences of students so that they understand their professional responsibilities, capabilities as well as personal motivations. According to this, the aim is to enable them to act in support of more sustainable ways of life not just in the domestic sphere, but by influencing change within their professions, industries and wider business environments.

Research into the Integration Between Mathematics Education and Sustainable Development in Teacher Training

Based on the rationale described above and the data of different research on the integration of sustainable development in teacher training [37–41], the GRECA Research Group of the University of Girona is currently carrying out research on the integration of mathematics education and sustainable development in teacher training [22–26, 42]. The purpose of this research is to contribute to the training of mathematics teachers who are competent in sustainability, based on the assumption that initial teacher training can be an important tool for social transformation. Alsina and Calabuig [42] carried out an exploratory study with 30 informants (10 teacher trainers, 10 in-service teachers and 10 pre-service teachers) to whom the previously validated EMS (Educación Matemática y Sostenibilidad—Mathematical Education and Sustainability) Questionnaire was administered with the aim of examining which elements sustainable development is able to contribute in order to improve the initial training of mathematics teachers.

Based on this study, Alsina and Calabuig [42] identified 20 elements of a profile of mathematics teachers in connection with sustainable development, i.e., the actions of the mathematics teacher are defined in order to promote sustainable development (Table 2.1).

With the aim of making progress in this direction, Vásquez et al. [43] have analysed the conceptions of 87 pre-service primary education teachers and 58 pre-service early years education teachers with regard to their competencies for incorporating education for sustainable development into the classroom, specifically into mathematics classes. Based on data obtained via a survey, a lack of clarity

Table 2.1 Elements of a profile of a mathematics teacher in connection with sustainable development [42, pp. 16–17]

1. Establishing in him/herself, and in children, a good relationship with mathematics based on the essence of the discipline
2. Establishing in him/herself, and in children, a good relationship between mathematics and the world
3. Improving day by day his/her own level of general culture and non-academic training, and that of his/her students, which can arise from opening up horizons to the world and its diversity
4. Making use of general culture and non-academic training as an ESD resource when establishing connections with other disciplines and the environment
5. Working on ESD at all times in a globalised and interdisciplinary manner
6. Working on the overall development of the student
7. Providing children with a solid foundation in ESD which will be of use to them at other times in their education
8. Working on ESD in order to improve understanding of information published in the media
9. Promoting children's creativity in order to improve their results in all mathematical processes, particularly in terms of problem-solving
10. Respecting, ensuring respect, appreciating, combining and promoting different ways of reasoning the same mathematical fact both personally and academically
11. Recognising the importance of language in the construction of thinking, both socially and individually, and to work in this direction
12. Understanding and appreciating mathematics in its disciplinary essence and in its role as an agent for both social and cultural change, in order to transmit this to his/her students
13. Understanding and appreciating sustainable development due to what it contributes in terms of responsibility and social commitment, in order to transmit this to his/her students
14. Working on all areas of knowledge, but particularly on that of mathematics in connection with the natural, social and cultural environment
15. Understanding and appreciating all of the mathematical contents of the curriculum in primary education
16. Working on all of the mathematical contents of the curriculum in primary education
17. Knowing how to be critical of the curriculum if the educational situation requires it
18. Continuing with on-going training in an autonomous way
19. Extracting information from publications on ESD and ESD research and experiments which can be applied to his/her own professional reality
20. Knowing (knowledge), knowing how (capacities), knowing how to be (skills and attitudes), knowing how to act (mobilise personal resources), knowing how to feel (emotions) and knowing how to imagine the future (predict)

was observed with regard to education for sustainable development and its scope, in spite of the fact that it was highly valued. In addition, a clear need was revealed for training in this regard, along with the potential of mathematics education as a tool for incorporating education for sustainable development into the classroom. These new data confirmed the results of Alsina and Calabuig [42] regarding the need to incorporate competencies linked to education for sustainable development into initial and on-going teacher training programmes in the field of mathematics with the aim of encouraging and stimulating their inclusion in the classroom.

How Can Mathematics Education and Sustainable Development Be Integrated into Teacher Training?

From a generic point of view, in order to develop the competencies of sustainable development, certain educational strategies and teaching methods should be taken into consideration, along with cross-cutting training processes originating from instances of formal, non-formal and informal education [44]. In this regard, Tilbury [28], in her review of the processes and learning for sustainable development, points out several key processes in which the frameworks and practices are sustained, including the following (p. 10): "processes of collaboration and dialogue (including multi-stakeholder and intercultural dialogue); processes which engage the 'whole system'; processes which innovate issues relating to curriculums as well as teaching and learning experiences; and processes of active and participatory learning".

Alsina and Mulà [22] add that it is essential that knowledge provided by the results of research from different fields of study linked with teacher training, among them sustainable development, should be explicitly included in the teaching of university lecturers who are responsible for teacher training in mathematics. From this perspective, these authors have developed the Transformational Professional Competence Model through Reflective Learning and Sustainability. This model describes certain essential strategies in promoting the transformation of the everyday knowledge of pre-service mathematics teachers (knowledge, experiences and prior beliefs) into professional knowledge from the framework of education for sustainable development and using a realistic and reflexive training model [45].

Taking these frameworks as a reference, these authors have integrated sustainable development into the Model of Mathematical Literacy in Childhood [46], with the aim of providing pre-service and in-service teachers with guidelines to prevent them from only thinking about mathematics, and to concentrate on mathematics in relation to sustainable development [23]. The authors do not claim to offer guidelines to enable teachers to plan the practice of mathematics in contexts of sustainable development or to integrate knowledge of sustainability when they plan and carry out teaching practice in mathematics with the aim of reorienting the learning experiences of students so that they understand their professional responsibilities, capabilities as well as personal motivations [19].

In this regard, the Model of Mathematical Literacy in Childhood contemplates the following phases with a perspective of sustainability:

Analysis of the context: taking into consideration the same theoretical and methodological principles of the Model of Mathematical Literacy in Childhood, mathematical knowledge is determined (contents and processes) along with the ideas of sustainable development (objectives and competencies) which are to be worked on. In this way, the development of interdisciplinary connections between mathematics and sustainable development is encouraged. Ultimately, it is a question of thinking within mathematics and also beyond mathematics in order to enrich mathematical practice from the point of view of sustainable development. In this

regard, whatever the real context selected may be, it should be linked with an appropriate SDG and the sustainable development competencies.

1. *Prior knowledge:* Prior knowledge of mathematics and sustainable development are revealed in a communicative environment in the classroom via the use of good questions and/or other resources and contexts (relating experiences, an article from a newspaper, a story, etc.).
2. *Working in context:* Access to ideas on mathematics and sustainable development is encouraged in the context of the situation and actions are documented for their subsequent analysis.
3. *Co-construction and reconstruction:* Interaction, negotiation and dialogue are encouraged in order to communicate learning in context, both of mathematics and of sustainable development based on the analysis of the documentation. The new co-constructed knowledge is contrasted with the prior knowledge, giving rise to the reconstruction of knowledge regarding mathematics and sustainable development. Possibilities to seek solutions, create alternatives or undertake actions to foster sustainable development in the classroom, in the school, and in the community are encouraged.
4. *Formalisation of learning:* The process concludes with the formalisation of learning acquired in mathematics and sustainable development, using language which is progressively more specific and adapted to the two disciplines.
5. *Systematic reflection:* A self-evaluation of the teacher's practice is carried out with the aim of improving it: What has been taught about mathematics and sustainable development? What has changed? How can it be improved?

In order to assist pre-service and in-service teachers to progressively change their mathematics teaching methods to have a perspective of sustainable development, taking into account all of the elements presented in this chapter, and particularly the model described, it is recommendable to use teaching strategies which guide this transformation. By way of example, one possible strategy may consist of promoting spaces for interaction, negotiation and dialogue based on episodes such as that described below:

From statistics education to statistics education in connection with sustainable development

During their break time, a group of 4–5-year-old children pay great attention to the vehicles using the roundabouts close to their school. Thus, the teacher proposes the following challenge: What type of vehicles go round the roundabouts most frequently? After a conversation in which the children debate different strategies to respond to the question, they decide to gather data by going out to the roundabout. They establish the categories of the statistical variable they wish to study (vans, lorries, cars, motorbikes, tractors and bicycles), collect data over a pre-established period of time in a tally chart, organise the data in a frequency table and, later, represent and interpret the data via a graph, using pieces of wood.

This competency-based mathematical activity makes it possible to identify the type of vehicles going round the roundabout and with which frequency they do so. But what use do these data and the conclusions obtained have? Having reached this point, the pre-service and in-service teachers must integrate the statistical research carried out with sustainable development. In this way, one more step is taken for teachers to research and reflect from the perspective of education for sustainable development and to learn, as stated by Tilbury [28], to ask critical questions, clarify their own ideas, propose more positive and sustainable futures, think systemically, respond via applied learning or study the dialectics between tradition and innovation with the aim of being able to promote the same learning among their own students.

The conclusions of the statistical research carried out based on the vehicles going round the roundabout can be enriched from the point of view of sustainable development by working on aspects connected with SDG 11 on sustainable cities and communities, and SDG 13 regarding climate change. In this framework, the following competencies could be fostered:

- *Anticipatory competency:* Let's imagine and draw what would happen if no vehicles, or mainly bicycles, went round the roundabout. How would the school's surroundings change? What impact would be noted in terms of safety? How would the noise we hear from the school change? What implications would there be in terms of our health and that of the drivers of the vehicles? Which scenario is more sustainable? And which do we prefer: the scenario we have detected or the one we have imagined?
- *Self-awareness competency:* Let's reflect on the route each child takes to come to school, which we can represent in a graph. What type of transport is used? How sustainable is our class in relation to the means of transport we use to travel to school?
- *Strategic competency:* What actions could we promote to encourage sustainable transport? We can present the data and results of the studies to families and to the council and prepare a plan of action in collaboration with older children. During the campaign, data can be collected in order to verify whether the actions taken have an impact, taking into account the need to reflect on the difficulty of changing behaviours and observing them in the short term.

Conclusion

In this chapter, arguments have been presented regarding the importance of establishing connections between mathematics education and sustainable development in teacher training based on an approach which stimulates sustainable development in university education [12, 18]. This approach assumes the proposals of the United Nations Decade of Education for Sustainable Development (DESD) which, as has been stated, is a worldwide movement aspiring to transform policies,

investment and practices in the field of education [10], highlighting not only the transformation of education, but also an improvement in the quality of life of many people throughout the world [28].

From this perspective, the integration of sustainable development into teacher training, which in the literature is called teacher education for sustainability (TEfS), is a growing field which aims to prepare future educators for their role as societal change agents by developing in them specific sustainability competencies [37–41]. The training of teachers in mathematics, as an essential part of teacher training, cannot be marginalised from this aim. Thus, for a number of years, we have been carrying out research on issues such as the definition of a profile of a mathematics teacher in connection with sustainable development [42] and the definition of a model to carry out teacher training in mathematics which is transformative, taking into consideration elements of sustainable development and realistic and reflexive learning [22].

In order for both pre-service and in-service teachers to have at their disposal guidelines for planning and carrying out practical teaching from this perspective, Alsina and Mulà [23] have recently integrated sustainable development into the Model of Mathematical Literacy in Childhood [46]. Via the six phases of which this model consists, from the planning of the context of the competency-based activity to reflection on how it is put into practice, mathematics teachers have at their disposal a tool to foster the development of mathematical and sustainable development competencies in an integrated way [23]. In order to achieve this, both pre-service and in-service teachers must transform the way they plan their teaching and how they put this teaching into practice. As far as the planning of activities is concerned, teachers should ask questions concerning the following aspects:

- Is it an activity which has the aim of providing an answer to a question, addressing a social, economic, environmental or healthcare challenge?
- Does the activity make it possible to apply previously acquired knowledge and to achieve new learning in the fields of mathematics and sustainable development?
- Does it help to relate different knowledge within mathematics and with other subjects from the perspective of sustainable development?
- Is it an activity which can be carried out in different ways and stimulate the students' curiosity and creativity?
- Does it imply the use of tools such as materials which can be manipulated, drawing tools, software, etc.?
- Does it involve collaboration with different agents?

As far as practical teaching is concerning, the following may constitute guiding questions for the transformation:

- Is student autonomy and initiative promoted?
- Is the intervention based more on appropriate questions than on explanations?

- As well as individual work and effort, is work in pairs or in groups employed in order to create dialogue, argue, convince, form a consensus, etc.?
- Does it imply reasoning regarding what has been done and the justification of results?
- Is increasingly accurate progress made in terms of representation?
- Is the most appropriate language of mathematics and sustainable development used?
- Does it promote critical reflection and the questioning of values?
- Does it enable actions in favour of sustainable development to be encouraged?

To sum up, this chapter has provided answers to the questions asked in its title: why, to what end and how can mathematics education and sustainable development be connected in teacher training in such a way that pre-service mathematics teachers can have the necessary knowledge at their disposal in their role as agents of social change [37–42]? Furthermore, this exemplification can serve as a guide for carrying out similar processes of transformation in other areas of knowledge of school curriculums due to the fact that it is based on the sum of changes that we will achieve the common objective of improving the quality of life of people around the world from the field of teacher training. This is an urgent need if the belief is held that teachers have the capacity to shape their countries.

References

1. Niss M (2002) Mathematical competencies and the learning of mathematics: the Danish Kom Project. Roskilde University
2. OECD (2006) Assessing scientific, reading and mathematical literacy—a framework for PISA 2006. OECD
3. OECD (2019) PISA 2018 mathematics framework. In: OECD (ed) PISA 2018 Mathematics framework. OECD, pp 73–95
4. NCTM (2000) Principles and standards for school mathematics. NCTM
5. Alsina Á, Maurandi A, Ferre E, Coronata C (2021) Validating an instrument to evaluate the teaching of mathematics through processes. Int J Sci Math Educ 19:559–577
6. CCEA (2020) Using mathematics. https://ccea.org.uk/foundation-stage/curriculum/using-mathematics
7. Bianchi G, Pisiotis U, Cabrera Giraldez M (2022) GreenComp The European sustainability competence framework. Publications Office of the European Union
8. UNESCO (2017) Education for sustainable development goals. Learning objectives. https://unesdoc.unesco.org/ark:/48223/pf0000247444
9. European Union (2022) Commission calls for environmental sustainability to be at the core of EU education and training systems. https://ec.europa.eu/commission/presscorner/detail/en/ip_22_327
10. UNESCO (2005) UN decade of education for sustainable development 2005–2014. https://unesdoc.unesco.org/ark:/48223/pf0000141629
11. UNESCO (2014) Shaping the future we want: UN decade of education for sustainable development final report. https://unesdoc.unesco.org/ark:/48223/pf0000230171

12. UNESCO (2014) UNESCO roadmap for implementing the global action programme on education for sustainable development. https://sustainabledevelopment.un.org/content/documents/1674unescoroadmap.pdf
13. UNESCO (2015) World education forum 2015. Final report. http://unesdoc.unesco.org/images/0024/002437/243724e.pdf
14. UNESCO (2016) Education for people and planet: creating sustainable futures for all. http://unesdoc.unesco.org/images/0024/002457/245752e.pdf
15. UNESCO (2018) Progress on education for sustainable development and global citizenship education. https://unesdoc.unesco.org/ark:/48223/pf0000266176.
16. United Nations (2015) Transforming our world: the 2030 agenda for sustainable development. https://sustainabledevelopment.un.org/content/documents/21252030%20Agenda%20for%20Sustainable%20Development%20web.pdf
17. United Nations (2020) Shared responsibility, global solidarity: responding to the socio-economic impacts of COVID-19. https://unsdg.un.org/sites/default/files/2020-03/SG-Report-Socio-Economic-Impact-of-Covid19.pdf
18. COPERNICUS Alliance (2012) Rio +20 treaty on higher education. COPERNICUS Alliance
19. Mulà I, Tilbury D, Ryan A, Mader M, Dlouha J, Mader C, Benayas J, Dlouhy J, Alba D (2017) Catalysing change in higher education for sustainable development: a review of professional development initiatives for university educators. Int J Sustain High Educ 18 (5):798–820
20. Orr DW (2013) Governance in the long emergency. In: The state of the world 2013: Is sustainability still possible? W.W. Norton, pp 279–291
21. Tilbury D (2014) Higher education: ESD actions around the World. In: Shaping the future we want: UN decade of education for sustainable development final report UNESCO, pp 113–128. https://unesdoc.unesco.org/ark:/48223/pf0000230171
22. Alsina Á, Mulà I (2019) Advancing towards a transformational professional competence model through reflective learning and sustainability: the case of mathematics teacher education. Sustainability 11:4039
23. Alsina Á, Mulà I (2022) Sumando competencias matemáticas y de Sostenibilidad. Implementar y evaluar actividades interdisciplinares. Uno, Revista de Didáctica de las Matemáticas 95:23–30
24. Calabuig T (2017) Connexions entre educació matemàtica i educació per a la sostenibilitat: definició d'un perfil de mestre de matemàtiques. Doctoral thesis. Universitat de Girona. Girona. http://hdl.handle.net/10803/401745
25. Calabuig T, Alsina Á, Geli AM (2013) Avances en la formación inicial de maestros de matemáticas a través de la educación para la sostenibilidad. Enseñanza de las Ciencias, Núm. Extra: 551–556
26. Calabuig T, Alsina Á, Geli AM (2017) Definición de un perfil de maestro de matemáticas en concordancia con la educación para la sostenibilidad. Enseñanza de las Ciencias, Núm. Extra: 281–286
27. The World Commission on Environment and Development (1987) Report of the world commission on environment and development: our common future. https://sustainabledevelopment.un.org/content/documents/5987our-common-future.pdf
28. Tilbury D (2011) Education for sustainable development: an expert review of processes and learning. UNESCO
29. de Haan G (2010) The development of ESD-related competencies in supportive institutional frameworks. Int Rev Educ 56(2):315–328
30. Rieckmann M (2012) Future-oriented higher education: which key competencies should be fostered through university teaching and learning? Futures 44(2):127–135
31. Wiek A, Withycombe L, Redman CL (2011) Key competencies in sustainability: a reference framework for academic program development. Sustain Sci 6:203–218

32. Rychen DS (2003) Key competencies: meeting important challenges in life. In: Key competencies for a successful life and a well-functioning society. Hogrefe & Huber Publishers, pp 63–107
33. Weinert FE (2001) Concept of competence: a conceptual clarification. In: Defining and selecting key competencies. Hogrefe & Huber Publishers, pp 45–65
34. Guni (2012) Higher education in the world 4. Higher education's commitment to sustainability: from understanding to action. Palgrave Macmillan
35. Sterling S (2011) Transformative learning and sustainability: sketching the conceptual ground. Learn Teach Higher Educ 5:17–33
36. Ryan A, Tilbury D (2013) Uncharted waters: voyages for education for sustainable development in the higher education curriculum. Curric J 24(2):272–294
37. Brandt J-O, Barth M, Merritt E, Hale AE (2021) A matter of connection: the 4 Cs of learning in pre-service teacher education for sustainability. J Clean Prod 279:123749
38. Ferreira J-A, Ryan L, Tilbury D (2007) Mainstreaming education for sustainable development in initial teacher education in Australia: a review of existing professional development models. J Educ Teach 33(2):225–239
39. Ferreira J-A, Ryan L, Davis J, Cavanagh M, Thomas J (2009) Mainstreaming sustainability into pre-service teacher education in Australia. Australian Government Department of the Environment, Water, Heritage and the Arts
40. Ferreira J-A, Ryan L, Tilbury D (2014) A response to reorienting teacher education towards sustainability. Aust J Environ Educ 30(1):147–148
41. Timm J-M, Barth M (2020) Making education for sustainable development happen in elementary schools: the role of teachers. Environ Educ Res 27(1):50–66
42. Alsina Á, Calabuig MT (2019) Vinculando educación matemática y sostenibilidad: implicaciones para la formación inicial de maestros como herramienta de transformación social. Revista de Educación Ambiental y Sostenibilidad 1(1):1203
43. Vásquez C, Seckel MJ, Alsina Á (2020) Belief system of future teachers on education for sustainable development in math classes. Uniciencia 34(2):1–15
44. Murga-Menoyo MA (2015) Competencias para el desarrollo sostenible: las capacidades, actitudes y valores meta de la educación en el marco de la Agenda global post-2015. Foro de Educación 13(19):55–83
45. Korthagen FAJ (2001) Linking practice and theory: the pedagogy of realistic teacher education. Lawrence Erlbaum Associates
46. Alsina Á (2017) Caracterización de un modelo para fomentar la alfabetización matemática en la infancia: vinculando la investigación con buenas prácticas. AIEM, Avances de Investigación en Educación Matemática 12:59–78

Ángel Alsina holds a Ph.D. from the Autonomous University of Barcelona (Spain)

Social Sciences Education Based on Social Problems: Traditions and Integrative Tendencies

3

Antoni Santisteban-Fernández

Abstract

Most integrative tendencies seek to change practices and promote innovation. On the contrary, the proposals which defend the predominance of disciplines in general do not address social criticism subjects or analyse the problems. The fundamental purpose of social sciences education is to teach critical and democratic citizens. This must be the main goal of education. In this respect, the heart of education is not the disciplines, but rather people and their problems. The work based on social problems originated in Dewey's proposals, followed by two differentiated currents: social problems as a methodology and social problems and conflicts as essential knowledge. We consider critical theory to be the most important source to suggest an integrated curriculum. From a critical perspective controversial issues should be the basis of education for citizenship, considering that controversy is the essence of democratic education. It is a question of understanding plurality, the existence of different points of view in social problems or conflicts.

Keywords

Integrated curriculum · Critical citizens · Problem-situations · Issues-centered social studies · Controversial issues · Socially acute questions

A. Santisteban-Fernández (✉)
Universidad Autónoma de Barcelona, Barcelona, Spain
e-mail: antoni.santisteban@uab.cat

D. Ortega-Sánchez (ed.), *Controversial Issues and Social Problems for an Integrated Disciplinary Teaching*, Integrated Science 8,
https://doi.org/10.1007/978-3-031-08697-7_3

Why Do We Propose an Integrated Curriculum Based on Social Sciences Education?

The proposals for an integrated curriculum based on social sciences education encounter an initial hurdle within social sciences seen as a whole. Traditionally speaking, history, geography and civic education have been prioritized, much less importance being given to the other social sciences, such as economics, sociology and anthropology [1]. This is the case in both countries where the curriculum is organized as social studies and those where it is structured as social sciences. In any case, most social disciplines consider themselves to have a great capacity for integration. Geography, for example, proposes studying socio-environmental problems [2]. History offers its capacity to construct an overall narrative of society in the past and the present [3]. Another example is sociology, which asserts its contribution to the formation of social thought [4]. We could offer similar examples for all social sciences.

Most integrative tendencies seek to change social sciences education practices and promote innovation. On the contrary, the proposals which defend the predominance of disciplines and their contents above curricular integration related to the economic and social system. The defence of disciplines rather than interdisciplinary or transdisciplinary integration often leaves social problems outside the school context [5]. In any case, integrative proposals are always made from a certain field of knowledge or scientific perspective, that which is mastered the best. Thus, from our field of knowledge, we can integrate other perspectives of the study of problems. It is logical and good to have a command of one discipline more than another.

The fundamental purpose of social sciences education is to teach critical and democratic citizens capable of acting in their context to produce social change. In relation to this main educational objective, the social sciences are similar to most school disciplines, which also encourage young people to act in their world in order to transform it. This must be the main goal of education [6, 7]. In this respect, one of the most important changes to occur in recent times, in relation to the selection of knowledge that we should teach at school, is that we no longer ask the scientific disciplines what we should teach, but rather we ask: what do each of the disciplines contribute to the overall education of people and to the solution of their problems? [8]. The heart of education is not the disciplines, but rather people and their problems. This was the great contribution of the progressive educators of the early twentieth century, especially Dewey [9], who we should now recover and reinterpret.

Traditions and Tendencies of Working with Social Problems: An Integrative Perspective

Education is not a neutral process, but rather a form of social control, and therefore the objectives of social studies are defined when the type of society that we want to achieve is defined. For Ross [10], there is no "scientifically objective" answer to the

question of the purposes of education, because these purposes are decided in accordance with a way of understanding the world. Freire [11, 12]. described education as an instrument that can be used in two ways: first, to integrate people into the logic of a social system and achieve their conformity and, second, as a process to "practise freedom", which is the means by which people confront reality in a critical and creative manner and discover how to participate in the transformation of their world. This second possibility gives meaning to social sciences education based on social problems and conflicts.

The work based on social problems originated in Dewey's proposals in the first half of the twentieth century [13, 14], and in his defence of education based on the real problems of people in society, on the development of reflective thinking and on learning about democratic participation. For Dewey, knowledge is constructed from experience, from continuous interaction with the environment, giving meaning to life and to education. Conflicts and resistance to change in these interactions help to reclassify experience starting from the emotions that they generate and from the rationality necessary to define our ideas [15].

Dewey's ideals were applied by various authors, who defined a series of strategies on which citizenship should be based. These proposals were called the "problems approach" and were widely disseminated in US history courses in the following decades. Hunt and Metcalf [16], for instance, devised the so-called "reflective inquiries", proposing a systematic model of problem analysis which integrated values, semantics and empirical analysis. The work of Dewey was followed by two differentiated currents:

(a) social problems as a methodology or process of "inquiry", from an intellectual point of view;
(b) social problems and conflicts as essential knowledge and as the backbone of the curriculum.

Work Based on Social Problems as a Methodology

The first current of work on social problems which is focused on the methodology and which we frequently encounter in other fields of knowledge is problem-based learning. In social sciences education, this is based on the problematization of the subjects of the curriculum, whatever this content is, in order to propose a work process that follows guidelines, and to generate a model that could be applied to other social problems. After the problematization of the content, debates and arguments on the facts are proposed. One of these currents is problem-situations, highly developed in the Francophone context, with works such as those by Dalongeville [17], De Vecchi and Carmona-Magnaldi [18] and Le Roux [19]. For Dalongeville [20], problematizing the content means relating the past to the present and to the future, and discussing social values and their evolution.

Table 3.1 Problem-situations process [18, p. 24]

Exercise	Problem
Known situation	Unprecedented situation
Method already acquired	Method unknown
Application, reproduction	Creation
Mechanical execution	Process to invent
Consolidation of the knowledge from the training	Acquiring knowledge always unfinished
Adaptation	Autonomy

For De Vecchi and Carmona-Magnaldi [18], a problem is an initial situation in which we have certain data, starting from which we intend to reach an objective, which produces a series of actions which mobilize an intellectual activity, involving a process of inquiry to achieve an end result (initially unknown), although the solution is not immediately available. For these authors, there is a process with steps to be followed, although there is an essential creative part, as shown in the following Table 3.1.

A similar tradition, which originated in Italy, proposes transforming history, geography and social sciences classes into a problem-solving laboratory. This is competency-based work which poses a challenge to be solved with all kinds of information sources [21]. From the didactics of geography, for De Vecchis and Staluppi [22]. the laboratory is another form of teaching organization which addresses interdisciplinary environmental intervention projects. From the didactics of history, for Landi [23]. the laboratory requires the development of competencies to address the complexity of historical problems, also from an interdisciplinary perspective.

"Given that tackling a problem in an operational manner almost always implies the need to consider the issue from numerous viewpoints, the laboratory is, therefore, also an opportunity to reflect on the interdisciplinary connections necessary to tackle the challenge of complexity." [23, p. 69].

Mattozzi [24] considers that what is most important is for students to achieve a "*mente laboratoriale*", feeding their curiosity, in order to ask questions, seek answers, assess information, make decisions and solve problems. The different authors agree on the importance of working with sources in the laboratory to solve problems [25].

Work Based on Social Problems or Controversial Issues

The critical theory proposals focus on demanding a curriculum in which social problems or controversial issues form its backbone, irrespective of whether they can share a methodology with proposals such as those mentioned above. The main difference is that, while other lines seek methodological models to deal with the problems, critical theory insists on considering the most awkward problems, the

taboos, the latent and controversial issues of our society, in the essential content to be taught.

Along these lines, the most important work undertaken is that published by Evans and Saxe [26], recently updated [27]. This work aims to situate those controversial questions, which imply reflection and which are linked to topical issues and to the historical context, at the heart of social sciences education. They define "issues-centered education" as:

> Issues-centered education focuses on problematic questions that need to be addressed and answered, at least provisionally. Problematic questions are those on which intelligent, well-informed people may disagree. Such disagreement, in many cases, leads to controversy and discussion marked by expression of opposing views. [28, p. 2]

The work by Evans and Saxe [26] had a great repercussion on critical social studies, since it included the main research works on how to teach based on "issues-centered social studies". Hahn [29] considers that these proposals lead to greater interest by the students in social questions and develop advanced cognitive skills and participatory political attitudes, in addition to a critical awareness of important global questions.

Controversial issues should be the basis of education for citizenship, considering that controversy is the essence of democratic education [30, 31]. It is a question of understanding plurality, the existence of different points of view and opposing interests in social problems or conflicts. Controversial issues: (a) question social values; (b) favour political education; (c) oppose emotions and rationality; (d) show the complexity of society; (e) address topical issues (adapted from [32].

A controversial issue requires value judgements, thus questioning the neutrality of teachers [33]. The controversy allows students to understand the existence of different alternatives or solutions to social problems [34]. For Latour [35], there are five rules that teachers must follow to choose a controversy (Table 3.2).

Table 3.2 Adapted from Latour (2011)

Rule No. 1	Choose an issue that is not closed, that evolves during the year and that students can follow live. This rule is essential because it is the only way to avoid a retrospective mistake supposing, once the controversy is resolved, that the "true" experts knew "from the beginning" how to end it
Rule No. 2	It must be a relatively hot issue, which does not necessarily mean with a high profile, but rather in which there are sufficient participants to be able to expect opposing results, refutations, developed on the scale of a school year
Rule No. 3	Take an issue which forces the students to compare heterogeneous sources. It should not, for example, be limited to the most widely read newspapers or those with the same inclination. It should cover the whole range of media without forgetting specialized professional journals
Rule No. 4	Take an issue which is sufficiently limited or manageable to be addressed by the group as a controversy in one year
Rule No. 5	Take an issue which is accessible from specialized literature. Students very often choose excellent issues, but about which their only source is the conventional press or web forums. Everything else is in the form of literature which they cannot consult or in a language unknown by the students

Socially Acute Questions: The Francophone Tradition

From a critical perspective in Anglo-Saxon tradition, proposals appeared in the 90 s which were originally called, in French, "Questions Socialement Vives (QSV)", translated into English as "Socially Acute Questions" [36]. They originated from Chevallard [37], who proposes transforming school into a place which answers acute questions, in order to restore a "moribund" curriculum. Legardez [38] suggests placing questions with open debates and with historical roots at the centre of education. The characteristics of QSV are that they must be (i) acute for society, (ii) acute for science, and (iii) acute for school [39, 40]. One of the first issues addressed was sustainable development, in addition to other contemporary economic problems, such as crises, cycles, unemployment, inequalities, poverty… They are issues with a heavy load of values, which allow cooperative work in the search for solutions with a scientific base and from a transdisciplinary perspective [38]. Socially acute questions also address historical issues which have been silenced but which are latent in society, for example the Algerian independence process in France or the consequences of the Civil War in Spain [41].

For Tutiaux-Guillon [42], acute questions include the demands of groups or minorities which denounce the silence and neglect of their suffering, the memories of genocides, the memory of slavery, the suffering of colonization. For Brusa and Musci [43], QSV focus, for example, on the intercultural question and on rendering people, hidden identities and communities visible in the contents of education [44, 45]. The most appropriate methods are debating and arguing [46]. They give prominence to the students and to the formation of critical thinking, and the role of the teacher is not that of a neutral spectator, but rather of a facilitator of inquiry and free discussion. In the curriculum they are transdisciplinary questions, although they can have a disciplinary origin. For example, in the case of geography they are based on the management of the territory, of resources and of the space as power. In the case of history, they are based on the most obscure and "slippery" events from the past.

Why Teach School Disciplines Based on Social Problems?

We consider critical theory to be the most important source to suggest an integrated curriculum, which must be based on solving social problems or those which somehow affect people, either individually or collectively. Critical theory in education has been reinterpreted from the concept of education for social justice by various authors [47–51]. We encounter proposals arising from research for formal and non-formal education, such as those by McCrary and Ross [52], who focus on inequalities and social injustices as problems to investigate in history and geography classes. Ross and Vinson [53] propose working with the concept of a common social project and of solidarity.

Renner [54] states that it is necessary to work on the "shock" social studies of the beginning of the twenty-first century, for example the Iraq War, the Darfur genocide, hurricane Katrina, or corporate globalization… He suggests working on these problems or conflicts as a platform of teaching possibilities starting from the question: How can teachers use these events to construct (or reconstruct) the idea of humanity or a global community? He proposes working on the historical and geographical perspective, establishing connections with the local context (for example, starting from the life of refugees), and exploring other related teaching possibilities such as, for example, the emotions experienced by victims, some of whom may be in our schools.

For Renner and Brown [55] and Renner [54], teachers require "courage" to show social reality to their students, to put a human face on issues such as war, poverty and exploitation, whether global or local, in order to progress toward solidarity and toward a more active and participatory democracy in schools. Our world is more global and complex, but we need to find ways of connecting social sciences education with the life of students, with what occurs outside school, with reality and with the people around us and in other places in the world: "finding ways to connect students' lives together, connecting curriculum with the world outside of school… and connecting students with real lives/stories/faces in local, national, and global communities" [54, p. 72].

Working based on social problems or controversial issues means re-humanizing social sciences education: "Focusing on (re) humanization, grounded in a promising struggle, provides one antidote to the shock therapists who strive to keep the world divided, less whole, and without hope" [54, p. 76]. It is important to investigate the role that people play in the subjects that are addressed from social sciences education, in the study of our present and in the construction of our future. We must ensure that students feel that they are part of the society that they are studying, an actor and a spectator at the same time. It is necessary to investigate, in geography and history classes, what it is that makes us human [56]. What differentiates us from other animals or from machines when we interact with the world or with other people? What do we all, as inhabitants of the Earth, have in common? How can we make students feel that they are important characters in the world to which they belong? What and how do we have to teach so that students learn and are capable of making decisions about their future?

An Example of Work with a Social Problem: The 2020 Pandemic

The pandemic can be a subject that integrates different types of knowledge and that, at the same time, can address various controversial issues, such as the history of epidemics in the world or current health epidemics in various parts of the planet, as well as the relationship with the situation of childhood in the world, causes of mortality and possible solutions. To understand what happened during the pandemic, it is essential to analyse it from numerous perspectives (Fig. 3.1).

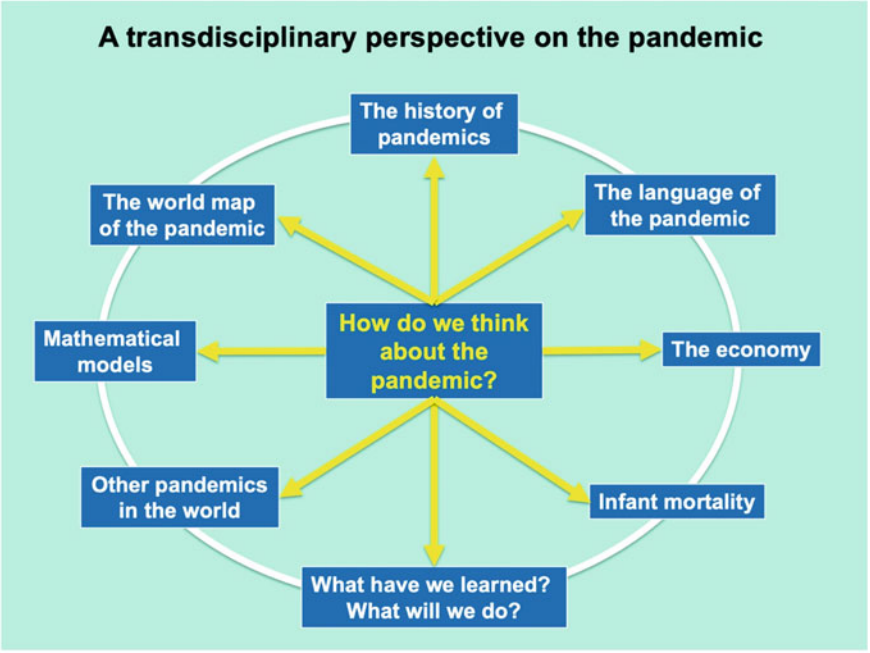


Fig. 3.1 A transdisciplinary perspective on the pandemic

One of the controversial issues was the language used during the healthcare crisis. Language of war was used, when international health organizations were requesting the use of language of care and attention to the weakest and most defenceless, a language of solidarity. We could discuss the contributions that mathematical models have offered to understand the evolution of the pandemic. Experimental sciences can help us to understand the need for vaccines or the vaccine creation process, its importance in history and at the present time. Also, we should not forget the role of the economy throughout this crisis, since the long duration of the pandemic and the periods of lockdown have given rise to a debate on how we can combine care for people with the evolution of the economy.

Finally, the pandemic has led to an appraisal being made of the quality of democracy in each country. The most democratic countries have placed public services at the service of all people, without exception. The pandemic has taught us that the most democratic countries have cared for their citizens better. Democracy must take care of what is public: high-quality public services, public healthcare and equitable education for all people, ensuring access to knowledge for everyone, whatever their origin or conditions. These questions must help us to reflect on what we have learnt for the future, for example about the need for countries to collaborate on medical progress, since borders do not exist for a virus.

The experience of the pandemic has therefore given rise to a series of controversial issues that we can tackle in a transdisciplinary manner, since this is the only way to seek solutions to the situation that we have experienced. The pandemic is a good example of how we can think of an integrated curriculum, placing the problems that affect us at the centre and undertaking a critical interpretation of them. We thus see how only a transdisciplinary outlook can help us to understand the complexity of our world. What is most important is to understand and solve problems based on an analysis from different disciplinary perspectives.

Epilogue

The idea is for students to relate school to life, without there being this terrible dissociation which takes place all too often, when students think that what they learn at school has nothing to do with their life. Therefore, if the problems are close to home and important for young people, we can make them feel that they are important members of society. Youths form part of citizenship. They consume, use public services, express opinions and have influence in families, suffer from social conflicts and have a voice to think of alternatives to these problems and to build their future.

To date, work with social problems or controversial issues has not had the influence that was expected [57]. For some authors, this is due to what has been called the "critical social studies war", which has taken place in the last two decades [5, 58, 59]. Other authors have continued with this line of argument and demonstrate how teachers have gradually lost freedom and autonomy to decide about working with social problems [60]. In the face of this situation, education for social justice is proposed which tackles social problems, questions power, situations of inequality, and injustice [52].

In any case, what gives meaning to the study of social problems or controversial issues at school, from an integrative perspective, is to think of education as an instrument for social transformation.

References

1. Thornton SJ (2008) Continuity and change in social studies curriculum. In: Levstik LS, Tyson CA (eds) Handbook of research in social studies education. Routledge, New York/London, pp 15–32
2. Walshe N (2016) An interdisciplinary approach to environmental and sustainability education: developing geography students' understandings of sustainable development using poetry. Environ Educ Res 23:1130–1149
3. Barton KC, Levstik LS (2004) Teaching history for the common good. Routledge, New York
4. Pipkin D, Sofia P, Stechina M (2007) La enseñanza de la sociología: nuevos paradigmas, nuevas estrategias didácticas. VII Jornadas de Sociología. Buenos Aires: Facultad de Ciencias Sociales, Universidad de Buenos Aires, https://cdsa.aacademica.org/000-106/542.pdf

5. Evans RW (2004) The social studies wars: what should we teach the children? Teachers College Press, New York
6. Fien J (1984) Teaching geography for change in world society. Geogr Educ 4(4):185–201
7. Fien J (1992) Geografía, sociedad y vida cotidiana. Documents d'Anàlisi Geogràfica 21:73–90
8. Pagès J, Santisteban A (2014) Una mirada del pasado al futuro en la didáctica de las ciencias sociales. In: Pagès J, Santisteban A (eds) Una mirada al pasado y un proyecto de futuro. Investigación e innovación en didáctica de las ciencias sociales, vol 1. Servicio de Publicaciones de la UAB / AUPDCS, Barcelona, pp 17–39
9. Dewey J (1990) The school and society; and the child and the curriculum. University of Chicago Press, Chicago
10. Ross EW (2019) Humanizing critical pedagogy: What kind of teachers? What kind of citizenship? What kind of future? Review of education, pedagogy, and cultural studies. Taylor & Francis Group.https://doi.org/10.1080/10714413.2019.1570792
11. Freire P (1970) Pedagogía del Oprimido. Tierra Nueva, Montevideo
12. Freire P (1974) Education for critical consciousness. Continuum, New York
13. Dewey J (1995) Democracia y educación: Una introducción a la filosofía de la educación. Morata, Madrid (edición original de 1916)
14. Dewey J (2002) Cómo pensamos: Nueva exposición de la relación entre pensamiento y proceso educativo. Paidós, Barcelona (edición original de 1910)
15. Dewey J (2008) El arte como experiencia. Paidós, Barcelona (edición original de 1934)
16. Hunt MP, Metcalf LE (1968) Teaching high school studies: problems in reflective thinking and social understanding. Harper and Row, New York (Original 1955)
17. Dalongeville A (2006) Enseigner l'histoire à l'école. Hachette, París
18. De Vecchis G, Carmona-Magnaldi N (2002) Faire vivre véritables situations problèmes. Hachette, Paris
19. Le Roux A (coord.) (2004) Enseigner l'histoire-géographie par le problème? L'Harmattan, Paris
20. Dalongeville A (2003) Noción y práctica de la situación-problema en historia. Enseñanza de las Ciencias Sociales 2:3–12
21. Mattozzi I (2002) Laboratori per la storia. Quaderni di Clio'92. (Rivista de ll'Associazione Clio'92. Gruppi di ricerca sull'insegnamento della storia) 3:7–14
22. De Vecchis G, Staluppi G (2004) Didattica della geografia. Idee e programmi. Utet, Torino
23. Landi L (2006) Insegnare la storia ai bambini. Carocci, Roma
24. Mattozzi I (2006) La mente laboratoriale, en Bernardi, A. (a cura di) (2006). Insegnare storia. Guida alla didattica del laboratorio storico, 9–17. UTET, Torino
25. Bernardi A (a cura di) (2006) Insegnare storia. Guida alla didattica del laboratorio storico. UTET, Torino
26. Evans RW, Saxe DW (1996) Handbook on teaching social issues. NCSS, Washington
27. Evans RW (ed) (2021) Handbook on teaching social issues, 2nd edn. Information Age Publishing, EEUU
28. Evans RW, Newmann FM, Saxe DW (1996) Handbook on teaching social issues. NCSS, Washington, pp 2–5
29. Hahn C (1996) Research on issues-centered social studies. In: Evans RW, Saxe DW (eds) Handbook on teaching social issues. NCSS, Washington, pp 25-41
30. Hess D (2008) Controversial issues and democratic discourse. In: Levstik L, Tyson C (eds) Handbook of research on social studies education. Lawrence Erlbaum, Mahwah, NJ, pp 124–137
31. Hess D (2009) Controversy in the classroom: the democratic power of discussion. Routledge, New York
32. Wellington JJ (1986) Controversial issues in the curriculum. Basil Blackwell, Oxford

33. Avery PG, Barton KC (2017) Exemplars from the field of social studies education research. In: McGlinn M, Bolick CM (eds) The Wiley handbook of social studies research. Wiley, Malden, MA, pp 168–188
34. Ho L-C, McAvoy P, Hess D, Gibbs B (2017) Teaching and learning about controversial issues and topics in the social studies. A review of the research. In: McGlinn M, Bolick CM (eds) The Wiley handbook of social studies research. Wiley, Malden, MA, pp 321–335
35. Latour B (2011) Nous construisons des outils pour évaluer les controverses. La Recherche 456:76–79
36. Simonneaux J, Legardez A (2010) The epistemological and didactical challenges involved in teaching socially acute questions. The example of globalization. J Soc Sci Educ 9(4):24–35
37. Chevallard Y (1997) Questions vives, savoirs moribonds : le problème curriculaire aujourd'hui. Actes du colloque Défendre et Transformer l'école pour tous, Marseille, 3, 4, 5 octobre
38. Legardez A (2004) Transposition didactique et rapports aux savoirs : l'exemple de questions économiques et sociales, socialement vives. Revue française de pédagogie 149:19–27
39. Legardez A, Simonneaux L (2006) L'école à l'épreuve de l'actualité. Enseigner les questions vives. ESF, Issy les Moulineaux
40. Legardez A, Simonneaux L (dir.) (2011) Education au développement durable et autres questions socialement vives. Educagri, Dijon
41. Pagès J, Santisteban A (coords.) (2011) Les qüestions socialment vives i l'ensenyament de les ciències socials. Publicacions de la UAB, Barcelona
42. Tutiaux-Guillon N (2011) Les qüestions socialment vives, un repte per a la història i la geografia escolars? In: Pagès J, Santisteban A (coords.) Les qüestions socialment vives i l'ensenyament de les ciències socials. Publicacions de la UAB, Barcelona, pp 25–39
43. Brusa A, Musci E (2011) La didàctica difícil. Els problemes dels límits de l'ensenyament històric. In: Pagès J, i Santisteban A (coord.) Les qüestions socialment vives i l'ensenyament de les ciències socials. Servei de Publicacions de la UAB, Barcelona, pp 41–52
44. Santisteban A, Pagès J, Bravo L (2017) History education and global citizenship education**.** In: Davies I, Ho L-C, Kiwan D, Peck C, Peterson A, Sant E, Waghid Y (eds) Palgrave handbook of global citizenship and education. Palgrave Macmillan, London, pp 457–472
45. Santisteban A, González-Monfort N (2019) Education for citizenship and identities. In: Pineda-Alfonso JA, De Alba-Fernández N, Navarro-Medina E (eds) Handbook of research on education for participative citizenship and global prosperity. IGI Global, Hershey PA, pp 551–567. https://ddd.uab.cat/record/196202?ln=ca
46. Pineda-Alfonso JA, Navarro-Medina E (2019) Education for citizenship to integrate the curriculum. In: Pineda-Alfonso JA, De Alba-Fernández N, Navarro-Medina E (eds) Handbook of research on education for participative citizenship and global prosperity. IGI Global, Hershey PA, pp 481–499
47. Gewirtz S (1998) Conceptualizing social justice in education: mapping the territory. J Educ Policy 13(4):469–484
48. Bickmore K (2008) Social justice and the social studies. In: Levstik LS, Tyson CA (eds) Handbook of research in social studies education. Routledge, New York, pp 155–171
49. Fraser N (2009) Social justice in the age of identity politics. In: Henderson G, Waterstone M (eds) Geographic thought: a praxis perspective. Routledge, New York, NY, pp 72–89
50. Bogotch I, Shields CM (eds) (2013) International handbook of educational leadership and social (in) justice. Springer, New York
51. Sant E, Lewis S, Delgado S, Ross W (2017) Justice and global citizenship education. In: Davies I, Ho L-C, Kiwan D, Peck C, Peterson A, Sant E, Waghid Y (eds) Palgrave handbook of global citizenship and education. Palgrave Macmillan, London (En prensa)
52. McCrary NE, Ross EW (eds) (2016) Working for social justice inside & outside the classroom. A community of students, teachers, researchers, and activists. Peter Lang, New York

53. Ross EW, Vinson KD (2006) Social justice requires a revolution of everyday life. In: Allen RL, Pruyn M, Rossatto CA (eds) Reinventing critical pedagogy. Rowman & Littlefield, Lanham, MD, pp 143–186
54. Renner A (2009) Teaching community, praxis, and courage: a foundations pedagogy of hope and humanization. Educ Stud 45:59–79
55. Renner A, Brown M (2006) A hopeful curriculum: community, praxis, and courage. J Curric Theor 22:101–122
56. Levstik L (2014) What can history and the social sciences contribute to civic education? In: Pagès J, Santisteban A (eds) Una mirada al pasado y un proyecto de futuro. Investigación e innovación en la didáctica de las ciencias sociales. Servei de Publicacions de la UAB/AUPDCS, Barcelona, pp 43–51
57. Nelson JL, Stanley WB (2013) Critical studies and social education: 40 years of *TRSE*. Theory Res Soc Educ 41(4):438–456
58. Evans RW (2006) The social studies wars, now and then. Soc Educ 70:321–325
59. Evans RW (2011) La naturalesa tràgica de la reforma escolar nord-americana. El cas dels estudis socials. In: Pagès J, Santisteban A (coords.) Les qüestions socialment vives i l'ensenyament de les ciències socials. Servei de Publicacions de la UAB, Barcelona
60. Ross EW, Vinson KD (2012) La educación para una ciudadanía peligrosa. Enseñanza de las Ciencias Sociales 11:73–86

Antoni Santisteban-Fernández holds a Ph.D. in Social Studies Education.

4 Controversial Heritage, Ecosocial Education and Citizenship. Connections for the Development of Heritage Education in Formal Education

Elisa Arroyo-Mora, Sergio Sampedro-Martín, Myriam J. Martín-Cáceres, and José María Cuenca-López

Abstract

Heritage education is configured in formal education as the ideal framework to develop educational experiences that integrate controversial heritages for the formation of a critical eco-citizenship, foster knowledge and appreciation of the environment and action on it, and promote the first forms of community and active and democratic participation. This chapter is a review and theoretical update of concepts related to heritage education, controversial heritages and ecosocial education, fundamental pillars of the EPITEC2 project, in which this work is framed. Based on the review of these concepts, basic criteria are established to allow the design of didactic proposals which, through heritage and based on innovative, interactive, dynamic and participative outlooks, connect the experimentation of good educational practices with teacher training at different educational levels, in order to approach citizenship training through the analysis of current socio-environmental issues.

This publication is part of the R+D+i project *PID2020-116662GB-I00*, funded by MCIN/AEI/10.13039/501100011033/.

E. Arroyo-Mora (✉) · S. Sampedro-Martín · M. J. Martín-Cáceres · J. M. Cuenca-López
University of Huelva, Huelva, Spain
e-mail: elisa.arroyo@ddi.uhu.es

S. Sampedro-Martín
e-mail: sergio.sampedro@ddi.uhu.es

M. J. Martín-Cáceres
e-mail: myriam.martin@ddcc.uhu.es

J. M. Cuenca-López
e-mail: jcuenca@ddcc.uhu.es

D. Ortega-Sánchez (ed.), *Controversial Issues and Social Problems for an Integrated Disciplinary Teaching*, Integrated Science 8,
https://doi.org/10.1007/978-3-031-08697-7_4

Keywords

Heritage education · Controversial heritage · Ecosocial education · Citizenship education · Formal education

Background: The EPITEC Project

This chapter is based on the theoretical foundations of the EPITEC2[1] research project for the development of a research proposal within the framework of heritage education. We set out by analysing which socio-environmental problems can be addressed through heritage education and how they should be approached in order to re-signify their ecosocial meaning in line with the forming of a socio-critical, participative and transformative eco-citizenship, based on controversial heritage.

The initial proposals of the project are based on the principles set forth in the Faro Convention 2005,[2] in which heritage is articulated as an element for development, networking, interaction and social participation [1], from multiple perspectives (economic, social, political…), among which education is a fundamental reference point for their implementation. In this sense, it establishes the need to develop a heritage education focused on change and transformation, through the committed participation of citizens in recognition of the social value of heritage, the assumption of their own identities and respect for those of others [2].

Educating with, from, towards and for heritage [3] entails, first of all, a methodological change regarding how heritage is taught and learned. To this end, from the perspective advocated here, heritage education is crucial when carrying out training proposals for citizenship at different educational levels (from compulsory education to initial and continuing teacher training), always from symbolic-identity, socio-critical, innovative and transdisciplinary perspectives that lead to in-depth reflection on territorial and emotional intelligences [4, 5]. As shown in the studies carried out in the EPITEC[3] project, heritage education is the link between emotional education and territorial intelligence in connection with the formation of a critical, participative and democratic citizenship [6], as key aspects guiding this research, addressing competencies linked to social skills, respect, tolerance, positive conflict resolution and empathy, among others [7].

[1] R+D+i project "Controversial heritages for the ecosocial formation of citizenship. An investigation of heritage education in formal education." (PID2020-116662GB-I00). Funding body: Ministry of Science and Innovation and State Research Agency (MCIN/AEI/10.13039/501100011033/). I.P.: José María Cuenca López and Myriam J. Martín-Cáceres (University of Huelva).

[2] https://www.coe.int/en/web/culture-and-heritage/faro-convention.

[3] R+D+i project "Heritage Education for the Territorial and Emotional Intelligence of Citizenship. Analysis of good practices, design and intervention in compulsory education." (EDU2015-67,953-P). Funding body: Ministry of Economy and Competitiveness. 2016–2020. I.P.: José María Cuenca López and Jesús Estepa Giménez (University of Huelva). Funding 45.012 €.

In relation to these research results in heritage education, in the new EPITEC2 project we propose to incorporate three perspectives whose educational potential was glimpsed during the previous EPITEC project: relevant socio-environmental problems, controversial issues and an ecosocial approach, which, as it will be observed, are totally related.

Previous works have already considered the relevance of linking heritage with the analysis of relevant socio-environmental issues, paving the way to approaching these controversial heritages as elements that allow us to address the social reality of a community, both from the standpoint of formal education, the object of study in this new project, and through non-formal and informal education [8], in order to achieve an education that enables the acquisition of a greater commitment to the environment, the understanding of the links with the past and the reflection on the possible consequences of actions in the present and in the future [9], in order to understand them, value them and reflect on them from a critical and constructive perspective, favouring the development of territorial and emotional intelligence competences [10].

Controversial Heritage

The Council of Europe considers it advisable to "address controversial issues for the education of a critical citizenship, which develops a socially transformative democratic commitment" [11, p. 484], stressing the importance of heritage education in socially conflictive issues [12]. According to Kerr and Huddleston [13] it is necessary to include controversial topics in the classroom because of their importance to society, due to the debate that is generated as part of the democratic process, to the participation of students receiving and sharing information, to the involvement of the media that present biased information, to the emergence of new controversies on a continuous basis, by analysis of the controversy of putting critical and analytical thinking into practice, by the commitment to these issues to contribute positively to the personal and emotional development of students, by the inclusion of current issues of great relevance and also, especially, by the raising of doubts or the introduction of controversial issues within the classroom by students.

The first to use the concept of "critical heritage studies" was Harrison [14], but this critical perspective applied to heritage education can also be seen in Waterton and Watson [15] or Graham et al. [16], who have led us to the concept of controversial heritage from the educational perspective, which arises from the need to develop in students a critical and argumentative thinking that allows them to analyse everyday reality using thinking and acting procedures typical of science (scientific literacy), as ecosocial citizenship training of students is the purpose of the educational process [11].

Consequently, in order to achieve this educational purpose, and following the previous definitions of controversial heritage made by several authors in the framework of the EPITEC projects [9, 11, 17–20], or in the RODA Group on

uncomfortable or decontextualised heritage [12, 21–23], we define controversial heritages as those heritage elements that are didactically selected in response to various causes that raise or generate conflict, controversy, dilemma or debate, whether ideological, political, economic, social, cultural or environmental, due to interaction between them, or that entail some kind of discrimination or hegemonic dominance of one element over another, causing the latter to be forgotten or silenced.

These elements allow us to approach the social reality of a community from the areas of formal, non-formal and informal education [8], connecting with the everyday facts and situations of the present, which may have a future projection and about which we must be aware of their origin in the past [17], to understand them, interpret them, value them and reflect on them with a critical, constructive and innovative vision.

Controversial heritages are intended to develop and structure critical thinking and allow us to analyse arguments, formulate and answer clarifying questions, judge the credibility of sources, deduce and judge our own deductions, make value judgements or opinions, make decisions, and interact with others. In short, as Estepa and Martín-Cáceres [18] point out, "this enhances relativistic thinking from multiple perspectives, as there are often several versions of the past and heritage elements that can be analysed from many points of view" (p. 78).

In the quest to delve deeper into this polyperspectivist thinking, the concept of controversial heritages can be used to classify the different heritage perspectives on the basis of the controversies or dilemmas that arise around them, always based on an ideological stance of committed impartiality that seeks to avoid indoctrination and promotes reflective and critical attitudes [19]. The following classification, however, shares some common characteristics, as Martín-Cáceres, Estepa and Cuenca point out [20]. Controversial heritages do not remain unchanged over time, because a tradition must continually adapt as it develops within a culture; they may pose a conflict of values, as they are made up of beliefs, moral rules, behaviours, etc., and therefore promote critical thinking. For their didactic use, personal involvement and participation are essential, although this cannot be uncritical; and they have a special relationship with nature and the environment.

Continuing with the classification, we find a precedent in the work of Domínguez-Almansa and López-Facal [21], who point out that there are uncomfortable heritages that become conflictive, notably those generated in Spain with the processes of identification of the victims of the Civil War and Francoism as a symbol of the recovery of historical memory for citizenship; historical facts of pedagogical relevance based on the conflict for citizenship education [24]. The usefulness of these controversial topics to improve coexistence and promote peace and reconciliation in societies affected by violent conflicts, such as victims of terrorism and counterterrorism [25], reveals the potential of working with controversial heritage perspectives in the classroom. Therefore, taking this approach and based on Estepa and Martín-Cáceres [19], our approach is broadened by focusing on the work on relevant socio-environmental issues through heritage education, and more specifically on controversial heritage, in the classroom.

From the first classification of controversial heritage proposed by Estepa and Martín-Cáceres [18] to the last classification we have used as a reference to date [20], we have observed an ongoing search for a more concrete definition of heritage perspectives. This classification consists of a first block called conflicting heritages, composed of anti-heritage, heritage dilemmas, cruelty heritage and interested heritage; and a second block under the name of silenced heritages, made up of female heritages, subdued heritages and rescued heritages.

Having set out the background and in order to clarify the categorisation of the various heritage outlooks that could be included as controversial heritages, we will now proceed to a classification that will enable future research to be carried out in the EPITEC2 project, defining each of these controversial perspectives that we consider should be included. Always on the basis of previous research, we present the ideas and foundations that have led us to establish this classification, without implying a definitive modification of the conclusions reached in previous research on the subject.

In line with the integrative and holistic definition of the concept of controversial heritage as described above, the classification includes categories that generate controversy and conflict and involve political, economic, cultural, religious or environmental positioning [17]. Through these ethical problems, the relevance of working with Human Rights and the Sustainable Development Goals of the 2030 Agenda is highlighted [20], alongside heritage perspectives that are subjugated to dominant groups or cultures whose common nexus is subjugation and oblivion [19]; or any other vision of heritage in the process of transformation towards more social positions, which enable a double reading, that of the element in the context in which it is generated and the meaning it acquires nowadays [11].

On the other hand, starting from the consideration that controversial heritage overall entails, to a certain extent, a dilemma, the very definition of heritage dilemmas is included as part of each of the perspectives of controversial heritage, as each of them forces us to reflect and take sides, as well as carrying an implicit load that generates conflicts in thinking. Like Estepa and Martín-Cáceres [19], we do not establish clear boundaries between these dilemmas and the rest of the heritage perspectives.

So, our classification of controversial heritage types would be as follows:

- Anti-heritage: heritage elements that represent counter-values as an example of the atrocities of war, persecution and repression committed by humankind.
- Cruelty heritage: those customs that are part of the cultural tradition of peoples and which involve the exercise of some kind of physical violence against people or animals.
- Feminist heritage: stems from the so-called feminine heritage, attempting to escape from this excluding and hierarchical dichotomy of masculine-feminine, where the former presupposes dominance over the latter. Feminist heritage pursues a critical re-reading of heritage, reviewing the criteria that hierarchise it and that make visible or invisible those heritage elements that are only different because of the gender of the hand that created them, or that reproduce

socio-cultural behaviour patterns of men and women imbued with prejudices and customary practices or of any other nature that are based on the idea of inferiority or superiority and stereotypes, including representations of the female gender in the heritage elements themselves with stereotypical roles. Thus, a feminist approach to heritage, which seeks and reinforces equality/equity, must be established.

- Interested heritage: examples of heritage management and conservation that allow the analysis of conflicts between political, ideological, cultural, economic, ecological and social logic at play in the processes of heritage selection and activation.
- Heritage in transition: patrimonialisation processes of forgotten heritages adapted to today's social demands, inversely (mercantilisation of heritage) or directly (to enhance the value of heritage as an end in itself).
- Subjected-rescued heritage: that heritage which is subjugated by the dominant culture, usually politically imposed, and which has been persecuted at many times in history; including that which is intended to flourish and come into play in order to break the hegemony of the strong over the weak. This concept is broadened to include not only urban speculation or economic interests, but also conflicts that may arise between ideologies, cultures, traditions, or ecological and social dimensions.
- Inclusive heritage: critical re-reading of heritage, reviewing the criteria of accessibility to the same to cater for diversity, seeking a vision of heritage as a resource for inclusion and where heritage elements that represent multiculturalism and social plurality are integrated.

Thus, as Pagès [26] states, from a methodological standpoint, controversy, debate, discussion and conflict are becoming very powerful strategies for citizenship education. In the words of Martín-Cáceres et al. [20], "controversial issues have always been present in education, although not always voluntarily or consciously, and were seen as an obstacle rather than an opportunity" (p. 114). The opportunity we find lies in the fact that the teaching of controversial heritages allows us to work on these controversial issues related to relevant socio-environmental problems from an ecosocial approach in order to form a citizenry committed to the defence of—and participation in—the management, conservation and safeguarding of heritage [18, 19].

Ecosocial Citizen Education

Understanding education as a driver of social change in a changing reality and an uncertain present and future, the forming of a citizenry committed to its heritage and its community, resilient and participatory in its commitment to the transformation of its environment based on values of social justice, eco-justice, equity and solidarity, is today an educational requirement.

It is therefore important to develop educational practices that encourage students to make decisions and understand the importance of participating in social and community actions under the civic principles that guarantee democracy, such as freedom, equality, dignity, social cohesion and justice [27]. It is also necessary to prepare students for life in society and enable them to meet their needs in a conscious, responsible and sustainable manner, minimising production and consumption, maximising social cooperation and community articulation, and reflecting on the implications of culture and heritage on the environment [28].

Along these lines, environmental education has become a powerful tool for environmental management and for raising awareness of socio-environmental issues through participatory processes which, although not aimed at changing the social and economic system, seek to make it sustainable. However, Mayer [29] argues that environmental education still shows a worldview in which humans can dominate nature and anticipate the environmental effects of its use. As stated by Puleo [30], the main limitations of environmental education are its characteristic hyper-separation between human and non-human, the reduction of nature to the environment and the homogenisation of other living beings, including those emotionally closest to the students, converted only into species, resources or wildlife. This same author points out the anthropocentric and androcentric bias that still persists in environmental education, in which "mankind seems to inhabit a strange empty world in which there are no individuals other than humans in ecosystems that can be altered if a rational management of resources is not carried out" [30, p. 309].

Education thus needs to be reformed from an ecosocial perspective so that teachers and students become protagonists of a social, political, economic and cultural change that allows societies to live sustainably on the planet [31]. Ecosocial education is focused on achieving common welfare through a civilisational change in which all individual, collective and institutional actions are based on the cornerstones that allow sustainable human and non-human life, setting out from a biocentric perspective of reality. This is, in the words of Herrero [32], "an education that places life at the centre of reflection and experience, that links us to the surrounding territory and the community, that unmasks and denounces the current development model and allows us to imagine, build and experiment with alternatives" (p. 9).

From this ecosocial perspective, as González-Reyes [33] argues, "educating from a double perspective" (p. 12) is crucial. One that analyses the present and the demands of today's society and another that projects into the future, providing students with the skills they will need throughout their lives. The nearby context, heritage and urban landscapes are ideal for analysing and linking the past and the present, as they "help us to think about ourselves" [34, p. 69], to know who we are, what our community is like, the reason for our traditions and how we shape ourselves as a society. In the same way, our daily life in cities encourages us to create the spaces we want, the heritages we identify with and social transformation in pursuit of the good of the community. Thus, the natural, social and cultural environment is inescapable in the process of education for a critical citizenship

committed to the democratic memory of its past, the problems of the present and the construction of its future [17].

This past-present-future interconnection in ecosocial citizenship training aims to provide students with a set of skills that will enable them to develop in their context in a coherent, conscious, sustainable and glocal way—global thinking, local action—[35]. To this end, Assadourian [31] describes ecosocial education based on six principles that should be included in its implementation at all educational levels: dependence on Earth, interdependence, creativity, deep learning, Earth-centred leadership and life skills training.

The principles of Earth dependence and interdependence correlate in the basis of the ethics of care, which includes empathically conceiving of otherness and the environment among its objectives [36]. As Herrero [37] notes, human beings are eco-dependent beings, as we are one of the species that inhabit the Earth and, like all of them, we depend on nature to sustain life, and interdependent beings, since throughout our lives we need physical and emotional care from other people. However, these dependencies have been made invisible in the social, production and economic systems of our societies, among other reasons, due to the fact that:

> In patriarchal societies, those who have mostly taken care of the work of attention and care for [the] needs of vulnerable bodies are mostly women, not because they are essentially better constituted to do so, but because that is the role imposed by the sexual division of labour in this type of society. And they carry out this work in the private and invisible space of the home, governed by the logic of the family institution. [37, p. 281]

In addition, as stated by Morán et al. [28], "inequalities and situations of social injustice are vectors that drive environmental degradation processes and vice versa, so there will be no environmental justice without social justice. Justice is needed to conserve nature" (p. 6). It is therefore necessary to examine the causes and consequences of the economic, social, ecological and care crisis and propose alternatives to current lifestyles from a gender perspective, placing human and non-human life at the core of all actions.

For this reason, ecosocial education implicitly includes the principles and practices of ecofeminism, which by definition is a meeting point between feminist demands and those of environmentalism, claiming "eco-justice and sisterhood" [38, p. 213], as they converge in understanding care—of nature and of people— from a holistic viewpoint that goes beyond conservationism and includes emotional education and education in values through which the involvement and commitment of society as a whole is achieved by means of the active participation of citizens and democratic development [28].

According to Tardón [39], "caring for life means caring for others; the fate of nature depends on human action" (p. 541). Hence, it is essential to promote co-responsibility for the care of people and our natural and cultural heritage, implementing collective actions to ensure the sustainability of life and security for all people and life forms that coexist on our planet. Thus, in the quest for a liveable and friendlier world for all, it could be said that:

> Sustainability is solidarity with all citizens, an ecological citizenship that knows no borders and to which we commit ourselves to preserve our common living space. It is a responsibility to future generations. It is concern for the people most vulnerable to pollution and environmental degradation. […] It is listening and openness to its transforming initiatives, to its new protagonist that appeals to our solidarity and helps us find alternatives to inhuman and ecocidal development. [30, p. 435]

The ethics of care in ecosocial education, on the basis of the interdependence it highlights, requires that educational processes include the development of emotional competencies. Bisquerra and Pérez [40] define emotional education as "an educational process, continuous and permanent, which aims to enhance the development of emotional competencies as an essential element of human development, in order to train for life and with the purpose of increasing personal and social well-being" (p. 1). These emotional competencies complement cognitive skills and are therefore basic for life [41].

For this reason, ecosocial education proposals should be based on socio-environmental themes which, in addition to encouraging reflection and critical thinking, should be part of the students' life experience and generate emotions. In this sense, heritage education, through direct contact with heritage elements [41], is the ideal framework for action, as among the educational values of heritage is its great power of identity and its ability to mobilise emotions and values, such as solidarity, understanding, commitment, joy, motivation, care, affection, accompaniment, creativity and empathy, etc. [42]. Likewise, using heritage as an educational resource, in addition to motivating students, is ideal for the promotion of meaningful and functional or deep learning, in the words of Assadourian [31], as the contribution to the community that comes with the knowledge, appreciation, dissemination and defence of heritage makes learning useful for the socio-environmental transformation of the local context.

In this way, we will be collaborating in the integral development of the student, as meaningful learning, values and emotional competences are essential for this and, in this case, will facilitate interpersonal relationships, predisposing the students to the creation of a satisfactory social climate [40]. Thus, the link between emotional education and heritage education for the achievement of meaningful learning is crucial, as the remit of both disciplines is the formation of citizens who know, understand and value their heritage, who respect the opinions and feelings of others and who practice peaceful coexistence and sustainability of the planet [7].

The sustainability and solidarity that are part of the values promoted by ecosocial education are also in line with the Sustainable Development Goals of the United Nations 2030 Agenda, the framework for action and justification for training proposals of this nature. This agenda is configured as a tool and a goal to be achieved in order to guarantee a sustainable present and future for all global citizens. These objectives are closely interrelated and have been formulated to address the major global socio-ecological challenges of our time and to ensure that humanity operates within a safe and just space [43].

In this line, ecosocial education through the treatment of socially relevant issues and controversial heritage contributes directly to the achievement of SDG 4 objectives —ensuring inclusive, equitable and quality education and promoting lifelong learning opportunities for all—5—achieving gender equality and empowering women and girls—11—making cities more inclusive, safe, resilient and sustainable —12—ensuring sustainable consumption and production patterns—13—taking urgent action to combat climate change and its impacts—15—sustainably managing forests, combating desertification, halting and reversing land degradation, stemming the loss of biodiversity—and 16—promoting just, peaceful and inclusive societies—.

Goal 5 is proposed as a priority under the SDGs, as gender inequality is a phenomenon that occurs in all countries and societies around the world and equality between women and men is not only a fundamental right, but also a basic principle for democracy, peace, prosperity and sustainability. To achieve these goals, it is essential to implement a heritage coeducation [44] in the classroom that disarticulates gender roles and stereotypes that are deeply rooted in our culture, history and heritage. Likewise, Blázquez [45] states that objective 5, in relation to interdependence and training for life, which Assadourian [31] includes among the principles of ecosocial education, seeks to highlight the value of care work as an essential task for development that is totally feminised and undervalued.

In turn, objective 11 proposes, among other goals, to increase citizen participation for sustainable and inclusive urban development and facilitate access to natural spaces and public areas in cities, especially for women and children. Along these lines, Morán and Díaz [46] explain that the current concept of a sustainable city involves "promoting quality of life for its inhabitants within a framework of respect for natural resources and progress towards equality and social justice" (p. 25).

In this ecosocial approach to education, especially from the principle of Earth-centred leadership, SDGs 15 and 13 are interrelated and are also configured as necessary and a priority. With respect to SDG 15, the treatment of socially relevant issues includes the respect and valuation of natural spaces, the problem of biodiversity loss and urban development plans that threaten the natural heritage of cities. Objective 13 stands out for its involvement with the educational sphere, where it advocates improving socio-environmental education in order to raise students' awareness and foster their capacity for action to mitigate climate change and reduce its effects. Thus, Rodrigo-Cano et al. [47] argue that it is essential that education and communication converge in a message aimed at sustainable development, so that heritage and environmental educommunication is generalised and reaches all citizens in the formal, non-formal and informal spheres of education to improve access to training, reduce poverty levels, foster gender equality and promote responsible consumption—which corresponds to objective 12—which means minimising the use of resources, waste and pollution, considering future generations and guaranteeing a dignified life for all people [48].

For the formation of a responsible, critical and democratic eco-citizenship that actively participates in its community to be effective, it is essential to understand education as an agent of ecosocial change "based on a humanistic, holistic and progressive vision of development in its aims, objectives, strategies and instruments, as well as all the impact it may have on the organisation and operation of the education system" [49, p. 341], in the pursuit of improved educational quality, as proposed in SDG 4. Likewise, guaranteeing inclusive education entails the development of activities in which students can actively participate, express their opinions, be acknowledged and cooperate to build the first forms of community, so that, based on learning that develops each person's capabilities to the maximum, goal 16 can be achieved, that is, to implement an "inclusive education for an inclusive society" [50, p. 13] within a framework of sustainability and security for all citizens.

However, there are several works that point out the oxymoron entailed in the concept of sustainable development [51–53], as development is synonymous with economic progress, which in capitalist societies—and in so-called developed countries—is one of the causes of ecosystem degradation, mass production and consumption and the exploitation of species without this progress leading to the achievement of human well-being on a planetary scale.

Although the term sustainable development was originally defined as the improvement of the quality of human life without exceeding the Earth's carrying capacity, through the conservation of biodiversity and ecosystems and the minimised exploitation of non-renewable resources, it has been demonstrated over the last decades that there is limited—or zero—compatibility between development and the environment and that in order to achieve an ecological balance it is necessary to modify the economic model of growth and current lifestyles, hence it seems more appropriate to speak of sustainability rather than sustainable development [51]. This author explains that sustainability is currently the alternative to unsustainable economic growth, as it leads to rethinking the modes of production, placing "being" and the common good above possession and seeking the patrimonialisation of territory [54] and the social reappropriation of nature, conceived as an integrated and inseparable entity of culture, heritage and identity of peoples and not as a scenario where human life develops or as a *marketable* resource. Along these lines, Rivera-Hernández et al. [55] argue that "development based on the sustainability of economic growth has been based on unthinking paradigms and conduct and on unsustainable behaviours based on the principles of individualism and competition of economic rationality" (p. 62).

However, the Earth-centred leadership proposed by Assadourian [31] as one of the principles of ecosocial education goes beyond this: we must remain diligent about conserving nature and ecosystems and safeguarding heritage as constituent elements of our culture, even if this means facing social, economic and political pressures. Therefore, if the sustainability of human and non-human life and natural and cultural heritage becomes a priority in individual, collective and institutional decision making, it will possibly be more appropriate to act according to the principles of degrowth theory.

Taibo [56] explains that degrowth advocates a reduction in production and consumption, as it is urgent to reduce emissions that damage the environment and to stop producing massively by exploiting vital raw materials that are becoming scarce. Degrowth, according to this author, proposes a social and structural change in the system that not only involves consuming and producing less, but also a far-reaching social and ecological transformation. As argued by Bermejo et al. [57], degrowth is an opportunity to increase social welfare, where the qualitative takes precedence over the quantitative and emotions, human relations, justice and equity over the accumulation of goods. From this perspective, heritage education plays a fundamental role, as it combines the relationship between emotions and territory [58], and it is essential to build community networks that defend their culture, heritage and identity and seek social, cultural and economic regeneration based on their territory.

However, Echave-Sustaeta [59] explains that the theory of degrowth lacks a gender perspective, so equity will only be achieved if it is taken into account that care work, made invisible by capitalism, is essential for life and production systems and that women, in general, suffer more from the consequences of environmental issues. For this reason, she proposes an ecofeminist degrowth that forms an eco-citizenship that is fair to the environment and with all people and forms of life.

If the purpose of education, as stated in Organic Law 3/2020, of December 29, amending Organic Law 2/2006, of May 3, on Education, is the formation of a critical, participatory citizenship that seeks the common good beyond its own interests or those of its specific community, in what García-Pérez, Moreno-Fernández and Rodríguez-Marín [60] refer to as global or planetary citizenship, the aim of ecosocial education is to flee from the anthropocentrism that can be perceived in this concept and achieve a citizen model in which human beings have a harmonious relationship with nature in order to achieve an ecological balance [61]. To this end, it is essential to educate from a biocentric vision of reality [62], so as to opt for a new socio-ecological paradigm [63], in which students are aware of their belonging to the planet as another species and develop a full responsibility and commitment to the territory and the forms of life that inhabit it [64].

The eco-citizenship pursued by ecosocial education is characterised by a broad knowledge of its territory as the base where life is built and epicentre of social, cultural and natural development [64] and is aware of the need to safeguard the heritage of its community for the socio-ecological balance and to maintain the identity of the people. This understanding of territory as a collaborative and participatory space for societies is known as territorial intelligence [65].

The work of this intelligence aims to enrich shared, participatory reflection, to expand the frontier of understanding of the interaction between the different agents, humans, cultural artefacts and landscape, in general, within the community and outside it [66], in order to foster the agency of students, understood as "capacity for action" or "capacity for transformation" [67, p. 91], to promote changes in their context through social justice and eco-justice. In this sense, Morán et al. [28] argue that being a socially active agent requires the development of emotional competencies —mentioned above— such as empathy and holistic and critical thinking.

This development of learner agency is especially linked to the life skills principle that Assadourian [31] emphasises as key to ecosocial education. This training includes, in relation to the principles of eco-dependence and interdependence, the "basic survival skills" or "home economics" (p. 38), which correspond to care and life-sustaining work, a key point, cited above, of both ecosocial training and ecofeminist practice.

Likewise, training for life translates, from an ecosocial perspective, into an eco-citizenship training that allows students to develop in their present and future social, academic and professional life. To provide learning with meaning, usefulness and depth, it is essential to connect the contents of formal education with daily experiences and student interests and to promote the mobilisation of knowledge in a practical community application through conflict and problem-situations [68]. Thus, the territory, relevant socio-environmental issues and controversial heritage are ideal elements for their treatment in ecosocial education, not only as content in themselves, but also as a vehicle for development of the agency of children and young people that leads to social transformation under the principles of justice, eco-justice, sustainability, equity and solidarity and, ultimately, to "build societies worth living in" [69, p. 300].

Conclusions and Future Prospects

Heritage education is, as has been described throughout this chapter, key to promoting students' sense of identity and belonging to a community and to the forming of a desirable eco-citizenship, as it combines territorial and emotional intelligence with pro-social, democratic and ecological values, such as solidarity, equity, citizen participation and social justice and eco-justice. Thus, the outcomes and good practices of the EPITEC project have made it possible to glimpse the potential for tackling relevant socio-environmental issues based on heritage in the classroom for the development of critical, reflective and divergent thinking of students.

Educational work on controversial heritage from an ecosocial perspective should be carried out through comprehensive, interdisciplinary projects based on school research approaches, such as Project-Based Learning or Service-Learning, so that school learning and the importance of conserving, preserving and disseminating heritage can be transferred to the community. Likewise, heritage education is the ideal means to analyse our way of life based on the principles of ecosocial education of eco-dependence, interdependence, deep learning, creativity and Earth-based leadership and to enable students to function in their natural, social and cultural environment in a framework of advancement of social rights and respect for natural resources.

To this end, the initial and ongoing training of teachers should include conceptual and methodological aspects related to heritage education and the treatment of controversial heritage and develop research models in heritage education that assess didactic proposals, construct evaluation instruments for the study of the

teaching of controversial heritage, detect suitable methodological strategies for its treatment and transfer the results to the community, so that eco-citizen education is able to promote social transformation based on local heritage and citizen participation.

Thus, throughout the development of the current EPITEC2 project we will try to answer, among others, the following questions: Why teach about controversial issues through heritage? What selection of conflicting heritage elements to teach? What expert knowledge is needed by teachers to work on these issues in the classroom? What attitudes of teachers should be encouraged in order to approach heritage education from this perspective? What classroom climate is conducive to teaching and learning? What examples of good practice can serve as a reference for the design and experimentation of activities for working with controversial heritage?

References

1. Pla F, Poznan J (2021) The Faro convention's role in a changing society. Council of Europe
2. Jagielska-Burduk A, Stec P (2019) Council of Europe cultural heritage and education policy: preserving identity and searching for a common core? Revista Electrónica Interuniversitaria de Formación del Profesorado 22(1):1–12
3. Fontal O (2013) La educación patrimonial: del patrimonio a las personas. Trea
4. Miedes B (2017) Diseño de la transición e inteligencia territorial. Enfoques para la regeneración en la era del Antropoceno. Arquetipo 15:7–20
5. Cuenca JM, Estepa J (2017) Educación patrimonial para la inteligencia territorial y emocional de la ciudadanía. Midas e estudos interdisciplinares 8:1–10
6. Cuenca JM, Estepa J, Martín-Cáceres MJ (2021) Investigación y buenas prácticas en educación patrimonial entre la escuela y el museo. Territorio, emociones y ciudadanía. Trea
7. Lucas L, Estepa J (2017) Educación patrimonial e inteligencia emocional. Hablan los alumnos. Clío. History History Teach 41:194–207
8. Cuenca JM, Martín-Cáceres MJ (2014) Manual para el desarrollo de proyectos educativos de museos. Trea
9. Arroyo E, Cuenca JM (2021) Patrimonios controversiales y educación ciudadana a través del museo en Educación Infantil. Revista Interuniversitaria de Formación del Profesorado 96 (35.3):109–128
10. Trabajo M, Cuenca JM (2017) La educación patrimonial para la adquisición de competencias emocionales y territoriales del alumnado de enseñanza secundaria. Pulso: Revista de Educación (40):159–174
11. Estepa J, Cuenca JM, Martín-Cáceres MJ (2021) Líneas futuras de trabajo desde el proyecto Epitec: patrimonios controversiales para una educación ecosocial de la ciudadanía. In: Investigación y buenas prácticas en educación patrimonial entre la escuela y el museo. Territorio, emociones y ciudadanía. Trea, pp 483–492
12. Pedrouzo A, Castro B (2021) Del Pazo de Meirás a la Matanza de Oseira: intervención educativa sobre memoria, patrimonio y conflicto. Revista Interuniversitaria de Formación del Profesorado 96(35.3):11–28
13. Kerr D, Huddleston T (2016) La enseñanza de temas controversiales. Ministerio de Educación, Cultura y Deporte
14. Harrison R (2010) Understanding the politics of heritage. Understanding global heritage series. Manchester University Press

15. Waterton E, Watson S (2015) The Palgrave handbook of contemporary heritage research. Palgrave Macmillan
16. Graham B, Ashworth GJ, Tumbridge JE (2016) A geography of heritage: power, culture and economy. Routledge
17. Estepa J (2019) Memoria, patrimonio y ciudadanía: una contribución desde una perspectiva didáctica. PH (96):225–226
18. Estepa J, Martín-Cáceres MJ (2018) Competencia en conciencia y expresiones culturales y educación histórica. Patrimonios en conflicto y pensamiento crítico. In: La educación histórica ante el reto de las competencias. Métodos, recursos y enfoques de enseñanza. Octaedro, pp 75–86
19. Estepa J, Martín-Cáceres MJ (2020) Heritage in conflict: a way to educate in a critical and participative citizenship. In: Handbook of research on citizenship and heritage education. IGI Global, pp 43–55
20. Martín-Cáceres MJ, Estepa J, Cuenca JM (2021) Los patrimonios controversiales en la educación patrimonial para la formación de la ciudadanía. In: Enseñanza de las ciencias sociales para una ciudadanía democrática. Octaedro, pp 109–122
21. Domínguez-Almansa A, López-Facal R (2017) Patrimonios en conflicto, competencias cívicas y formación profesional en educación primaria. Revista de Educación 375:86–109
22. Souto F (2019) O "método Meirás". O proceso de mobilización cidadá. Revista Grial 57 (224):42–49
23. Castro B, López-Facal R, Jiménez G, Schugurensky D (2021) What can be learned from decontextualised heritage? In: Handbook of research on teacher education in history and geography. Peter Lang, pp 283–308
24. Feliu M, Hernandez-Cardona FX (2020) The Spanish civil war in the classrooms: working for citizenship education. In: Handbook of research on citizenship and heritage education. IGI Global, pp 429–448
25. Vicent N, Castrillo J, Ibañez-Etxeberria A, Albas L (2020) Conflictos armados y su tratamiento en educación. Análisis de la producción científica de los últimos 25 años en la Web of Science. Panta Rei: revista digital de Historia y didáctica de la Historia 2:55–91
26. Pagès J (2019) Ciudadanía global y enseñanza de las Ciencias Sociales: retos y posibilidades para el futuro. REIDICS 5:5–22
27. Lucas L, Delgado-Algarra EJ (2018) Educación para una ciudadanía comprometida en la enseñanza de las Ciencias Sociales: ¿Qué piensa el alumnado de un profesor innovador sobre su aprendizaje? Didáctica de las Ciencias Experimentales y Sociales 35:3–16
28. Morán C, González-Reyes L, Nieto M, Rodríguez-Muñoz VM (2021) El conocimiento y la defensa del medio natural en la LOMLOE. Fuhem Ecosocial
29. Mayer M (1998) Educación ambiental: de la acción a la investigación. Enseñanza de las Ciencias 16(2):217–231
30. Puleo AH (2011) Ecofeminismo para otro mundo posible. Cátedra
31. Assadourian E (2017) Educación ecosocial: cómo educar frente a la crisis ecológica. In: Educación ecosocial: cómo educar frente a la crisis ecológica. La situación del mundo 2017. Fuhem Ecosocial, pp 25–47
32. Herrero Y (2018) Prólogo. In: Educar para la transformación ecosocial. Orientaciones para la incorporación de la dimensión ecosocial al currículo. Fuhem Ecosocial, pp 8–9
33. González-Reyes L (2018) Educar para la transformación ecosocial. Orientaciones para la incorporación de la dimensión ecosocial al currículo. Fuhem Ecosocial
34. Díez-Bedmar MC (2018) Paisajes culturales urbanos con perspectiva de género: revisión bibliográfica y repercusiones para la Didáctica de las Ciencias Sociales. UNES. Universidad, Escuela y Sociedad 4:60–77
35. Delgado-Algarra EJ (2015) Conocimiento glocal y pensamiento crítico en la educación del siglo XXI: International Journal of Educational Research and Innovation. International Journal of Educational Research and Innovation (IJERI) (4):I-V

36. Rodríguez-Muñoz VM, Herrero Y (2017) Claves para la construcción de un proyecto educativo transformador. In: Educación ecosocial: cómo educar frente a la crisis ecológica. La situación del mundo 2017. Fuhem Ecosocial, pp 331–346
37. Herrero Y (2015) Apuntes introductorios sobre el ecofeminismo. Boletín de recursos de información de Hegoa: Instituto de Estudios sobre Desarrollo y Cooperación Internacional (43)
38. Puleo AH (2017) ¿Qué es el ecofeminismo? Quaderns de la Mediterrànea 25:210–215
39. Tardón M (2011) Ecofeminismo. Una reivindicación de la mujer y la naturaleza. El Futuro del Pasado 2:533–542
40. Bisquerra R, Pérez-Escoda N (2012) Educación emocional: Estrategias para su puesta en práctica. Revista de la Asociación de Inspectores de Educación de España 16:1–11
41. Estepa J (2001) El patrimonio en la didáctica de las Ciencias Sociales: obstáculos y propuestas para su tratamiento en el aula. Iber. Didáctica de las Ciencias Sociales, Geografía e Historia 30:93–105
42. Estepa J, Cuenca JM, Jiménez R, Travé G, De las Heras MA, Miedes B, Martín-Cáceres MJ, Calaf R (2021) El proyecto Epitec: relaciones escuela-museo. Conexiones entre emociones, territorio y ciudadanía. In: Investigación y buenas prácticas en educación patrimonial entre la escuela y el museo. Territorio, emociones y ciudadanía. Trea, pp 15–28
43. Miedes B (2022) Faro convention and sustainable development. In: The Faro Convention's role in a changing society. Building on decade of advancement. Council of Europe, pp 36–53
44. Cacheda M (2019) La coeducación patrimonial o cómo aplicar la perspectiva de género en la educación patrimonial en las instituciones culturales y museos. Cuadernos del Claeh 2 (110):273–300
45. Blázquez EM (2017) La igualdad de género como objetivo de desarrollo sostenible. Femeris 2 (1):4–7
46. Morán S, Díaz CM (2020) El objetivo de desarrollo sostenible 11 de la Agenda 2030: ciudades y comunidades sostenibles. Metas, desafíos, políticas y logros. Cuadernos de estrategia 206:21–68
47. Rodrigo-Cano D, Picó MJ, Dimuro G (2019) Los Objetivos de Desarrollo Sostenible como marco para la acción y la intervención social y ambiental. Retos Revista de Ciencias de la Administración y Economía 9(17):25–36
48. Díez E (2009) La alfabetización socioeconómica y financiera y la educación para el consumo sostenible en México: algunas reflexiones desde la psicología y la educación. Revista de Investigación Educativa 8:1–15
49. Martínez-Usarralde MJ, Lloret-Catalá C (2020) Odeseizar la educación y la cooperación para el desarrollo en España: una mirada internacional a la AOD y al ODS 4. Educar 56(2): 333–348
50. Murillo FJ, Duk C (2017) El ODS 4 (y el 16) como meta para los próximos años. Revista Latinoamericana de Educación Inclusiva 11(2):11–13
51. Gómez-Contreras JL (2014) Del desarrollo sostenible a la sustentabilidad ambiental. Revista de la Facultad de Ciencias Económicas: Investigación y Reflexión 22(1):115–136
52. Demaria F, Acosta A, Kothari A, Salleh A, Escobar A (2019) El pluriverso, horizontes para la transformación civilizatoria. Revista de Economía Crítica 29:46–66
53. Blanco-Varela B, Amoedo JM, Sánchez-Carreira MC (2021) El Objetivo de Desarrollo Sostenible 8. La fetichización del empleo y el oxímoron del crecimiento sostenible e inclusivo. Revista Internacional de Comunicación y Desarrollo 3(14):104–117
54. Bustos R (2004) Patrimonialización de valores territoriales. Turismo, sistemas productivos y desarrollo local. Aportes y Transferencias 8(2):11–23
55. Rivera-Hernández JE, Blanco-Orozco NV, Alcántara-Salinas G, Houbron EP, Pérez-Sato JA (2017) ¿Desarrollo sostenible o sustentable? La controversia de un concepto. Posgrado y Sociedad Revista Electrónica del Sistema de Estudios de Posgrado 15(1):57–67
56. Taibo C (2017) En defensa del decrecimiento. Sobre Capitalismo, crisis y barbarie. Catarata

57. Bermejo R, Arto I, Hoyos D, Garmendia E (2010) Menos es más: del desarrollo sostenible al decrecimiento sostenible. Hegoa
58. Miedes B, Sánchez C, Moreno A (2014) Escenarios alternativos para las TICS y el conocimiento territorial en el marco de las transiciones socioecológicas: smart cities e inteligencia territorial. ¿Hacia una sociedad del "buen conocer"? In: Perspectivas alternativas del desarrollo. II Congreso Internacional de Estudios del Desarrollo. Universidad de Huelva, España
59. Echave-Sustaeta A (2021) Decrecimiento ecofeminista: Los aportes de la teoría feminista a la teoría del decrecimiento. Derechos fundamentales a debate 17:23–33
60. García-Pérez FF, Moreno-Fernández O, Rodríguez-Marín F (2015) Problemas del mundo y educación: hacia una ciudadanía planetaria. In: Novi Cives. Cittadini dall'infanzia in poi. Pàtron Editore, pp 33–41
61. Pabón-Figueras M, Pino-Mejías MA (2020) Ecociudadanía y desarrollo humano: la construcción de un modelo de turismo local sostenible. In: Ecociudadanía. Retos de la educación ambiental ante los objetivos de desarrollo sostenible. Octaedro, pp 85–96
62. Estepa J (2007) Investigando Nuestro Mundo. Investigando las sociedades actuales e históricas. Díada
63. De la Rasilla L (2008) En la senda de la ecociudadanía. Informe-balance de la iniciativa inter/sur para la ecociudadanía 1996–2007
64. Trabajo M (2020) La educación patrimonial como vínculo entre escuela y museo: un estudio de caso para la formación de la ciudadanía en Ciencias Sociales de ESO. Tesis doctoral. Universidad de Huelva
65. Perea MJ, Navarro E, Luque AM (2018) Inteligencia territorial: conceptualización y avance en el estado de la cuestión. Vínculos posibles con los destinos turísticos. Cuadernos de Turismo 41:535–554
66. Miedes B, Martín-Cáceres MJ (2021) La educación patrimonial como agente transformador. La formación de agentes de cambio en el contexto de la transición socioecológica. In: Investigación y buenas prácticas en educación patrimonial entre la escuela y el museo. Territorio, emociones y ciudadanía. Trea, pp 465–482
67. Giddens A (2006) La constitución de la sociedad: bases para la teoría de la estructuración. Amorrortu
68. García-Luque A, De la Cruz A (2018) Aprendizaje basado en proyectos como recurso en Educación Infantil. In: Entorno, sociedad y cultura en Educación Infantil. Pirámide, pp 195–220
69. Herrero Y (2013) Miradas ecofeministas para transitar a un mundo justo y sostenible. Revista de Economía Crítica 16:278–307

Elisa Arroyo-Mora Graduated in Early Childhood Education at the University of Huelva and currently PhD student of the Interuniversity Doctoral Program (UHU-UEx) of Research in Teaching and Learning of Experimental, Social and Mathematical Sciences and Physical Activity and Sports (IEACAD), she studied the Official Master's in teaching and Learning of Sciences (Experimental, Social and Mathematical) (UHU-UNIA) and the Official Master's in Gender Studies, Identities and Citizenship (UHU-UCA).

Professor of Didactics of Social Sciences at the University of Huelva, she is part of the DESYM Research Group, COIDESO Research Center, of the R+D+i Epitec2 Project "Controversial heritage for the ecosocial citizenship education. An investigation of heritage education in regulated education" and of the Red14: Research Network in Social Science Teaching, being its main lines of research heritage education in Early Childhood Education and Primary Education, education for (eco) citizenship and coeducation in the Didactics of Social Sciences.

Sergio Sampedro-Martín Graduated in Primary Education (UHU), he studied the Official Interuniversity Master in Research about Teaching and Learning of Experimental, Social and Mathematical Sciences (UHU-UNIA), and is currently in the Official Interuniversity Doctoral Program in Research about Teaching and Learning of Experimental, Social and Mathematical Sciences and Physical Activity and Sport (UHU-UEX). Contracted FPU by the Ministry of Universities, he develops his training in the Area of Didactics of Social Sciences, Department of Integrated Didactics in the Faculty of Education, Psychology and Sports Sciences of the University of Huelva. He is a member of the COIDESO Research Center, the DESYM Group, the Red14: Research Network in Social Science Teaching, and the R+D+i Project "Controversial heritages for the ecosocial citizenship education. An investigation of heritage education in regulated education". His lines of research are heritage education, controversial topics, initial teacher training, gamification, and citizenship education.

Myriam J. Martín-Cáceres Associate Professor of Didactics of Social Sciences (University of Huelva), with a degree in Humanities and a PhD in the program "Research in Teaching and Learning of Social Sciences", carrying out in her thesis a case study that highlights the connections of the museum institution with heritage education. Researcher of the Research Group "Initial Training and Professional Development of Teachers - Didactics of Experimental, Social and Mathematical Sciences" (DESYM-HUM168), of the Research Center "Contemporary Thought and Innovation for Social Development" (COIDESO) and of the Red14: Research Network in the Teaching of Social Sciences (RED2018-102336-T). Co-IP of the project of the R+D+I Project "Controversial heritages for the ecosocial formation of citizenship" (PID2020-116662GB-I00; AEI-Ministry of Science and Innovation, Spain). Director of the Scientific Culture and Innovation Unit of the University of Huelva. ORCID: https://orcid.org/0000-0003-1199-3899; Google scholar: https://scholar.google.es/citations?user=XZKztH0AAAAJ&hl=es.

José María Cuenca-López Full Professor of Social Sciences Didactics at the University of Huelva (Spain). Degree in Geography and History and PhD in Psychopedagogy. Research on heritage education, initial teacher training and video games in the teaching of Social Sciences and Social Sciences. Principal Investigator of the R+D+i Project "Controversial heritages for the ecosocial formation of citizenship" (PID2020-116662GB-I00; AEI-Ministerio de Ciencia e Innovación, Spain). He has been teaching at the University of Huelva since 1996, with stays at the universities of Barcelona, Basque Country and Arizona State. He has three research and one transfer (ANECA) and has supervised 8 doctoral theses. He is a researcher of the Network 14: Research Network in Social Sciences Teaching (RED2018-102336-T), of the DESYM Research Group and of the COIDESO Research Center and member of the Network of Experts in Cultural and Natural Heritage (Campus of International Excellence in Cultural and Natural Heritage). ORCID: http://orcid.org/0000-0002-0190-5739; Google Scholar: http://scholar.google.es/citations?user=oemsHesAAAAJ&hl=es.

A New Education for a New Era: Transdisciplinarity, Transversal Competences and an Eclectic Approach to Evaluation

5

José Luis Aróstegui

Abstract

This chapter discusses the emergence of a new era characterized by social and economic uncertainty which demands a school training which is general rather than specific in order to be flexible and adaptable to changing circumstances. The promotion of key competences, although still important, seems to have run out their options to educate for this new era. So is the case with an evaluation solely focused on measurement. Thus, an articulated teaching of science and humanities as well as general or transversal competences become major issues for curriculum development in ordinary education, as well as a blended evaluation taking into account qualitative issues as well. In this chapter I will discuss why scholars find that a new era is emerging. Then I will show some signs that these changes have reached education. Finally, I will suggest why an interdisciplinary approach of subject matter, an emphasis on transversal competences and a holistic approach to evaluation is critical to prepare new generations for this new era which is already here.

Keywords

General competences · Age of disorder · Curriculum development · Well-rounded education · Interdisciplinarity · Evaluation

This chapter discusses the emergence of a new era characterized by social and economic uncertainty which demands a school training which is general rather than specific in order to be flexible and adaptable to changing circumstances. Key competences—although still important—and an evaluation approach solely based on measurement seem to have run out their options to educate for this new era.

J. L. Aróstegui (✉)
Facultad de Ciencias de la Educación, University of Granada, Granada, Spain
e-mail: arostegu@ugr.es

D. Ortega-Sánchez (ed.), *Controversial Issues and Social Problems for an Integrated Disciplinary Teaching*, Integrated Science 8,
https://doi.org/10.1007/978-3-031-08697-7_5

Thus, an articulated teaching of science and humanities, an emphasis on general or transversal competences and a holistic approach to evaluation have become major issues for educational policy reforms and curriculum development.

This paper is structured as follows: First, I will discuss why scholars find that a new era is emerging. Then I will show some signs that these changes have reached education. And, finally, I will discuss why an interdisciplinary approach across subjects, an emphasis on transversal competences and a evaluation with qualitative components are critical to preparing new generations for this new era which is already here.

By and large, the European framework will be referred, although an international setting, as well as the USA and Spain, will also be taken into account.

The Emergence of a New Era

At least since 1989, taking the fall of the Berlin Wall as the date of the advent of post-modernity, the world is presented as changing, in permanent crisis and with neoliberalism as the only economic option in a globalized world. In what refers education, this has implied the development of a competence-based curriculum where the key competences have been emphasized together with an evaluation approach focused on quantitative measurement as a consequence to implement the neoliberal economic rationale for curriculum development (e.g. [1]). Likewise, it has meant an emphasis on the STEM (Science, Technology, Engineering and Mathematics) competence when this is just one of the eight OECD [2] DeSeCo competences in ordinary education that the European Parliament and European Commission [3] adopted as its own. And, finally, it has also entailed an emphasis on science, mathematics and the mother language, as the *core* subjects of national curricula which has inevitably brought out virtually all over the world a decline of the other subjects, music and arts education in particular. It can be argued that these policy reforms have stressed out the economic side of education to the detriment of the humanism, citizenship and equity.

Since the 2008 economic crisis a new social era started to emerge—that the current pandemic is just speeding up—as a consequence of the wounds that neoliberal economic globalization had caused: the low growth of real wages, the subcontracting of many poorly paid jobs and the increase in inequality [4]. This is the so-called *age of disorder,* characterized by:

1. Deteriorating US/China relations and the reversal of unfettered globalization—that is, the return of protectionist practices in the business world.
2. A make-or-break decade for Europe.
3. Even higher debt and Modern Monetary Theory/helicopter money becoming mainstream—neokeynesianism.
4. World economies struggling between inflation and deflation.
5. Inequality worsening before a backlash and reversal takes place.

6. The intergenerational divide widening—with precarious jobs for the youngest and the unsustainability of the retirement systems for the elderly.
7. The climate debate.
8. The Technology, moving between being a revolution or an economic bubble.

The age of disorder is not the only metaphor coined to describe this emerging world, but perhaps is the most spread or at least the one who came up first, likely by Schweller [5] who discussed how the emergence of new superpowers—mainly, but not only China—could shape a new world where the United States and Europe are not the *center* anymore—as, to quite extent, it has already occured. Reid et al. [4] retrieved this metaphor more recently, providing an emphasis on economics, as we have observed.

In addition, Schwab and Mallert [6] speak of the "Great Reset," on occasion of the world crisis that the COVID-19 has provoked in almost any human issue: from health to economics; from supplies to education. According to these authors, the long-term economic consequences of the pandemic will exacerbate the climate and social crises that were already underway and this will make more urgent the "great reset" of our economic and social systems, which should be based on three pillars:

1. Steering the market towards fairer outcomes, bearing in mind environmental and social risks and opportunities and not just focusing on short term financial profits.
2. Ensuring that investments pursue shared goals, such as equality and sustainability.
3. To harness the innovations of the Fourth Industrial Revolution—that one of automation and data exchange in manufacturing technologies—to support the public good, especially by addressing current health and social challenges.

A third metaphor to describe the emergence of a new era is that of the "Demographic reversal" [7]. Their argument is that China's greatest contribution to global growth is now past because its working age population is now shrinking, while the ranks of the old expands. According to these authors, this worldwide demographic reversal will lead to a return of inflation, higher nominal interest rates, lessening inequality globally but increasing within countries, while worsening fiscal problems, as medical, care and pension expenditures all increase as our societies age.

These three powerful metaphors to describe a new emerging age have many points in common. First, an economic change where the nation-states and the transnational institutions will take side in the market to intend to balance inflation, emerging demands of an aging society, new tax policies and, in short, to counteract the economic uncertainty to which the neoliberal policies of the last 40 years cannot provide an answer. Second, inequalities, greater than in the past, which were already very high, with the rise of left-wing parties in some areas (such as Latin America and Southern Europe) and the rise of extreme right-wing populist parties in others (the United States and all Europe, Brazil…). Third, a reversal of

globalization that, although it will not disappear, there will bring out a relocation of industries to the West. Finally, the unstoppable process of digitalization and robotization, the intergenerational gap and the climate change, are contributing to the shaping of a new world order as well.

These commonalities share another one underneath: all of them are raised by economic actors. Thus, the Reid et al. report is published by the Deutsche Bank; the Schawb & Mallet report by the World Economic Forum; and the Goodhart and Pradhan report, while independent of any business institution, is carried out by two economists. Their perception goes beyond economy and foresee an even more changing world with directions potentially dangerous.

Winds of Change in Education

While all these social and economic changes are taking place, in education there has recently been a move to provide a *well-rounded education*, as stated in the US Every Student Success Act (ESSA). This means, on the one hand, an integration of scientific and humanistic curriculum issues and, on the other, a comprehensive assessment of students' needs [8]. Behind it is the idea that a balanced education and a balanced life are necessary for the world to move forward in terms of social justice and in terms of economic prosperity (Glenn Nierman, in Aróstegui [9]) as leaders in industry claim for flexible, creative, and disciplined thinkers in the workforce—all characteristics that a well-rounded education helps to provide.

The profusion of the Project Based Learning (PBL) (e.g. [10]) approach is another sign of these changes in education. PBL is a form of situated learning based on constructivism whose learning is an overall approach to the design of learning environments, which means a transdisciplinary teaching. PBLs are not actually new, in fact its origins can be traced to the American philosopher and educator John Dewey in 1897 [11]. In the case of Spain, PBLs have been contemplated in curriculum since the 1990 Education Act, but the fact is that it has been barely implemented, at least extensively. It has persisted throughout the different curricular reforms since then, but it is now, with the Education Act of 2021, which has once again been brought back more strongly.

And the STEAM movement, promoting the joint teaching of the STEM competences together with the Arts (e.g. [12]) is another illustration of this well-rounded education approach emerging in recent times. The reasons why this integration occurs just now are varied, although the main cause seems to be the approximation of the concept of creativity within STEM education [13]. Thus, a STEAM education could be defined as one that proposes an integrated teaching of scientific-technological, artistic and, in general, humanistic competencies, with integration understood in a progressive sense that goes from interdisciplinarity to transdisciplinarity [14]. This scientific and artistic integration should provide an answer to this new world in which not only scientists and technology experts, but

also professionals in the arts, humanities and social sciences will be needed to capture and understand the nuances and interpretations of human behavior [15].

The brand new Spanich Educational Act "Ley Orgánica de Modificación de la Ley Orgánica de Educación" (LOMLOE) [16] currently under curriculum development is another indicative of these changes in educational policy reforms. This Act is based on five pillars: (1) Children's rights; (2) gender equality; (3) a cross-cutting approach to learning; (4) education for sustainable development and global citizenship; and (5) digital competence. As can be seen, a transversal approach of learning—gender equality, sustainable development…–and transdisciplinary as well—a cross-cutting approach—is promoted.

A final sign that education is changing is evaluation. The Model Cornerstone Assessment (MCA) [17] to assess the artistic process of music performing, not only the product, the Dance Entry Level Teacher Assessment (DELTA) for evaluation of dance students focused on the Shulman's Pedagogic Content Knowledge and paying attention to the quality and appreciation of teachers as well [18], the qualitative summative assessment for theater education reported by Tabone and Weltsek [19] or the Advance Placement (AP) Studio Art Portfolio for Plastic Arts [20] are just four illustrations of an eclectic approach of evaluation using both quantitative and qualitative evaluation tools. I will not deal with each of these evaluations in this chapter due to word-extension and because they are specific of arts—when the new approach of evaluation encompasses all education. Instead, I will briefly discuss the research evaluation in higher education for being more general.

So turning out to the case of Spain, when a quantitative system of quality measurement was implemented in the 2000s, tons of critiques were raised because the quality was determined by journal impact factor rather than on the quality of article evaluated. In spite of this inconvenience, a dramatic shift took place:

> There are professors who now complain that quality used to be valued and now the calculator is simply squeezed. It is natural that they complain, before they could assess that the article of a submissive candidate, published in the lord's journal, was much better than the one published by a non-submissive candidate in a Harvard journal. That one or several gentlemen had an opinion contrary to the assessment of the international scientific community is not a problem, what has been a very serious problem is that this opinion became a decision of a court of a university and shaped the ethical and scientific level of the same. Now, fortunately, the assessment of the international scientific community counts much more in the decisions, it counts much more to publish in Harvard than in the mediocre journals of those gentlemen. [21, p. 118]

That very same year, Smeyers and Burbules [22] published a paper denouncing the problems of quantification of academic quality that at moment was under way and that nine years later is well-spread, at least across Europe. Their critique was basically against impact factors used alone—instead of a more holistic approach to evaluation—which "are being used for entirely inappropriate purposes and are inherently skewed in favor of some groups and against others" (p. 14). As can be noticed, the panorama was quite different at that time in the international arena and

in Spain, due to the enormous backlog in research this country had—that, in a lesser extent, still persists.

In these days, there is a switch towards that more holistic approach to evaluation called for by Smeyers and Burbules [22]. Thus, many evaluation agencies and universities have adhered to the Declaration on Research Assessment[1] (DORA) and the Leiden Manifesto[2] [23], both warning about possible bias that can occur in the current assessment of scientific production and betting for using qualitative indications of quality along with impact factors. These two actions are not actually new, DORA began in 2012 and the Leiden Manifesto dates from 2015, but it just now when official institutions are paying attention to them, as another clear sign of change in education. Thus, for example, the Spanish Agency for Quality Assurance —Agencia Nacional de Evaluación y Acreditación, ANECA—is considering "the use of indicators for evaluating scientific production that do not focus solely on quantitative evaluations or on the exclusive use of the impact factor of journals."[3] We have come a long way in research evaluation in Spain. From having to submit to the feudal lord, to submitting to the tyranny of numbers, to starting to consider a qualitative approach as well, we have come a long way.

A New Education for a New Era

This emerging well-rounded educational approach is far from being a temporary coincidence with the appearance of this new age of disorder but, rather, a reflection of the social move of our times. A first consequence in education is that the boundaries between compartmentalized knowledge inherited from increasingly specialized disciplines begin to blur, perceiving the need to offer a more inclusive education.

From this view, a curriculum in which science has exclusive priority with the argumentation that it is fundamental to the knowledge economy can no longer be sustained, at least if we support the idea that schooling is more than professional training, a position defended by neoliberal economists (e.g., [24]). In his book *The case against education: Why the education system is a waste of time and money,* Caplan argues that education is highly overrated, as decades of increasing access to education have not translated into better jobs for the average worker, but rather into a rampant inflation of the credentials required to enter the world of work. According to him, the only important subjects are: in school, learning to read and write; mathematics and carpentry in high school; and, in college, a few engineering or computer science majors. The rest is, in his opinion, useless. If we conceive education basically as a professional training at the service of the economic system, perhaps music and arts education should be eliminated from compulsory schooling,

[1] https://sfdora.org/.
[2] http://www.leidenmanifesto.org/.
[3] http://www.aneca.es/Sala-de-prensa/Noticias/2021/ANECA-publica-los-principios-generales-y-las-directrices-que-propondra-para-el-desarrollo-de-los-criterios-de-evaluacion-de-la-investigacion Information only available in Spanish.

which is what has almost happened (e.g. [1]) since this neoliberal rationale is applied to education, as the arts and humanities are perceived as something intended only for the private sector (Elliott et al. 2016). This economic approach is leading to the elimination or, at best, to the reduction of arts education in compulsory education because it is not perceived as contributing directly to improve results in scientific subjects (Leistyna 2007), i.e., Science, Technology, Engineering and Mathematics (STEM), considered as the most suitable for the workplace and which, under this prism, seem to be the only important thing.

On the contrary, if we defend that the human being must develop as a whole, the educational system cannot train in exclusively technical competencies, and even less so when any field of knowledge can change in a very short period of time. In fact, it is already four decades ago that Eisner (1982) warned about the incomplete literacy resulting from the exclusion of the arts from the curriculum. Moreover, Gianmarco et al. (2020) argue that the future of learning and work is social and emotional rather than technical, as employers increasingly demand human interaction skills, such as social and emotional intelligence, collaboration, creativity, intercultural competencies, relationship building, resilience and adaptability, which, they argue, places new demands on our skills training systems. Humanistic training has always been necessary, but today it is more than ever, also for the economy. As a matter of fact, STEM competency appears in eighth place in a list of ideal skills that the president of Google would have to have [29].

The reason for which this integration between science and humanism is necessary for both social and economic reasons is the digital revolution we already live in, but which is far from over. Such digital transformation will revolve the labor market where many jobs are jeopardized. OECD [30] analysis has estimated that around 14% of jobs across the OECD area as a whole are at risk of automation, while another 32% are likely to see significant changes. And this is just the average, varying the risk from the 5.7% of Norway to the 33.6% in Slovakia, clearly depending of the level of technical and digital development of each country. But this does not necessarily imply a catastrophe for the workforce in the near future; in fact, the World Economic Forum [31] predicts that 97 million emerging jobs will be created in the world in 2025. This data, compared to the 85 million that will be lost, arises an expected net job growth.

What these data also say, then, is that technology will drastically change the face of work [32]. The digital revolution in which we are already living is far from over and promises a transformation of the labor market where many jobs are at risk, and the education system has to prepare for what is to come, without knowing exactly what it will be like, hence the need to develop transversal rather than key competencies. In fact, a high percentage of employers estimate that creativity and innovation a cross-cutting competence – will play for graduates a determining role in the future [33].

For this digital revolution, we must prepare students to solve large-scale human problems. Educators, citizens, and the students themselves need to widen, not narrow, their futures. Hartley [15] claimed we need technical experts, but we also need people who grasp the nuances and interpretations of human behavior. In

addition, we cannot forget the social demands that go beyond the business world. The arts are an inescapable part of the integral education of people, even in this era of accountability and efficiency.

It is interesting to observe in this regard how in many business companies are ruled by CEOs with a degree in Humanities. This is the case of Slack, Alibaba, YouTube, and Airbnb, whose presidents have a degree in Philosophy, English Philology, History and Literature, and in Fine Arts, respectively. So there seems to be a tendency even in the business world to promote and closely articulate the Humanities with Science and Technology as one of the keys to human development which corresponds with the needs of a society that cannot be based just on an economic rationale [34].

In addition to the intermingling of sciences and humanities as a first characteristic of an emerging curriculum for this emerging era, transversal competences come up as a second feature of this new curriculum. If the future cannot be predicted even in the short term, then it is necessary to educate in a general rather than a specific way, so that people can adapt to new circumstances as they arise.

Transversal competences are not new, in fact they are included in the 1999 OECD DeSeCo competences retrieved by the EU in its 2006 Recommendations on key competences and lifelong learning. Despite of it, it is not possible to find a neat definition of transversal competences either in the European recommendations for curriculum development or in the Spanish regulations, perhaps because different terminology is employed in different countries and even because some key competences—digital skills, social and civic issues, entrepreneurship, and learning to learn—does actually have a cross-disciplinary approach. What it is clear is that these competences are "cross-curricular" [35], that is, they pertain to the whole curriculum and, when acquired, the subject can do something beyond the disciplinary content or a mechanical routine learned [36]. So, in short, the nature of transversal competences goes across subject matter, creating solid and well-established learnings on individuals which, in due time, will allow the development of specific skills according to the changing circumstances that future holds.

Unfortunately, this definition is not raised in official documentation, so it is neither possible to find an exhaustive list of potential transversal competences. For instance, the European Parliament [3] claims that "there are a number of themes that are applied throughout the Reference Framework: critical thinking, creativity, initiative, problem solving, risk assessment, decision taking, and constructive management of feelings play a role in all eight key competences" (p. L 394/14). This list could be expanded ad infinitum with other topics such as citizenship, environmental issues, gender equity, and so forth, also called *transversal elements* in the current Spanish national curriculum [37, 38].

From the vast and inexhaustive list of transversal issues coming from the scarce literature review in this regard, perhaps the research most compelling carried out is that one by Szafranski et al. [39] in Eastern Europe. It consisted of making use of a variety of practical teaching methods to develop transversal skills in undergrad students, checking its results by means of research. They identified four: entrepreneurship; creativity; communicativeness; and teamwork. From the list of

challenges to face in the age of disorder, environmental education, the struggle against inequities, and digital skills could likewise be added as more appropriate for consideration of national curricula.

As for a new approach in evaluation, it seems to be possible and even necessary to find a meeting point between standardized evaluation and more experiential evaluative approaches. The road of econometric accountability is demonstrably insufficient. New approaches perhaps based on the work of Eliot Eisner, Michael Scriven, Robert Stake, Daniel Stufflebeam, and other experts in qualitative methods, are necessary to implement more extensively. A long trajectory toward documenting the learning process and appreciating the "hard-to-measurables" seems more feasible now than in the recent past. An eclectic position between qualitative evaluation and standardized assessment is possible, even at this moment with accountability demands persisting and little challenged [40].

Final Remarks

Our world is in crisis and in process of transformation. The educational reform policies implemented over the last 15 years, if they were once effective, are not so much today. We need a new curriculum approach to answer these changes and uncertainties. For this, subject interdisciplinarity—or, even better, transdisciplinarity–, transversal competences, and blended evaluation has to take shape within the curriculum. For all its drag, this crisis should be seen as an opportunity for these changes. PBLs and a STEAM-based curriculum are good strategies for a broader curriculum beyond the three R's, History and science to provide a well-rounded education program. The STEM subjects will continue being the 'core' curriculum and the era of accountability is far from having been finished. But, again, a new articulation is possible with the forgotten areas of curriculum and evaluation. It has always been necessary, but now they seem to be the key for education to face the current social and economic challenges of the upcoming future.

In view of the difficulties to envisage even the upcoming future, it is impossible to know if the specific skills demanded nowadays will be useful later on, hence the emphasis on transversal competences rather than on the key ones. However, while transversality is taken into account by most of the in-service teachers, there are no clear directions for its curriculum development due to a concentration on the key competences, being necessary a better balance between basic and specific competences, and between scientific and humanistic skills too.

For this, we must acknowledge that teachers are more than agents to transfer information of each curriculum subject in search of the knowledge economy—as claimed by the OECD (Guerriero 2017)—but, above all, a global education which allows each student to be prepared for the Humanity. Education for productivity is overtaking too much space and, in the meantime, forgetting the integral vision of life we have to provide young generations. We must go beyond productivity and competitiveness; education is much more than that.

References

1. Aróstegui JL (2016) Exploring the global decline of music education. Arts Educ Policy Rev 117(2):96–103. https://doi.org/10.1080/10632913.2015.1007406
2. Organisation for Economic Co-operation and Development (OECD) (1996) The knowledge-based economy. Retrieved from http://www.oecd.org/sti/sci-tech/1913021.pdf
3. European Parliament and European Commission (2006) Recommendation of the European Parliament and of the Council of 18 December 2006 on key competences for lifelong learning (2006/962/EC). Official Journal of the European Union, 30.12.2006, L394/310-L394/318. Retrieved from https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2006:394:0010:0018:en:PDF
4. Reid J, Burn N, Templeman L, Allen H, Nagalingam K (2020) The age of disorder. Deutsche Bank AG
5. Schweller R (2011) Emerging powers in an age of disorder. Global Gov: Rev Multilateralism Int Organ 17(3):285–297
6. Schwab K, Malleret T (2020) COVID-19: the great reset. Forum Publishing
7. Goodhart C, Pardhan M (2020) The great demographic reversal. Springer, Berlin. https://doi.org/10.1007/978-3-030-42657-6
8. Jones SD, Workman E (2016) ESSA's well-rounded education. Special report. Education Commission of the States. Retrieved from https://files.eric.ed.gov/fulltext/ED566903.pdf
9. Aróstegui JL (2017) Looking to the future with optimism: an interview with Glenn Nierman on the occasion of the recent end of his appointment as NAfME president. Arts Educ Policy Rev 119(4):243–249. https://doi.org/10.1080/10632913.2017.1342108
10. Krajcik JS, Blumenfeld PC (2014) Project-based learning. In: Sawyer RK (ed) The Cambridge handbook of learning science. Cambridge University Press, Cambridge, pp 275–297. https://doi.org/10.1017/CBO9781139519526
11. Perry SB (2020) Project-based learning. In: Kimmons R, Caskurlu S (eds) The students' guide to learning design and research. EdTech Books. Retrieved from https://edtechbooks.org/studentguide/project-based_learning
12. Colucci-Gray L, Burnard P, Gray D, Cooke C (2019) A critical review of STEAM (science, technology, engineering, arts, and mathematics). In: Lingard B, Sellar S, Lewis S, Noblit GW (eds) Oxford research encyclopedia of education. OUP, pp 1–22. https://doi.org/10.1093/acrefore/9780190264093.013.398
13. Katz-Buonincontro J (2018) Gathering STE(A)M: policy, curricular, and programmatic developments in arts-based science, technology, engineering, and mathematics education. Introduction to the special issue of arts education policy review: STEAM Focus. Arts Educ Policy Rev 119(2):73–76. https://doi.org/10.1080/10632913.2017.1407979
14. Perales FJ, Aróstegui JL (2021) The STEAM approach: implementation and educational, social and economic consequences. Arts Educ Policy Rev. https://doi.org/10.1080/10632913.2021.1974997
15. Hartley S (2017) The fuzzy and the techie: why the liberal arts will rule the digital world. Hartley Global, LLC
16. Jefatura del Estado (2020) Ley Orgánica 3/2020, de 29 de diciembre, por la que se modifica la Ley Orgánica 2/2006, de 3 de mayo, de Educación. Boletín Oficial del Estado 340:122868–122953. Retrieved from https://www.boe.es/diario_boe/txt.php?id=BOE-A-2020-17264
17. Nierman GE (2016) From the president's keyboard: model cornerstone assessment—a key component of standards implementation. Music Educ J 102(3):6–8. https://doi.org/10.1177/0027432115624416
18. Schmid D (2019) Dance entry level teacher assessment (DELTA): reframing dance teacher preparation through consensus building. Arts Educ Policy Rev 120(3):149–164. https://doi.org/10.1080/10632913.2018.1536617
19. Tabone G, Weltsek GJ (2019) A qualitative summative assessment for theater education. Arts Educ Policy Rev 120(3):165–174. https://doi.org/10.1080/10632913.2019.1596854

20. Graham M (2019) Assessment in the visual arts: challenges and possibilities. Arts Educ Policy Rev 120(3):175–183. https://doi.org/10.1080/10632913.2019.1579131
21. Flecha R (2011) Vilanova. La caída del feudalismo universitario español. Revista de la Asociación de Sociología de la Educación (RASE) 4(2):115–132
22. Smeyers P, Burbules NC (2011) How to improve your impact factor: questioning the quantification of academic quality. J Philos Educ 45(1):1–17
23. Hicks D, Wouters P, Waltman L, De Rijcke S, Rafols I (2015) Bibliometrics: the Leiden Manifesto for research metrics. Nature 520(7548):429–431. https://doi.org/10.1038/520429a
24. Caplan B (2018) The case against education: why the education system is a waste of time and *money*. Princeton University Press
25. Elliott D, Silverman M, Bowman W (2016) Artistic citizenship: artistry, social responsibility, and ethical praxis. OUP
26. Leistyna P (2007) Neoliberal non-sense. Critical pedagogy: where are we now. In: McLaren P, Kincheloe JL (eds), Critical pedagogy: where are we now?, pp 97–123. Peter Lang
27. Eisner EW (1982) Cognition and curriculum: a basis for deciding what to teach. Longman
28. Gianmarco M, Higham S, McKean M (2020) The future is social and emotional: evolving skills needs in the 21st century. Conference Board of Canada, Ottawa. Retrieved from https://www.conferenceboard.ca/elibrary/abstract.aspx?did=10628y
29. Davidson C (2017) The new education. How to revolutionize the university to prepare students for a world in flux. Basic Books
30. Organisation for Economic Co-operation and Development (OECD) (2018) Job creation and local economic development 2018. Preparing for the future of work. OECD. Retrieved from http://www.oecd.org/publications/job-creation-and-local-economic-development-26174979.htm
31. World Economic Forum (2020) The future of jobs report 2020. World Economic Forum. Retrieved from http://www3.weforum.org/docs/WEF_Future_of_Jobs_2020.pdf
32. Oppenheimer A (2018) ¡Sálvese quien pueda!: El futuro del trabajo en la era de la automatización. Debate
33. Allina B (2018) The development of STEAM educational policy to promote student creativity and social empowerment. Arts Educ Policy Rev 119(2):77–87. https://doi.org/10.1080/10632913.2017.1296392
34. Cortina A (2013) El futuro de las humanidades. Rev Chil Lit 84:207–217. https://doi.org/10.4067/S0718-22952013000200015
35. Halász G, Michel A (2011) Key competences in Europe: interpretation, policy formulation and implementation. Eur J Educ 46(3):289–306. https://doi.org/10.1111/j.1465-3435.2011.01491.x
36. Rey B (2000) ¿Existen las competencias transversales? Educar 26:19–27. Retrieved from https://www.raco.cat/index.php/Educar/article/download/20724/20564.
37. Ministerio de Educación, Cultura y Deporte (2014) Real Decreto 126/2014, de 28 de febrero, por el que se establece el currículo básico de la Educación Primaria. Boletín Oficial del Estado 52:1–58. Retrieved from https://www.boe.es/buscar/pdf/2014/BOE-A-2014-2222-consolidado.pdf
38. Ministerio de Educación, Cultura y Deporte (2015) Real Decreto 1105/2014, de 26 de diciembre, por el que se establece el currículo básico de la Educación Secundaria Obligatoria y del Bachillerato. Boletín Oficial del Estado 3:169–546. Retrieved from https://www.boe.es/boe/dias/2015/01/03/pdfs/BOE-A-2015-37.pdf
39. Szafranski M, Golinski M, Simi H (eds) (2017) The acceleration of development of transversal competences. Centria University of Applied Sciences
40. Aróstegui JL (2019) Evaluation, educational policy reforms, and their implications for arts education. Arts Educ Policy Rev 120(3):121–125. https://doi.org/10.1080/10632913.2018.1532368
41. Guerriero S (2017) Pedagogical knowledge and the changing nature of the teaching profession. OECD. https://doi.org/10.1787/9789264270695-en

José Luis Aróstegui holds a Ph.D. in Pedagogy. He is professor of Music Education at the University of Granada, Spain, and co-ordinator of the Music Education Research Lab SEJ-540. He has leaded some research projects funded by the European Commission and the Ministry of Science and Innovation of Spain. He is member of International Advisory Board of the FUTURED research on music teacher education in Norway currently in progress.

Historical Thinking and Controversial Issues in Social Studies Education

6

Pedro Miralles and Nilson Javier Ibagón

Abstract

This chapter proposes a direct relationship between historical thinking and the analysis and comprehension of controversial issues for the history education of younger generations. It advocates the importance of working on controversial issues in History and Social Studies classes, considering conflict as an analytical parameter. Studying burning issues which are relevant to students' lives makes it possible to question the processes of explanatory naturalisation of certain historical phenomenon. Historical thinking and its skills seek the acquisition of strategies and abilities for the development of a critical and democratic citizenship. Thinking historically requires gaining an awareness of historical problems of the past and the present, making them relevant and relating them with the students' own personal experiences.

Keywords

Historical thinking · History teaching · Controversial issues · Democratic education · Social studies

P. Miralles
University of Murcia, Murcia, Spain
e-mail: pedromir@um.es

N. J. Ibagón (✉)
University of Valle, Cali, Colombia
e-mail: nilson.ibagon@correounivalle.edu.co

D. Ortega-Sánchez (ed.), *Controversial Issues and Social Problems for an Integrated Disciplinary Teaching*, Integrated Science 8,
https://doi.org/10.1007/978-3-031-08697-7_6

Introduction. History Teaching for a Critical and Democratic Education

In general, the teaching of history has sought to develop collective national identities. Although arguments concerning the value of otherness have gained ground in the definition of a new and complex sense of citizenship, in many cases, the teaching of history continues to reinforce, both explicitly and implicitly, particular, or even sectarian, identities which are structured around negative and stereotyped images of the "other" and normalise the victimisation or superiority of certain groups [1–4].

Indeed, in a recent study by Ortega-Sánchez and Pagès [5] on the perceptions of secondary education Geography and History teachers in Spain, the most frequently recurring controversial topic was the construction of national and cultural identities, along with the degree of recognition of multicultural and heterogeneous societies.

Even in the twenty-first century, the criteria for the organisation, selection and treatment of the substantive contents of history teaching (with some notable exceptions) are still defined by a chronological and linear outline of events which are to be memorised by students [6, 7]. This parameter is complemented by an "explanatory" approach, which is both sterile and neutral and views conflict and controversy as obstacles to learning.

Thus, it is necessary to perfect the ability to understand historical time [8, 9]. Not surprisingly, students themselves state that history must be memorised and that it should be learned in order to become "cultured" [10]. This makes it difficult to establish causal relationships between historical problems and current reality, thereby hindering the students' integration into society as citizens who are both critical and thoughtful [11]. This contributes towards the formation of a passive society from a political point of view, one which does not take a stand when faced with controversial issues and cannot easily be convinced of alternative approaches to the reality in which it lives [12].

However, there is an alternative approach based on historical thinking skills which seeks the acquisition of strategies and skills for the development of a critical and democratic citizenship which is capable of historical thinking. This requires people to be aware of the historical problems of the past and those of the present which are relevant and immediate to students. Thus, the school subjects of Social Studies and History can have a connection with the students' personal experiences rather than being far-removed from them, and only dealing with leaders from the past and concerned with the accumulation of information [13, 14]. This should be the origin of a critical citizenship which can discern the false information, prejudices and stereotypes which are so commonplace in this age of new technologies, fake news and post-truth [15].

In present-day societies, the amount of information which can be consulted, the ease with which it can be accessed and the fact that we belong to a global community in which everything can be created and shared so quickly and easily, requires citizens to process, filter and categorise this information in order to avoid

succumbing to the confusion of the information society, a new "horseman of the Apocalypse" leading to disinformation, [16]. At the present time, what is important is to teach people how to use tools in order to select information.

The Covid-19 pandemic has led to an "infodemic", a pandemic of disinformation, an illness which has become more severe due to the mismanagement of information and its consequences. Addiction to mobile devices and to information ("infoxication") has been followed by what the World Health Organisation has termed an "infodemic". This situation has fed narratives which appeal to prejudices, manipulate feelings and replace what is real and authentic with versions or rumours which do not distinguish facts from tales or reality from fiction. Passion overtakes reason and most people prefer to confirm their own ideas rather than to allow reality to change their conceptions [17, 18].

Therefore, one of the challenges faced by society today is that of forming critical, active and democratic citizens who act in favour of the defence of human rights, heritage, democratic systems and the sustainability of the planet. In a world of vertiginous progress in technological terms, but with vast chasms as far as economic issues are concerned, leading to great social inequality and a society in which discrimination based on gender or religious beliefs still leads to hate and violence, there is a desperate need for people to be critical of the reality of their everyday lives. In other words, they must understand the main achievements made and challenges they face as part of society, identify the relevance of these events and the causes and consequences which derive therefrom.

Thus, knowledge of the foundations of democratic systems, their evolution over time and the social and economic consequences implied by the establishment of authoritarian regimes around the world can contribute towards the exercise of a critical citizenship [19–21].

Furthermore, being able to search for the roots of current events and problems in the past makes it possible to identify changes and continuities over time, thus providing the opportunity to observe which aspects of society evolve more quickly than others. This implies being critical with the messages which transmit an idea of the progress of society based on consumerism and new technologies, whilst relegating those groups which, due to economic, ideological or cultural reasons, do not share the same idea. Adopting different perspectives, empathising with others and their contexts and points of view makes it possible to exercise attitudes of understanding and respect towards diversity, not only in terms of hierarchy and supremacy, but also based on the idea of belonging to a plural society. Upon this foundation, progress can be made towards the achievement of human and social rights and sexist attitudes, which perpetuate inequality between women and men, can be challenged, along with other forms of social discrimination. Furthermore, the possession of a scale of ethical values facilitates the critical evaluation of conflictive events from the past or which affect people in the present (wars, terrorism, migrations, child labour, etc.).

For all of the above reasons, a curricular approach based on controversial issues or relevant social problems provides answers to these challenges as it is connected with the approaches aimed at achieving objectives such as the following:

- Fostering reflection and critical and creative thinking among students.
- Analysing social values and practices.
- Educating for decision-taking, problem-solving, etc.

Based on this approach, the idea is defended that a critical model of history and social studies teaching should interrogate and challenge the processes of the production of culture and should take into account the role of school subjects in the social distribution of knowledge. In general, critical assumptions seek to convert schools into a scenario in the struggle for betterment; a progressive conception of education is chosen which contributes towards the transformation of society in the quest for solidarity, liberation and ethics.

This approach is committed to educational integration among scientific knowledge, socio-environmental issues and everyday knowledge. This synthesis should result in an alternative and inclusive curriculum which fosters a critical attitude in the teaching of the social sciences. It should take into consideration the students' conceptions and relevant social problems in order to bring about, more than the education of specialists in different disciplines, the education of citizens in a basic culture, capacitating them to interpret natural and social phenomena and to act in a critical and responsible way towards the problems of the society in which they live.

Opting for controversial issues and relevant social problems is justified by the consideration that the main objective of compulsory education cannot be the mere transmission of subject-based information. The curriculum focused on subjects and issues of an academic or cultured nature should be substituted by a curriculum based on problems and organised around projects. The selection of the controversial issues or relevant problems to be studied should be made based on the knowledge and interests of the students. The teaching model of this approach has a counter-socialising aim. In other words, students should be taught to form their own values rather than to accept the dominant values of society. Thus, the aim is to establish coherence between thought and action and to attribute a leading role to students in the construction of their personal and social world through values based on commitment, justice, tolerance and solidarity.

Historical Thinking Skills

Research in the field of history teaching has made a distinction between two types of historical contents. On the one hand are the substantive or first-order contents, which seek to respond to questions such as What? Who? When? and Where? This type of contents makes reference to the knowledge of concepts, dates and specific historical events. They are the substance of scientific contents, i.e., the result or final product of research and constitute what academic research has produced and defined and the result of this work. These substantive contents make it possible to explain a specific event and to classify it, to indicate what it is and describe its characteristics.

On the other hand can be found what are commonly referred to as strategic or second-order contents, which are defined by the possession or deployment of different strategies, capacities or skills in responding to historical questions and understanding the past in a more complex way. These are also known as procedural, methodological concepts, metaconcepts or structural concepts and their role is to foster reflection on the construction of other (first-order) concepts which define the final result of the research. These are the analytical categories employed by social scientists in order to interpret tests and generate their explanations and form the basis for the development of skills-based learning.

This historical knowledge is related with the skills of the historian and, therefore, with the historical thinking skills: historical significance, source analysis, historical consciousness, causes and consequences, change and continuity and historical empathy [22–31]. In order to develop these skills among students, it is necessary to foster the capacity of posing historical problems, interweaving the everyday lives of men and women of the past with the great historical processes. Secondly, it is important to encourage the collection and analysis of evidence from historical sources, understood as complex and creative thinking and the critical examination of witnesses from the past. Working with primary sources from an early age has been carried out in depth in the United States [32]. In the context of Ibero-America, the use of sources is one of the most commonly proposed elements of historical thinking [33, 34]. Thirdly, it is necessary to foster the development of historical consciousness among students, understanding this to be the capacity to interrelate phenomena from the past with those of the present. This implies developing the notion that everything in the present has its origin in the past; the conviction that societies are not static but are subject to transformations and that each person has a role to play in this process of social transformation [35, 36]. Fourthly, students should be encouraged to develop the ability to represent narratives from the past. In this regard, Chapman [22] has analysed the arguments of students and the formation of historical thinking via reasoning and the use of sources and a coherent structure of discourse. More recently, Kolikant and Pollack [37] have carried out exercises in historical empathy among Israeli students in an attempt to help them understand the multiple perspectives and interpretations of historical events. There is also an abundance of research from North America which stresses the abilities to think, read, write and argue historically, emphasising historical literacy [38, 39].

Ultimately, the historical skills connect with the main challenges of society today. Therefore, if it is important for adults to participate in these critical and democratic principles and to be capable of developing these skills, it is even more the case for those who are in the process of being educated.

Thinking and Teaching About Controversial Issues in History and Social Education

Traditional approaches to the teaching and learning of history, in favouring the dissemination of unquestionable "truths" and unchanging explanatory outlines, generally avoid the analysis of historical processes and problems which imply any degree of controversy associated to the very characteristics of their development and/or the interpretations which have been built up over time. Such omissions (which can be expressed via concealment or misrepresentations) make it possible to trace "stable" discursive routes which ensure the predominance and naturalisation of cultural arbiters via whom the past is legitimised and the present is aligned to the specific interests of the dominant groups.

As stated by López-Facal and Santidrián [40], including debate on these controversial issues in the classroom can encourage the emotional involvement of our students, which, in turn, leads to a much higher degree of participation, which then has an impact on their final epistemological learning and a greater understanding of their reality as citizens within society. Various authors have argued that schools cannot claim to provide a response to these conflicts, but they can teach the guidelines to understand why they arose and how they can be managed democratically. As these topics arise in the classroom, internal cognitive processes can be pursued further [41, 42].

In this regard, controversial issues are a way of counteracting the chicanery and silencing originating from the uses and abuses of traditional history teaching. From this perspective, speaking without fear of a relevant but inconvenient truth for some sectors of society is the basis of an education in history which makes it possible to understand not only the past (be it distant or recent) but also the relationships of this past with the present and the future [3, 26]. Thus, in spite of the complexity implied by analysing socio-historical events and processes determined by grief, desolation and suffering, approaching them critically in the classrooms of the societies which directly or indirectly experienced them is a fundamental aspect in the construction of a peaceful common future sustained by truth, justice, reparation and the avoidance of repetition.

Based on this assertion, different analytical categories have arisen over recent decades which seek to give an account of the nature of this type of contents and their importance in the renovation of the teaching aims of the school subjects of history and social sciences. For example, Legardez and Simonneaux [43], Tutiaux-Guillon [44] and Falaize [45] have written about the notion of "Socially Acute Questions" (QSV, in its French abbreviation, Questions Socialement Vives), concerning issues which generate debate and conflict in different areas of society, mobilising sensitive values and interests. For this reason, they cannot be understood from one single position or be resolved unilaterally. Taking as a point of reference the explanatory scope of SAQs, López-Facal [46] proposes understanding such topics in terms of "burning social conflicts", which are associated to realities which are both conflictive and difficult for society to address as they divide people and

generate opposing opinions, leading to confrontations of different kinds. Epstein and Peck [47], with the aim of explaining violent aspects of a past which evokes controversial and/or painful response, coined the term Difficult Histories, whereas Borries [48, 49] suggests the category Burdening History when analysing learning about historical experiences characterised by guilt, pain and shame, which, in his opinion, are more difficult to understand, as they imply addressing the controversy by way of the critical questioning of processes presented as uncomfortable and which destabilise the established social order [50].

Although they are built around diverse epistemological and methodological principles, each of these categories focuses on the defence of the educational, and even moral, value [51–53] of addressing controversial issues as a means for fostering the establishment of comprehensive connections between the past, present and future among students with the aim of building a fairer and more peaceful society. Thus, war, poverty, racism and its dehumanising effects, gender inequalities, the destruction of the environment, etc., problems with little or no development in official curriculums, should be understood from these analytical perspectives as possible driving forces of the generation of historical counter-narratives, which, by introducing more complex readings of social reality into schools and other places of education, make it possible to strengthen the historical education of future generations [50].

However, the introduction of these substantive teaching and learning contents in formal and non-formal places of education, based on the recognition of the educational value of controversial issues and their direct relationship with the development of historical thinking among children and young people, implies breaking with teaching methods and logic focused on the acritical and closed transmission of historical data presented from an essentialist perspective as revealed truths. In other words, it implies overcoming limited ontologies generated by practices and discourses which prevent people from connecting controversial historical processes with their life experience in terms of present and future, or individual and collective, impacts.

Therefore, the use of controversial issues as the backbone of the process of history education is directly linked with the education and fostering of an active and participative citizenship which is capable of recognising the meaning and importance of "the common good" [54] via complex connections between the past, present and future. Building upon the foundations of this active citizenship, which assumes history as a democratic tool [20, 55, 56], new generations can take on the burdens of the past, connecting their understanding of it with a critical reading of the relationships of injustice and inequality of the present. This exercise will make it easier for them to take action in their immediate circumstances and, as a consequence, to define more complex and humanistic expectations [57]. Thus, it is clear that this teaching approach advocates social practice more than individual cognitive processes [41]. This calls into question the traditional representations of History and Social Science classes and their limited educational objectives.

The introduction of controversial topics and burning issues in History and Social Science classes leads to teachers and students asking deep questions regarding the different kinds of forces and interests which have been essential in the process of the "invention of tradition", via which practices and discourses have been formed which have assisted the formation of a collective identity based on the negation of conflict and other forms of being, thinking and existing in the world. In this regard, the study of forms of production and presentation, communication and consumption, circulation and appropriation of historical narratives (i.e., considering the public uses of history via the comprehension of historical culture and the political and economic relationships which define it [35, 49]) becomes especially relevant. Based on these general principles, dealing with controversial issues becomes an essential new pattern in the teaching of history [58], as it necessarily introduces renewed logic into the definition of the educational methodologies and objectives which give shape and identity to the teaching and learning of history, rather than focusing merely on substantive contents.

The learning of history and social studies is not only a cognitive process of information acquisition, but it implies self-knowledge tinged with emotions, aesthetic perceptions and moral judgments. The relationships between the historical culture of each age and the teaching of history and social studies bring about consequences which imply decisive questions in relation to political dimensions, which are crucial for the processes of selection and human action [59].

How to Teach Controversial Topics

As far as dealing with these burning issues in the classroom is concerned, we present our point of view or professional perspective on the four possible attitudes for their implementation, presented by López-Facal and Santidrián [40], and also proposed by other authors such as Kelly [60] and Simonneaux [61]:

- Exclusive neutrality: the type of teacher who avoids any type of debate in class. The teacher does not wish to complicate his/her classes by provoking confrontation and avoids proposing discussions or conflicts on these burning issues.
- Exclusive partiality: the attitude in which the teacher only presents a single point of view (his/her own), excluding data, evidence or additional information which does not interest him/her as it contradicts his/her version or because it does not agree with his/her posture or opinion. In practice, this approach clearly borders on manipulation and educational indoctrination, which is more suited to the educational traditionalism of the nation states, where (unidirectional) teaching was synonymous with the imposition of ideas and the lack of possibility for communicative exchange. Unfortunately, there are still some schools in which this type of praxis, more appropriate for a merely disciplinary approach, persists and the master class continues to be deeply-rooted in teaching practice.

- Neutral impartiality: this teaching model or attitude is based on the idea of a brave teacher who dares to present different points of view about complex issues. However, although he/she presents burning issues, he/she prefers to steer clear of ideologies, beliefs and values. In other words, he/she does not take sides and prefers to be cautious and prudent when addressing such issues in the classroom.
- Committed impartiality: the teacher presents the burning issue or controversial topic and also manifests his/her point of view (without imposing it) with the aim of encouraging the class to express their opinions, defending positions, understanding the diversity of opinions which may exist and acquiring the skills of restraint, tolerance and respect towards others. Without doubt, this seems to us to be the most appropriate of the four approaches as participation in constructive debates enriches students' intellect, empowers them to investigate, contrast information, express doubts, communicate and take a stand in proposals and ideas which may arise around the topic. In this way, they can position themselves in the front line to be able to adopt strategies which will enable them to be critical citizens capable of dialogue for the rest of their lives and acquiring skills which will facilitate their lives.

In this regard, López-Facal and Santidrián [40] add that dealing with these issues does not have the aim of enabling students to resolve these problems, but for them to learn to manage them democratically. In other words, they acquire the capacity to formulate questions, to question all of the information and to understand that there will often be opinions and alternatives different to their own and that, therefore, it is necessary to attempt to study the contents of the school curriculum in parallel with these problems and adopting attitudes of respect with regard to divergence (civic-mindedness, politeness and respect).

Ultimately, in order to develop social and citizen skills and, thus, to gain a deeper and more appropriate critical education based on historical thinking and citizen participation, working on social problems and controversial issues in the classroom is essential, taking it as the development of a plurality which will ensure a new democratic culture [56, 62].

Teaching and Learning History and Social Studies Based on the Normalisation of Conflict

Critical transformations in the ways in which controversial historical processes are traditionally approached must take place in formal and non-formal educational scenarios [56]. For this purpose, one of the most complex problems is the marked trend in school systems in particular and in society in general towards presenting and assuming conflict as something exceptional and disconnected from present realities. Based on this reasoning, the lack of basic freedoms, the vast gap between rich and poor, violent confrontation among compatriots, the violation of human rights, among other problems, are taken to be unlived experiences (negation) or, in

the best-case scenario, experiences which have been overcome (forgotten). Conflict is, therefore, considered to be a destabilising principle which must be avoided as a topic for historical reflection [50].

Contrary to this position, the emphasis on the importance of working on controversial topics in History and Social Studies classes as the basis of students' history education goes hand in hand with the idea of conflict as an unavoidable parameter of analysis. Therefore, what is sought from this perspective is that the exercise of historical comprehension will make it possible to normalise conflict and de-normalise violence [63]. In this way, conflict is no longer seen as something negative per se, but is understood as an essential element in the promotion of social, political, economic and cultural changes and transformations. This analytical process leads to an understanding of the fact that no society is exempt from the presence of conflicts and to identifying that the ways and means via which conflicts are dealt with and processed establish significant differences between experiences, which should be evaluated critically in pursuit of the delegitimisation of the use of violence as a mechanism for the resolution of discrepancies.

A large number of violent (symbolic and physical) conflicts which have persisted over time and the controversial elements derived from understanding them are rooted in the nullification/negation of the other as a valid interlocutor. Over recent decades, this nullification/negation has been qualified via the culture of tolerance, which, due to its evaluative restrictions, has hindered the true recognition of the difference, taken to be a criterion for the formation of historical identities governed by interculturality [35, 64].

Thus, when controversial issues are dealt with in History and Social Studies classes, the idea of the peaceful and democratic management of conflicts [46, 55, 65] becomes an important and central issue, fostering the understanding, on the one hand, of how and why they arise and, in a complementary way, the analysis of their short, medium and long-term implications. As a consequence, the analysis of controversial issues from the perspective of historical and social education, in addition to facilitating the identification of the causes of conflicts, makes it possible to carry out in-depth analyses of their continuity and to reconfigure the present and its possible links with the students' life experience [66]. In this way, the natural dissociation at the heart of the traditional school, between the contents of the curriculum and their meaning and relevance for students begins to be overcome, making it possible to develop far-reaching educational processes.

Therefore, understanding conflict as an integral part of societies from History and Social Studies classes can help to combat the "culture of silence" [65, 67], i.e., discursive postures and practices which avoid the need for public discussion of traumatic, painful and controversial episodes from the past, either because their existence is explicitly denied or because it is considered that their analysis would not contribute anything of significance for the construction of the life of the community. Consciously fighting against this silence from the perspective of history teaching and learning implies an initial evaluation regarding the importance of analysing past conflicts with a view to carrying out future projects. In this process, it becomes essential to recognise alternative and plausible explanations regarding a

common past [68]. Such explanations in the context of an educational project of this kind should not only be convincing for those concerned, but also strongly convincing for rational and human dialogue in complex, democratic and pluralistic societies [49]. This dialogue should be open and must include younger generations in the quest for an effective historical reconciliation which is helpful in remedying the adverse effects of the denial and undervaluing of the other and of otherness in different spheres of life [50].

Conclusions: A Different Kind of History and Social Education is Possible

Social and historical issues have always been characterised by political, economic, cultural or ethical questions over the course of history and in geographically specific places. Given the interrelationship and interdependence of these fields, social problems and controversial issues should be addressed by Social Studies and History teachers. This is even more true concerning controversial issues of life today, which concern and affect us directly. Students must adopt their own criteria via which they are able to resolve learning situations. Therefore, it is necessary to provide the necessary strategies to facilitate their intellectual empowerment concerning information.

However, establishing a direct relationship between the analysis and comprehension of controversial issues and the history and social education of future generations implies a series of challenges and commitments concerning the change in educational meanings which have traditionally defined the teaching and learning of history and social studies. In this regard, it is essential to transform learning experiences based on the passive consumption of "legitimate" and "true" knowledge and teaching methods grounded in the acritical transmission of contents. A controversial approach put into action as a central axis of history teaching implies a break with "educational" models based on the transmission of unidirectional and absolute truths. This gives way to teaching and learning processes which recognise the value of heterogeneity when establishing explanatory connections between the past, present and future. Thus, by establishing new logic regarding the teaching and learning of history, studying socially relevant and controversial issues makes it possible to question the processes of explanatory naturalisation of certain historical phenomena; processes based on which narratives have been built which have little or nothing to do with their own characteristics and implications.

From this perspective, it is not possible to carry out a complex analysis of conflictive historical processes without revealing that historical knowledge is a social construct. This implies that people (mainly children and young people) understand how historical narratives are produced and question their purposes regarding identity. Therefore, it is important to identify and call into question the preconceptions and everyday ways (based on common sense) via which students see the world, introducing rational and emotional processes making it possible to

dialogically connect cognitive, ethical, political and aesthetic aspects when critically examining burning social problems. In this regard, History and Social Studies classes should be spaces for the open exchange of knowledge, in which informed access is available to different historical experiences and orientations, with the aim of establishing an integral recognition of the other and of otherness. Therefore, the relationship which is established between controversial issues and history and social education implies a work based on the ideas of multi-perspectivity and pluralism.

Consequently, the basis for learning and teaching is no longer formed by the acritical memorisation of information and the consolidation of an irreflexive historical identity which is imposed by force and which comes to be defined by the connection between historical perception (the multi-perspectivity of historical sources), interpretation (the controversy among theories in the form of historical narratives) and orientation (the intercultural plurality between identities in relation to practical life) [69].

This educational perspective gains strength and relevance as it enables the transition from learning based on contemplation (empty erudition) to learning oriented towards the effective construction of a fairer society, one in which human diversity and respect for the environment are successfully integrated as essential conditions for the definition of a common and peaceful future.

Acknowledgements This study has been carried out through the funding of two ongoing projects and to whose teams the authors belong. The first entitled "The geographical and historical thinking of primary education students in the Region of Murcia: an innovative methodological proposal for quality education (20874/PI/18), funded by Fundación" Séneca-Agencia de Ciencia y Tecnología de la Región de Murcia (Spain). The second is "The teaching and learning of historical competences at baccalaureate level: a challenge for critical and democratic citizenship" funded by MCIN (PID2020-113453RB-I00/AEI/10.13039/501100011033).

References

1. Bekerman Z, Zembylas M (2016) Identity negotiations in conflict-ridden societies: historical and anthropological perspectives. Paedagog Hist 52(1–2):201–218
2. Drapac V (2021) Teaching about war and genocide. In: Teaching history for the contemporary world tensions, challenges and classroom experiences in higher education. Springer, Berlin, pp 153–169
3. Ibagón N (2020) Enseñar la historia de conflictos armados internos recientes: revisión de experiencias en África, Europa, Oriente Medio y América. Revista Guillermo de Ockham 18 (1):103–114
4. Paulson J (2015) "Whether and how?" History education about recent and ongoing conflict: a review of research. J Educ Emergencies 1(1):115–141
5. Ortega-Sánchez D, Pagès J (2020) The end-purpose of teaching history and the curricular inclusion of social problems from the perspective of primary education trainee teachers. Soc Sci 9(2):9
6. Gómez C, Miralles P (2015) ¿Pensar históricamente o memorizar el pasado? La evaluación de los contenidos históricos en la educación obligatoria de España. Revista de Estudios Sociales 52:52–68
7. Ibagón N, Minte A (2019) Historical thinking in school contexts Towards a complex definition of teaching of Clio. Zona Próxima 31:107–131

8. Bernabé MM (2017) La prueba de acceso a la Universidad como reguladora del proceso de enseñanza/aprendizaje de Historia. História & Ensino 23(2):59–83
9. Wilschut A (2019) Historical consciousness of time and its societal uses. J Curric Stud 51:831–849
10. Martínez-Valcárcel N (Dir) (2014) La construcción de los recuerdos escolares de Historia de España en Bachillerato (1993–2013). Bases para la memoria educativa. Diego Marín
11. Monteagudo J, Portela E (2019) La evaluación en las programaciones didácticas LOE y LOMCE de los departamentos de Geografía e Historia. Revista UNES 6:76–95
12. Navarro E (2012) La enseñanza de la Historia de España y el desarrollo de las competencias ciudadanas: el conocimiento del alumnado al finalizar el Bachillerato. Doctoral thesis. University of Murcia
13. Goldberg T, Savenije G (2018) Teaching controversial historical issues. In: The Wiley international handbook of history teaching and learning. Wiley-Blackwell, pp 503–526
14. Sheps SW (2019) History and civics education in Israel: reflections from Israeli teachers. Crit Stud Educ 60(3):358–374
15. Wineburg S (2018) Why learn history (when it's already on your phone). Chicago University
16. Abbagliati E (2021) https://twitter.com/cadaunante/status/1428747622890737665
17. Manrique JL (2016) Populismo y posverdad, ¿sólo tendencias? Imanencia 5(1):161–165
18. Vila R (2018) La posverdad y la espiral del silencio. Aportes 24:9–19
19. Harris LM, Reid S, Benkert V, Bruner J (2019) Investigating comparative genocide teaching in two high school classrooms. Theory Res Soc Educ 47(4):497–525
20. Holland A (2021) Citizenship and history. In: Teaching history for the contemporary world tensions, challenges and classroom experiences in higher education. Springer, Berlin, pp 183–200
21. Moisan S (2019) Teaching history to educate students about human rights? Teaching the history of apartheid in Quebec classrooms. Educ Francoph 47(2):102–122
22. Chapman A (2011) Taking the perspective of the other seriously? Understanding historical argument. Educar em Revista 42:95–106
23. Cooper H (2018) History in the primary school: making connections across times and places through Folk Tales. In: Educação Histórica Ousadia e Inovação em Educação e em História. Escritos em homenagem a Maria Auxiliadora Moreira dos Santos Schmidt. WA Editores, pp 149–167
24. Ercikan K, Seixas P (2015) Issues in designing assessment of historical thinking. Theory Pract 54:255–262
25. Gestsdóttir S, Van Drie J, Van Boxtel C (2021) Teaching historical thinking and reasoning: teacher beliefs. History Educ Res J 18(1):46–63
26. Gómez C, Miralles P (2017) Los espejos de Clío. Usos y abusos de la Historia en el ámbito escolar. Sílex
27. Lévesque S, Clark P (2018) Historical thinking: definitions and educational applications. In: The Wiley international handbook of history teaching and learning. Wiley-Blackwell, pp 119–148
28. Seixas P (2017) Historical consciousness and historical thinking. In: Palgrave handbook of research in historical culture and education. Palgrave McMillan, pp 59–72
29. Seixas P, Morton T (2013) The big six historical thinking concepts. Nelson College
30. VanSledright BA (2014) Assessing historical thinking and understanding innovation design for new standards. Routledge
31. Zanazanian P (2015) Historical consciousness and metaphor: charting new directions for grasping human historical sense-making patterns for knowing and acting in time. Hist Encounters 2:16–33
32. Lesh BA (2011) Why won't you just tell us the answer? Teaching historical thinking in grades 7-12. Stenhouse
33. Prats J, Santacana J (2011) ¿Por qué y para qué enseñar historia? In: Enseñanza y aprendizaje de la historia en Educación Básica. Secretaría de Educación Pública, pp 18–68

34. Schmidt MA, Fronza M (2018) Jovens, consciência histórica e avaliação da aprendizagem: o caso do Exame Nacional Ensino Médio no Brasil entre 2009/2015. Educatio Siglo XX1, 36:149–171
35. Rüsen J (2015) Humanismo e didática da História. WA Editores
36. Sáiz J (2013) Alfabetización histórica y competencias básicas en libros de texto de historia y en aprendizaje de los estudiantes. Didáctica de las Ciencias Experimentales y Sociales 27:43–66
37. Kolikant YBD, Pollack S (2019) Collaborative, multi-perspective historical writing: the explanatory power of a dialogical framework. Dialogic Pedagogy 7:89–100
38. Nokes J, De La Paz S (2018) Writing and argumentation in history education. In: The Wiley international handbook of history teaching and learning. Wiley-Blackwell, pp 551–578
39. Wineburg S, Martin D, Monte-Sano C (2013) Reading like a historian teaching literacy in middle & high school history classrooms. Teachers College Press
40. López-Facal R, Santidrián V (2011) Los "conflictos sociales candentes." Íber Didáctica de las Ciencias Sociales, Geografía e Historia 69:8–20
41. Gómez CJ, Miralles P, López-Facal R, Prats J (2018) Las competencias históricas en el horizonte Propuestas presentes y perspectivas de futuro. In: Enseñanza de la historia y competencias educativas. Graó, pp 215–234
42. Ibagón N, Granados R (2021) Lidiar con las cargas del pasado en la escuela. Algunas reflexiones desde la enseñanza y el aprendizaje de la Historia. In: Afrontar los pasados controversiales y traumáticos. Aproximaciones desde la enseñanza y el aprendizaje de la Historia. Universidad del Valle-Universidad Icesi, pp 13–40
43. Legardez A, Simonneaux L (2006) L'école à l'épreuve de l'actualité: enseigner les questions vives. ESF
44. Tutiaux-Guillon N (2011) Les qüestions socialment vives, un repte per a la història i la geografia escolars? In: Les qüestions socialment vives i l'ensenyament de les ciències socials. Universitat Autònoma de Barcelona, pp 25–39
45. Falaize B (2014) O ensino de temas controversos na escola francesa: os novos fundamentos da história escolar na França? Tempo & Argumento 6(11):224–253
46. López-Facal R (2011) Conflictos sociales candentes en el aula. In: Les qüestions socialment vives i l'ensenyament de les ciències socials. Universitat Autònoma de Barcelona, pp 65–76
47. Epstein T, Peck C (2017) Teaching and learning difficult histories in international contexts a critical sociocultural approach. Routledge
48. von Borries B (2011) Coping with burdening history. In: Historicizing the uses of the past, Scandinavian perspectives on history culture historical consciousness and didactics of history related to World War II. Transcript Verlag, pp 165–188
49. von Borries B (2018) Jovens e consciência histórica. WA Editores
50. Ibagón N, Miralles P (2021) Temas controversiales y educación histórica. In: Enseñanza de las ciencias sociales para una ciudadanía democrática. Estudios en homenaje al profesor Ramón López Facal. Octaedro, pp 123–137
51. Edling S, Sharp H, Löfström J, Ammert N (2020) Why is ethics important in history education? A dialogue between the various ways of understanding the relationship between ethics and historical consciousness. Ethics Educ 15(3):336–354
52. Ho LC, McAvoy P, Hess D, Gibbs B (2017) Teaching and learning about controversial issues and topics in the social studies a review of the research. In: The Wiley handbook of social studies research. Wiley, pp 321–335
53. Körber A (2017) Historical consciousness and the moral dimensions. Hist Encounters: J Hist Conscious Hist Cultures History Educ 4(1):81–89
54. Barton K, Levstik L (2004) Teaching history for the common good. Lawrence Erlbau
55. Alvén F (2017) Making democrats while developing their historical consciousness: a complex task. Hist Encounters 4(1):52–67

56. Santisteban A (2019) La enseñanza de las ciencias sociales a partir de problemas sociales o temas controvertidos: estado de la cuestión y resultados de una investigación. El Futuro del Pasado 10:57–79
57. Ahonen S (2014) Education in post-conflict societies. Hist Encounters 1(1):75–87
58. Moreno-Vera JR (2018) El pensamiento crítico en la enseñanza de la historia a través de temas controvertidos. Actualidades Pedagógicas 72:15–28
59. Schmidt M, Cainelli M, Miralles P (2018) As pessoas tentam, mas a história difícil não é facilmente descartada: o lugar dos temas controversos no ensino de história. Antíteses 11 (22):484–493
60. Kelly TE (1986) Discussing controversial issues: four perspectives on the teacher's role. Theory Res Soc Educ 14(2):113–138
61. Simonneaux L (2007) Argumentation in socio-scientific contexts. In: Argumentation in science education. Springer, Berlin, pp 179–199
62. Ortega-Sánchez D, Pagès J (2022) Enseñar temas controvertidos en Ciencias Sociales: Actitudes y prácticas del profesorado de Educación Secundaria. In: Repensar el currículum de Ciencias Sociales: prácticas educativas para una ciudadanía crítica. Tirant Lo Blanch, pp 1163–1190
63. Padilla A, Bermúdez Á (2016) Normalising conflict and de-normalising violence: challenges and possibilities of critical teaching of the history of the Colombian armed conflict. Revista Colombiana de Educación 71:219–251
64. Schmidt M (2016) Interculturalidade, Humanismo e Educação Histórica: Formação da consciência histórica é mais do que Literacia Histórica? In: Consciência histórica e interculturalidade Investigações em Educação Histórica. WA Editores, pp 21–33
65. Gellman M (2015) Teaching silence in the schoolroom: whither national history in Sierra Leone and El Salvador? Third World Q 36(1):147–161
66. Ortega-Sánchez D, Barba C (2021) Building historical narratives about controversial issues on twitter: an analysis of digital literacy levels in secondary school students. In: Teacher education. IntechOpen, pp 1–11
67. Bentrovato D, Korostelina K, Schulze M (eds) (2016) History can bite: history education in divided and postwar societies. V&R Unipress
68. Carretero M, Bermúdez A (2012) Constructing histories. In: The Oxford handbook of culture and psychology. Oxford University Press, pp 625–646
69. von Borries B (2011) How to examine the (self) reflective effects of history teaching. In: Historicizing the uses of the past, Scandinavian perspectives on history culture. Historical consciousness and didactics of history related to World War II. Transcript Verlag, pp 210–229

Pedro Miralles is Full Professor at the University of Murcia. Has been a teacher during 39 years, in all educational levels: adult education; Primary Education; Geography and History teacher and professor in Secondary School Education; senior lecturer and professor at University. He worked in permanent teachers' training. He is principal Investigator of the research group 'Didactics of Social Sciences'. He has directed or participated in 27 research and innovation projects on didactics of social sciences in Early Childhood, Primary and Secondary Education. He is the author of more than two hundred publications and more than a hundred conferences and communications in scientific conferences about teaching and learning of social sciences, historical education, historical thinking, assessment, teacher training, education for citizenship and textbooks.

Nilson Javier Ibagón is Associate Professor at the History Department of the University of Valle (Colombia). Member of the group of Historical Research in Economics, Politics and Education (IHEPE). Associated Researcher of the Ministry of Science, Technology and Innovation of Colombia. Author of several scientific articles published in journals in Colombia, Brazil, Spain, Argentina, Mexico and Chile. He has also published four books in the field of teaching and learning of history, from the perspective of History Education. His research mainly has focused on the analysis of educational policy in Colombia, the teaching-learning of history, Historical Education, the development of comparative studies in education and teacher training.

7

Education and Controversial Topics in Post-conflict Societies: The *Coexistence and Memory* Project in Contemporary Teacher Training in the Basque Country

Alex Ibañez-Etxeberria, Leire Albas, Sara Gaskue, and Naiara Vicent

Abstract

There have been—and there continue to be—a great many conflicts in the world. The consequences of some of these conflicts tend to linger for many years in the societies where they occur. A case in point is the Basque Country. The education offered regarding controversial issues, and the ways such issues are deal with in the classroom, can improve this situation in that—properly implemented—they can help understand the nature of conflicts; create opportunities for learning, debating, and comparing differing opinions; and offer tools that promote both critical thinking and an attitude propitious to peaceful coexistence based on respect for human rights. Especially important in this regard is the inclusion of controversial issues in the initial teacher training. In the case of Basque society, recent years have seen the emergence of educational proposals characteristic of a post-conflict reality. This chapter includes mention of a number of programs that have been developed on the basis of public policies in the Basque Country, with a particular focus on implementation in educational faculties in the University of the Basque Country of the *Adi-adian* program through an innovative educational project. This initiative has been enthusiastically received by students exposed to it. The *Adi-adian* program has allowed students to understand the complexity of

This project has received financial support from the office of the Vice Rector for Innovation, Social Outreach and Cultural Activities of the University of the Basque Country (UPV-EHU) via the Educational Innovation Project Memory and Coexistence (HBP2019-20/102); from the Basque Government, via the Research Group GIPyPAC, UPV/EHU (IT1193-19), and from the Department of Peace and Coexistence of the Basque Government and the Vice-Rectorate for Basque Language and Continuing Education of the University of the Basque Country (UPV-EHU) (PIC INVEC3L4-D00024-1).

A. Ibañez-Etxeberria · L. Albas · S. Gaskue · N. Vicent (✉)
University of the Basque Country (UPV/EHU), San Sebastian, Spain
e-mail: naiara.vicent@ehu.eus

D. Ortega-Sánchez (ed.), *Controversial Issues and Social Problems for an Integrated Disciplinary Teaching*, Integrated Science 8,
https://doi.org/10.1007/978-3-031-08697-7_7

controversial issues through a research project that includes the components of exposure to direct victim testimony and the participants' conducting of interviews with their own family members.

Keywords

Controversial issues · Peace education · Post-conflict societies · Violence · Terrorism · Teacher training

Controversial Issues in Education

For the past several years, a type of citizenship education has been promoted by the European Union (EU) that is based on democratic values and respect for human rights [1]. This is a vision that constitutes a part of educational plans, and is manifest in subjects designed for these purposes. This view of citizenship education is complemented by another conceptualization of the EU, which approaches the matter from a cross-sectional standpoint [2]. Within the Spanish context, and in terms of the history education, the presentation of controversial issues in the classroom is being promoted as a strategy for civic education [3].

One publication of the EU aimed at instructing professors regarding the teaching of controversial issues defines such subject matter as "issues which arouse strong feelings and divide opinion in communities and in society" (p. 2) [2], further characterizing such matters as complex, more or less current, deeply rooted and/or dynamic, and reflected in communications media [4]. For these reasons, such topics constitute a highly useful tool for dealing with conflict as a part of life, and for learning how to engage in democratic debate with persons holding opinions different than one's own [2], in that they require the ability to compare and contrast differing viewpoints [5]. Dealing with controversial topics helps develop critical and analytical thinking through the process of gathering, analyzing, and assessing information from sources, and through recognizing any bias present in such information.

As regards the teaching of Social Sciences, in addition to learning from particular past events in order not to repeat them [6], bringing controversial issues into classrooms allows us to work with students on a number of different things: civic and scientific competence; engendering an understanding of students' lived reality; promoting a critical view of said reality; and allowing the possibility of working on the issue of coexistence based on human rights [7]. In the final analysis, and as Santisteban [8] suggests, working on controversial issues allows teachers to turn Social Science Education into a tool for social change, thus preventing history from going unnoticed during the educational process [9]. We agree with Pinto [10] that, by understanding different perspectives in the approach of source materials, history education may serve to help raise awareness of the effects of human actions; by

analyzing controversial social problems from a standpoint of historical empathy; and by shunning prejudice and simplistic explanations.

However, the complexity, dynamism, and contemporary relevance of these topics all mean that there are going to be a number of challenges involved in bringing them into the classroom. Given that these topics are, in effect, current events, the first such problem is the dearth of teaching materials—and the suitability of those materials that do exist. Similarly, any sources of information that might be available are likely to be biased [11]. However, the primary obstacle to overcome in this regard are the fears of teachers themselves. A number of studies conducted worldwide demonstrate that teachers have avoided dealing with controversial topics for fear of either fomenting conflict in the classroom [12] or of expressing their opinions—in particular those issues involving fundamental human rights violations [13]. Some have contended that, in certain instances, dealing with such matters has proven to be painful on a personal level [14, 15]. As a result, in order to avoid political disputes, there have been occasions when decisions have been made to offer authoritative instruction based on narratives of the past that are biased, and that are not open to question [16]. In addition, as Teeger [17] points out, when an instructor does choose to present the different aspects of a given conflict, it is by no means easy to do this without distorting reality. Another problem that teachers have identified is the fact that, when it comes to longstanding issues of conflict, students enter the classroom with biased histories that they have acquired outside the context of classroom instruction [18]—specifically from their families [14], friends, or communications media [19]. On the other hand, it can also prove complicated to make meaningful progress in cases where students have not previously had access to spaces conducive to taking a stand one way or another as regards a troubled past [20].

All of the aforementioned difficulties clearly point to the need to address these issues in teacher training, as indicated by various researchers [2, 12, 13, 21]. The teaching module promoted by the European Union seeks to ameliorate such problems. In referring to this module, Kerr and Huddleston [2] set forth a number of recommendations with a view to facilitating success in addressing controversial topics in the classroom. These authors identify debate as an indispensable tool in this regard. For proper debate to take place, the authors point to the need to create a trusting environment free of value judgments—an environment in which no one need fear contradicting either the teacher or a classmate. In this respect, Kerr and Huddleston [2] emphasize the importance of behavioral codes and rules. In relation to this latter point, the authors stress the need to offer not only a conceptual framework for the meaning of democracy, but also strategies for sharing different viewpoints through dialogue and an attitude of tolerance. The authors further defend problem-based teaching methods as the proper approach (in this way stripping teachers of their role as "experts") as well as working with sources, and encouraging students to analyze information critically, to identify reporting biases, to differentiate opinions from facts, and to detect emotional language and rumors. Citing Stradling [11], they present four kinds of procedures that can be used for dealing with controversial issues: *distancing* (i.e., presenting subject matter that is

similar, but that has a different spatiotemporal context); *compensatory* (i.e., presenting new information to challenge longstanding arguments based on ignorance); *empathetic* (i.e., showing the perspective of the other, as well as situations involving prejudice and discrimination); and *exploratory* (i.e., introducing activities based on questions in cases where a topic is complex and ill-defined). In addition, and in accordance with the recommendations of Oulton, Dillon and Grace [22], we would include the need to avoid those prejudices resulting from a lack of critical reflection, as well as the challenge of fostering the following qualities among students: the thirst for not only more information, but more diverse information; a willingness to change one's opinion when appropriate; and the avoidance of strategies that lead one to hastily assume a particular viewpoint.

The work that is being done within the institutional and academic context is encouraging an increasing number of teachers to address the difficulties that have previously been mentioned. In this regard, recent years have seen increasing numbers of teachers bringing controversial topics into the classroom, and a good many of these experiences have been evaluated in a positive light. Teacher feedback in this connection has indicated that the treatment of problematic topics has resulted in learning experiences involving subject matter in the social sciences [23, 24], political literacy and critical thinking [8, 23, 25] and, most especially, in the acquisition of democratic and respectful attitudes [24, 26, 27]. To this, it should be added that, in the case of teacher training, the treatment of controversial issues has also facilitated the acquisition of professional abilities [23]. There are also experiences that indicated an improvement in the confidence of all students when it comes to questioning teachers in post-conflict scenarios, as well as increased student interest in politics [28].

Controversial Issues in Post-conflict Societies: The Case of the Basque Country

As Montaño [29] has noted, conflict is inevitable in any situation where humans live together, but it need not be harmful, given that successful resolution of such conflicts as arise can in fact improve coexistence among the parties involved. Therefore, and as indicated by Kerr and Huddleston [2], the role of education becomes important in offering tools for democratically addressing conflict situations. In this regard, the UNICEF publication *The Progress of Nations* has mentioned the impossibility of educational initiatives eliminating all conflicts, while at the same time pointing out that schools can help students to learn that it is both possible and necessary to choose among different ways to react in the face of conflict. This learning—according to the publication—in turn allows students to develop negotiation and resolution skills that enable them to view conflict not as a crisis, but rather as an opportunity for creative change [30]. It is for this reason that the educational treatment of conflict has been trending upwards as a research subject [31], and one that might prove especially useful in post-conflict societies as

a means of facilitating a return to peaceful coexistence. It is in this regard that Corredor, Wills-Obregon, and Asensio [32] conclude that peace education within post-conflict contexts needs to take account of both violent historical events and the suffering of victims.

Nevertheless, as has previously been pointed out, it is by no means easy to deal with controversial subject matter when the conflict in question either still exists, or when it is a recent vivid memory. In the particular case of the Basque Country—which saw high levels of violence beginning in the second half of the twentieth century, as well as a high number of victims [33]—the educational treatment of the problem was not addressed until the early twenty-first century, and the knowledge levels among the region's youth are generally low [34]. An official government publication [35] indicated an interest among students in a systematic treatment of the subject, while students' families demanded that the subject be presented in a non-manipulative way. However, this same report also confirmed the express wish for the educational community to separate political opinions from the educational milieu. In addition, it was noted that the conflict resulted in not only significant suffering, but also in social division—as well as silence on the part of many in the community. Because of their emotional involvement, teachers indicated that they felt neither competent nor secure in dealing with the subject matter, which proved to be a source of frustration, annoyance, and helplessness. Along the lines indicated by Quaynor [12], teachers also expressed their fears that dealing with the subject in the classroom would lead to problems in coexisting. On the other hand, teachers did not see a way to address the subject in the absence of an educational proposal that enjoyed a broad consensus, with some teachers demanding orientation, guidance, and resources from administrators as regards presenting the Basque conflict in school classrooms.

As regards where Basque youth glean their information in relation to the subject, what was found was—as is the case at the international level—communications media and family constitute the main sources. According to results of a study conducted in 2009 [36], it is the family that serves as the primary agent when it comes to explaining the different positions taken by students regarding the subject. In a 2017 investigation, young persons identified communications media as the primary source of information, followed by family, social media, friends, school, and books, with the first three sources accounting for more than 50 percent of all participants in the study [37].

With the passage of time, and the evolving of the situation to one of post-conflict, perceptions of youth have gradually changed. Accordingly, Iraola et al. [38] contend that it is impossible to understand the politicization of Basques aged 25 and above without reference to the Basque conflict. Conversely, for those younger than 25, the Basque conflict is a thing of the past. According to a series of studies that were systematically conducted for the purpose of analyzing the opinions of Basque youth, violence and terrorism were identified as the main problem in the Basque Country in 1999–2000 [39] while, in the last published study in the series [40], these issues are not cited as problems at all. Furthermore, this same final study reports that 70% of youth indicate little or no interest in politics.

Turning to the previous issue of sources of information, a recent study [41] identifies the family as the main source of influence on the political education of youth, and on the construction of young persons' ideologies. Specifically, a distinction is made between politically active persons and those who are farther removed from politics. Within this differentiation, it has been observed that, for the more politically engaged group, political affiliation and memories transmitted within the family home have had an impact on youth. Conversely, families of the group of politically unengaged youth were found to have been silent on the subject.

Public Policies and Treatment of the Conflict in Educational Settings in the Basque Country

Education in human rights enables young persons to acquire greater awareness of their rights and obligations—as well as of the rights of other persons. On the other hand, such education also promotes dialogue and tolerance, values that are essential to the construction of a society based on human rights. For these reasons, it is important that such initiatives be components of education at all levels. Assuring that this happens will require increasing the sensitivity of the entire society with respect to the importance of these values, as well as the encouragement of citizen participation in the resolution of conflicts.

In line with this idea, recent years have seen the Basque Government enact public policies that promote peace education. Such initiatives seem to have arisen from two primary motives: fear that young persons will forget the past, and the desire to promote a climate of coexistence based on respect for memory, victims, and human rights in a post-conflict society. Within this framework, mandatory secondary educational programs for youth aged 12–18 have been instituted. These programs have highlighted the importance of peace education, with a proposal aimed at youth who have not directly experienced the period of violence, and who do not bear the burden of a recent violent past that continues to exercise an influence on various personal, ethical, and political positions of the majority of individuals in Basque society. Another key aspect of this initiative is dialogue that, along with peace education, constitutes a fundamental tool for constructing a society based on justice and respect for human rights.

During the years 2006–2021, nine different initiatives involving education with respect to the politically motivated violence that has taken place in recent years stand out in the Autonomous Community of the Basque Country and the Chartered Community of Navarre (see Fig. 7.1).

These initiatives overwhelmingly involve programs, study units, and didactic activities that, while targeting students in mandatory secondary education programs, have in certain instances also been conducted at the university level (see Table 7.1).

We can see here modules that promote proximity to the victims of human rights violations through work with concepts such as human dignity, empathy, and coexistence (no. 2) [42]. We also see programs that involve the creation of

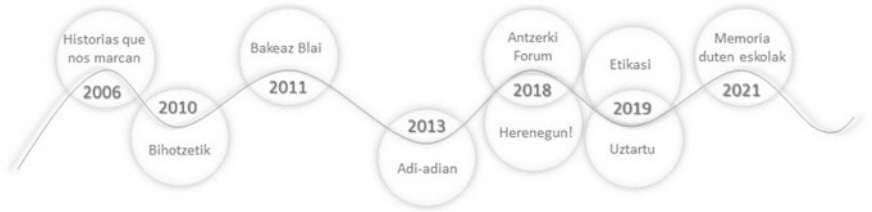


Fig. 7.1 Timeline of educational programs introduced in the Basque Country and Navarre that involve politically motivated violence. Created by authors

Table 7.1 Educational programs in the Basque Country and Navarre concerning politically motivated violence

No.	Name	Territory	Modality
1	Historias que nos marcan	Basque Country	Teacher manual
2	Bihotzetik	Basque Country	Didactic module
3	Bakeaz Blai	Basque Country	Pedagogical program
4	Adi-adian	Basque Country	Educational module
5	Antzerki Forum	Basque Country	Didactic-pedagogical activity
6	Herenegun!	Basque Country	Didactic unit
7	Etikasi	Basque Country	Pedagogical project
8	Uztartu	Basque Country	Preventive project
9	Memoria duten eskolak	Navarre	Educational program

Created by authors

welcoming and empathetic spaces that, availing themselves of the potential of victim-educators to construct peace, make it possible to talk about violence and its consequences in our region (no. 3) [43]. There are, in addition, programs that, through listening to the testimonies of direct victims of conflicts, attempt to contribute to the improvement and consolidation of educational process itself, and that are committed to creating a better society and world in the context of our own reality (no. 4) [44], as well as theatrical representations of the changes that can be made to the currently existing reality (no. 5) [45]. Other programs utilize didactic materials to familiarize secondary students with the recent history of the Basque Country (no. 6) [46], and school trips that have the purpose of learning about local history through visits to places where traumatic events have occurred (no. 7) [47]. Other projects encourage students to detect violent radicalization, and to then deal with such material didactically (no. 8) [48]. There are also programs that bring into the classroom the search for solutions to socially relevant topics through an engagement with recent history and its victims (no. 9) [49]. Finally, there is a teacher manual (no. 1) [50] designed to enable teachers to utilize didactic materials that focus on victims' stories.

We should also note the existence of another kind of resource that complements the work that has been done at the governmental level through proposals aimed at schools. Such is the case of institutions such as the Memorial Center for Victims of Terrorism,[1] and the Gogora Institute for Memory, Coexistence and Human Rights.[2] These entities offer their own educational programs.

Adi-adian and the Coexistence and Memory Project: The Treatment of Violence During the Initial Teacher Training in the University of the Basque Country

As we have reiterated in this paper, a new era began when ETA announced the ceasing of its operations in 2011—an era in which Basque society has embarked upon a new process of reflection. This reflective process involves confronting—on both an individual and collective level—a multi-faceted reality that has many ramifications, which may be ethical, political, and/or emotional in nature. For quite some time now, these ramifications have made it difficult to conduct the kind of calm and introspective analysis of politically motivated violence and terrorism that is needed, and of the implications of that violence for Basque society now and in the future. One of these challenges is the treatment of the past in the classroom—and especially in the education of teachers.

As we have seen, the Basque government's enacting of public policies that promote peace education came to fruition in 2013 with the design and implementation of *Adi-adian*, a program that utilized "educator-victims." *Adi-adian*, through a collaboration with agents, associations, and victims of politically motivated violence and terrorism, brings the testimony of victims into the classrooms of the Basque Country. It is this program that is slated for implementation in primary education teacher training in the Basque Country. Yet, while victim testimony is at the heart of *Adi-adian*, the program also offers support to schools, including the possibility of conducting sensitivity-training workshops and the provision of external staff to help teachers contextualize and make sense of the accounts of victims to an audience of students that generally has scant knowledge of the material being addressed.

In the academic year 2016–17, the Faculty of Education, Philosophy and Anthropology of the University of the Basque Country—within the framework of education concerning controversial issues—took upon itself the challenge of implementing *Adi-adian* in courses leading to the primary education degree. Current plans are for this program to later be included in early childhood education [51] and social education degrees and secondary education master's degree. This will all be done through the Educational Innovation Project (HBP2019-20/1021) of the University, which will also conduct research as to the impact of *Adi-adian* on participating students. As part of this initiative, the University of the Basque Country will promote an active culture in defense of human rights [52].

[1] www.memorialvt.com.
[2] www.gogora.euskadi.eus.

During its first year of implementation, history education was worked on by means of discrete projects. Within this course, and based upon the perspective of work with controversial issues, a decision was made to introduce facets of one of the most important problems facing education in post-violence Basque society: the knowledge of the recent past; a violation of fundamental human rights over the course of more than 50 years; and the role that victims of politically motivated violence and terrorism might play through the testimony they render before the Basque society of the twenty-first century.

Thus, a decision was made to include the *Adi-adian* program as part of the course "Didactics in the Social Sciences I." For this purpose, the project Coexistence and Memory was designed. Based upon the objectives, content, and procedures suitable for the teaching and learning of history, and starting with the premise of an important social problem involving conflict, this project seeks to work on issues such as empathy, change, continuity, temporal phases, important events, life histories, the interview as a method of educational research, the use of sources, the graphic representation of time, and ICTs. It is hoped that all these activities will lead to reflection on the part of future teachers regarding the recent past of the Basque Country, the value of a democratic citizenship, and the role of education in the construction of a more just society.

The design of the Coexistence and Memory project was scheduled to be implemented over the course of 3 weeks and 10 h of classroom instruction, with students successfully completing the project earning one ECTS credit. The project affected four groups of first-year students—a total of 180 students. The structure of *Adi-adian* comprised three phases: an initial phase of sensitivity training, with one two-hour session conducted by the Bakeola Foundation,[3] and the presentation of the testimony of one victim; a second phase involving work, either individually or in pairs, and both in school and at home, regarding the presence of violence in our surroundings; and a third phase involving the presentation of results in poster format, and a debate among all students in the class regarding what had been learned (Table 7.2).

The first work session in the implementation of the project—sensitivity training regarding the subject matter—was conducted by specialists in peace education from the Bakeola Foundation, with the support of the course instructor. In this initial session, conducted in an empty classroom with a total of 45 students, two activities were presented: "Barometer" and "Who is the enemy?" In "Barometer," through a series of questions that challenge attitudes toward a series of strongly worded statements in some way related to the conflict (e.g., "We must be tolerant toward everyone, except those who are not tolerant."; "Certain behavior is unforgivable.") students are encouraged to take an initial position either in favor of or against each statement, and are subsequently allowed to take more intermediate positions as the discussion proceeds. This is a dynamic and participatory activity in which students are encouraged to defend their positions. In the second activity, "Who is the

[3] https://edefundazioa.org/que-hacemos-lineas-de-trabajo/ede-intervencion-social/diversidad-convivencia-y-ddhh/bakeola/.

Table 7.2 Tasks and participants in the Coexistence and Memory project (2016–17)

Phase	1.1	1.2	2.1	2.2	2.3	3
Activity	Sensitivity training workshop	Testimony	What happened in my town?	Could you please tell me?	Timelines	Poster fair
Duration	2 h	2 h	2 h	Undefined	2 h	2 h
Guide	Bakeola Foundation	Victim of violence	Teacher	Family members aged 45 or above	Teachers	Everyone
Task	Active participation in workshops	Attendance and question–answer session	Table of events	Interview	Timelines	Poster

Created by authors

enemy", students sit in an oval circle, and numerous photographs of persons and attitudes representing different groups in our society are placed in the center of the circle. Students were asked to get up, walk around, choose a person who they think of as an enemy, and pick up a photograph of that person. Once they have sat down again, they are asked to reflect on the choices they made—and on hate, prejudice, and ignorance of the other. Then they are given the opportunity to recognize positive things about this "other."

The second and final session of the first phase involved students listening to the in-person testimony of a victim of politically motivated violence and/or terrorism. This testimony is presented in accordance with the requirements of the *Adi-adian* program and the Coexistence and Memory project. Given the existence of two testimonies and four class groups, the decision was made to include groups from different instructors in a single session. In this way, each of the victims gave their testimony to a mixed group that would in turn—through personal relationships and work in the larger group—be able to share impressions regarding the two testimonies given. Arranging things in this way—within a larger society in which the theory of two kinds of violence is highly regarded, seemed especially important to us in order to really get to the heart of the testimony, regardless of who the perpetrator was. This turned the victim into an actor who delegitimized violence, while fostering empathy toward the victim and their family members in the face of the violence that they had suffered. The spacious classroom was emptied out, and chairs were arranged in an oval configuration. The victim providing testimony was at one end of the oval. The quality of the victims' testimony, and its depth and ethical example acted as an incentive, and constituted the culminating moment of the project.

After this, the phase of actual academic work on the part of the students began. This work was organized into three class sessions of two hours each, plus individual and group work between the classroom sessions, which was to be done outside of class. The first session was devoted to conducting research work in a newspaper

archive in pairs. The purpose of this exercise was to identify ten important events involving the violation of human rights in the Basque Country during the period 1950–2017. In order to stress the extent of the problem, and how close it was to home, at least five of the events identified had to have occurred within the municipality of one of the paired students. In addition, for the purpose of offering grounds for hope, students were asked to identify two positive events (e.g., acts of homage or remembrance, plaques, etc.) related to the violation of human rights. For this purpose, they used their own devices, and filled in a table that included a brief description of the event chosen, a spatio-temporal representation of said event (i.e., date and place of occurrence), and a reference to the source of the information obtained.

As a complement to this first session, and in line with the work on relevant problems, students were asked to repeat this task at home. In this case, the source for collecting information to fill in the table had to be an anonymous interview with a person over the age of 45 (i.e., born prior to 1973). The idea here was to take the work involving a controversial topic into the home, and thus create spaces of interchange between students and their families regarding a topic that in many instances had seldom or never been dealt with, and that was problematic in nature. In order to minimize tensions, although it was recommended that each member of the student pairs do an interview and complete the table, only one table needed to be turned in. Thus, if it turned out that one of the students was not able to overcome a family member's resistance, or in the case of ignorance of the events, the project would not be affected. In this exercise, the table of information would have to include the spatio-temporal dimensions of the informant themselves. This also made it possible to add a new source of information (i.e., memory) and enabled an evaluation of information provided by our elders.

The third and final session of the second phase focused on the creation of timelines. Each of the student pairs was required to present one timeline of the events chosen in the previous session, and another timeline reflecting the interview that they had conducted. Afterward, on the basis of geographical distribution and where each of the students fell on the rural–urban continuum, groups of six students were created. With their six timelines, each of these newly formed groups had then to create a scaled poster that included approximately 20 of the events previously described by students and informants. Students then were asked to discuss and reflect in their groups upon what they learned from the superimposed timelines, and the reality that they reflected.

The venue for the third phase of *Adi-adian* was a poster fair in the final session. For this poster fair, each one of the groups (which had created digitalized versions of their timelines) had to add graphic materials to these timelines that included elements that would constitute a reminder of the different victims of violence and terrorism that existed in their municipality. This task required students to search in their immediate surroundings for memories of, and acts of homage to victims of human rights violations. In addition to this, students were to add their own individual reflections, fragments of testimony, and as many other things as they wanted, all within a format that allowed for the presentation of the posters in class—not in

the usual kind of poster exhibition, but rather as part of an exchange among the small groups that included direct conversation among students. Proceeding in this way enabled students to communicate with one another and internalize the objective of collecting different kinds of testimony, something that reflected a complex society in which events—and the reading of those events—could vary in ways that depended on the immediate surroundings in which persons happen to find themselves.

Conclusion

Participation in the sensitivity training workshops led us to appreciate the difficulty of the subject matter, as well as of the discomfort that it generates. On the other hand, these workshops also showed us that the help of qualified professionals and educators as regards issues involving conflict management and peace education is of inestimable value in approaching such issues properly. This experience also helped assuage the fears of teachers who participated in the project. These teachers clearly noticed the generational gap between themselves and their students who were born at the turn of the twenty-first century, and who had not actually lived through the events in all of their ugliness. Interestingly, it was the teachers who had the most reservations about dealing with subject matter that they were convinced was important, and that needed to be addressed in the classroom.

The testimony of victims—to whom we are grateful for their generosity—proved to be powerful tool for generating empathy and attracting attention, while also serving as a source of content as well as a kind of "search engine" for the introspection that was needed to analyze facts that, while part of the past, can still be said to be "floating" in the environment of the present. Victims serve as an example, and their ethical testimony was evaluated very positively by the students, who participated in the always-difficult question-and-answer session to a much greater degree than had been expected. What was especially striking was the participation of students who made statements on the basis of ideological positions that were distant from those of the victims, but who were grateful to these victims for having provided testimony that was solid and honest, and that did not bear the least hint of hatred.

As regards the actual academic work of the Coexistence and Memory project, our first impression was that there was high degree of ignorance and that, in certain cases, students' knowledge about what had happened in their own towns was disheartening (e.g., "Nothing happened in my town."). However, the creation of the tables and the timelines, and the closeness to home of the events in question—all of which was buttressed by the testimony that was given—succeeded in providing an incentive for students' research regarding a subject matter that, as we've indicated, they did not know much about.

In pursuing our objective of taking this work on important problems out of the school and bringing it into students' homes through the compilation of ethnographic testimonies within familiar environments, we attained very positive results. Despite our initial fears, these interviews (save in rare cases that often were due to ignorance because the persons in question were not native to the Basque region) did not prove to be a problem and, in many instances actually served as a breath of fresh air, and as an opportunity for families to share memories or experiences that had previously been more or less stifled.

Finally, the presentation session enabled us to visualize the tragedy involved as regards the subject matter under consideration: the numbers of people effected, the extent to which the problem hits home, and the different points of view and approaches to the problem. All of this enables students to understand the complexity of these kinds of historical events.

From an educational standpoint, the results of this study show the potential of controversial issues to generate controversy, research, and reflection on teacher training. Following the sessions, attendees came to realize that engaging with a particular conflict allows one to understand any other conflict. This is something that proved especially useful in the training of future teachers, who will constantly have to deal with conflicts. Similarly, it was also observed that there is to some extent a need to show objective data regarding what has happened—data that support the more subjective testimonies that have been provided.

References

1. Eurydice (2012) La educación para la ciudadanía en Europa. Ministerio De Educación, Cultura y Deporte, España
2. Kerr D, Huddleston T (2015) Vivir con la controversia: Cómo enseñar temas controvertidos mediante la Educación para la ciudadanía y los derechos humanos (EDC/HRE). Módulo de formación para el profesorado. European Union. https://www.gcedclearinghouse.org/es/resources/vivir-con-la-controversia-c%C3%B3mo-ense%C3%B1ar-temas-controvertidos-mediante-la-educaci%C3%B3n-para-la?language=ar
3. Moreno JR, Monteagudo J (2019) Temas controvertidos en el aula. Editum, Murcia
4. Pagès J, Santisteban A (Coords.) (2012) Les qüestions socialement vives l'ensenyament de les ciències socials. Servei de Publicacions de la Universitat Autònoma de Barcelona, Barcelona. Col. Documents, 97
5. Goldberg T, Savenije GM (2018) Teaching controversial historical issues. In: Metzger SA, Harris LM (eds) The Wiley international handbook of history teaching and learning. Wiley Blackwell, pp 503–526
6. Cuesta R (2011) Historia con memoria y didáctica crítica. Conciencia social: Anuario de didáctica de la Geografía, la Historia y las Ciencias Sociales 15:15–30
7. López-Facal R, Santidrián VM (2011) Los «conflictos sociales candentes» en el aula. Iber: Didáctica de las ciencias sociales, geografía e historia 69:8–20
8. Santisteban A (2019) La enseñanza de las Ciencias Sociales a partir de problemas sociales o temas controvertidos: estado de la cuestión y resultados de una investigación. El Futuro del Pasado 10:57–79. https://doi.org/10.14516/fdp.2019.010.001.002

9. Arias L, Egea A, Sánchez-Ibáñez R, Domínguez J, García-Crespo FJ, Miralles P (2019) Forgotten history or history not taught? The students of Spanish High School and their lack of knowledge about the Civil War. Revista Complutense de Educación 30(2):461–478. https://doi.org/10.5209/RCED.57625
10. Pinto H (2019) Refletindo sobre questões controversas no ensino de História. In: Moreno JR, Monteagudo J (eds) Temas controvertidos en el aula. Enseñar historia en la era de la posverdad. Editum, Murcia, pp 451–454
11. Stradling R (1984) The teaching of controversial issues: an evaluation. Educ Rev 36(2): 121–129
12. Quaynor LJ (2011) Citizenship education in post-conflict contexts: a review of the literature. Educ Citizensh Soc Just 7(1):33–57. https://doi.org/10.1177/1746197911432593
13. Toledo MI, Magendzo A, Gutiérrez V, Iglesias R, López R (2015) Enseñanza de "temas controversiales" en el curso de historia, desde la perspectiva de los estudiantes chilenos. Revista de estudios sociales 52:119–133. https://doi.org/10.7440/res52.2015.08
14. Vidal de Almeida D (2019) O legado dos Passados Dolorosos: como são ensinados os The Troubles aos jovens, na Irlanda do Norte? (Tesis doctoral). Universidade do Porto
15. Zembylas M, Charalambous P, Charalambous C (2011) Teachers' emerging stances and repertoires towards reconciliation: potential and challenges in Greek-Cypriot education. J Peace Educ 8(1):19–36. https://doi.org/10.1080/17400201.2011.553378
16. Skårås M, Breidlid A (2016) Teaching the violent past in secondary schools in newly independent South Sudan. Educ Change 20(3):98–118
17. Teeger C (2015) "Both sides of the story" history education in post-apartheid South Africa. Am Sociol Rev 80(6):1175–1200. https://doi.org/10.1177/0003122415613078
18. Barton KC, McCully AW (2005) History, identity, and the school curriculum in Northern Ireland: an empirical study of secondary students' ideas and perspectives. J Curric Stud 37 (1):85–116. https://doi.org/10.1080/0022027032000266070
19. Reidy CM, Taylor LK, Merrilees CE, Ajduković D, Biruški DČ, Cummings EM (2015) The political socialization of youth in a post-conflict community. Int J Intercult Relat 45:11–23. https://doi.org/10.1016/j.ijintrel.2014.12.005
20. Reyes MJ, Cruz MA, Aguirre FJ (2016) Los lugares de memoria y las nuevas generaciones: algunos efectos políticos de la transmisión de memorias del pasado reciente de Chile. Revista Española de Ciencia Política 41:93–114. https://doi.org/10.21308/recp.41.04
21. Felices MM, Chaparro A (2019) Concepciones del profesorado en formación sobre temas controvertidos. ETA como contenido histórico. en Hortas MJ, Diaz A, De Alba N, Enseñar y aprender didáctica de las ciencias sociales: la formación del profesorado desde una perspectiva sociocrítica. Ediciones Escola Superior de Educação, Instituto Politécnico de Lisboa, Lisboa; AUPDCS, pp 476–483
22. Oulton C, Dillon J, Grace MM (2004) Reconceptualizing the teaching of controversial issues. Int J Sci Educ 26(4):411–423. https://doi.org/10.1080/0950069032000072746
23. Jiménez MD, Felices M del M (2018) Cuestiones socialmente vivas en la formación inicial del profesorado: la infancia refugiada siria como problemática. REIDICS. Revista De Investigación En Didáctica De Las Ciencias Sociales 3:87–102. https://doi.org/10.17398/2531-0968.03.87
24. Montanares E (2017) ¿Cuánto sabemos de la historia reciente? Iber: Didáctica De Las Ciencias Sociales Geografía e Historia 88:34–39
25. Jerome L, Elwick A (2018) Identifying an educational response to the prevent policy: student perspectives on learning about terrorism, extremism and radicalisation. Br J Educ Stud. https://doi.org/10.1080/00071005.2017.1415295
26. Espinosa A, Cueto RM, Páez D (2019) Reflecting upon the years of political violence in Peru: an experimental study to promote a culture of peace in higher education. J Prev Interv Commun. https://doi.org/10.1080/10852352.2019.1664710

27. Finkel SE, Ernst HR (2005) Civic education in post-apartheid South Africa: alternative paths to the development of political knowledge and democratic values. Polit Psychol 26(3): 333–364
28. Quaynor L (2014) I do not have the means to speak: educating youth for citizenship in post-conflict Liberia. J Peace Educ. https://doi.org/10.1080/17400201.2014.931277
29. Montaño E (2020) El conflicto escolar: una oportunidad para construir relaciones de convivencia con estudiantes de básica primaria. Revista Sci 5(16):62–81, 2542–2987. https://doi.org/10.29394/Scientific.issn.2542-2987.2020.5.16.3.62-81
30. UNICEF (1999) El progreso de las naciones. Unicef, Madrid
31. Vicent N, Castrillo J, Ibañez-Etxeberria A, Albas L (2020) Conflictos armados y su tratamiento en educación. Análisis de la producción científica de los últimos 25 años en la Web of Science. Panta Rei. Revista digital de Historia y Didáctica de la Historia 14(2):55–91. https://doi.org/10.6018/pantarei.445721
32. Corredor J, Wills-Obregon ME, Asensio M (2018) Historical memory education for peace and justice: definition of a field. J Peace Educ 15(2):169–190. https://doi.org/10.1080/17400201.2018.1463208
33. Carmena M, Landa JM, Múgica R, Uriarte JM (2013) Informe-base de vulneraciones de derechos humanos en el caso vasco (1960–2013). Secretaria de Paz y Convivencia (Gobierno Vasco), Vitoria-Gasteiz
34. Vicent N, Albas L, Gillate I, Ibañez-Etxeberria A (2021) What do our future teachers think about terrorism and politically motivated violence in the Basque Country? Humanit Soc Sci Commun 8(1):1–11. https://doi.org/10.1057/s41599-021-00721-0
35. Gobierno Vasco (2004) Educación para la convivencia y la paz en los centros escolares de la CAPV. Gobierno Vasco, Vitoria-Gasteiz. https://www.euskadi.eus/gobierno-vasco/-/libro/bizikidetza-eta-bakearen-aldeko-heziketa-eaeko-ikastetxeetan-educacion-para-la-convivencia-y-la-paz-en-los-centros-escolares-de-la-capv/
36. Elzo J, Barrutia A, Ibáñez M, Laespada T, Leonardo J (2009) La transmisión de valores a menores. Araarteko, Vitoria–Gasteiz. https://www.ararteko.eus/contenedor.jsp?contenido=4773&layout=s_p_9_final_Principal_Listado.jsp&tipo=8&seccion=s_fnot_d4_v1.jsp&nivel=1400&language=es
37. Usón I (2017) Terrorismo y vulneraciones de Derechos Humanos de motivación política en el caso vasco: estudio exploratorio sobre los conocimientos y la valoración ética de la juventud universitaria vasca. Deusto Journal of Human Rights 2:121–148. https://doi.org/10.18543/djhr-2-2017pp121-148
38. Iraola I, Epelde M, Odriozola O (2020) ¿Cómo nos politizamos? Visiones de los y las jóvenes politizadas vascas. En Álvarez-Benavides A, Fernández-Trujillo Moares F, Sribman Mittelman A, Castillo Patton AE (eds) Acción colectiva, movilización y resistencias en el siglo XXI: Volumen 3: Estudios de caso. Betiko Fundazioa, Abadiño, pp 95–108
39. Gobierno Vasco (2001) *Retratos de juventud 1999–2000.* https://www.euskadi.eus/retratos-de-juventud/web01-s1lehike/es/
40. Gobierno Vasco (2018) Retratos de juventud 2017. https://www.euskadi.eus/retratos-de-juventud/web01-s1lehike/es/
41. Larrinaga A, Zabalo J, Epelde M, Iraola I, Odriozola O, Amurrio M (2020) Parte hartu ala paso egin? Gazteen ikasketa politikoak aztergai. Parte Hartuz Ikerketa Taldea (UPV/EHU). https://www.ehu.eus/es/web/partehartuz/interesgarria
42. Baketik (2016) Módulo didáctico Bihotzetik: Propuesta para la solidaridad en la escuela con las víctimas de violaciones de derechos humanos en el caso vasco. Baketik, Tolosa
43. Ruiz G, Salazar R (2014) Bakeaz Blai: Programa Pedagógico con Víctimas Educadoras. Oñati Socio-Legal Ser [online] 4(3):525–549. Available from: http://ssrn.com/abstract=2368140
44. Gobierno Vasco (2013) Módulo educativo Adi-Adian: Aprendizajes de dignidad humana, convivencia y empatía mediante una experiencia de escucha de testimonios de víctimas. Gobierno Vasco, Vitoria-Gasteiz

45. Baketik (2018) Antzerki Foruma: 2018–19 egitasmoa eskolan balio etikoak bultzatzeko. Baketik, Tolosa
46. Gobierno Vasco (2013) Herenegun! Unitate didaktikoa. Gobierno Vasco, Vitoria-Gasteiz
47. Consejo de la Juventud de Euskadi (2019) Programa Etikasi. EGK, Bilbao
48. Gobierno Vasco (2019) Uztartu: Programa socioeducativo para la prevención de la radicalización violenta. Gobierno Vasco, Vitoria-Gasteiz
49. Gobierno de Navarra (2021) Memoria duten eskolak Programa. Gobierno de Navarra, Pamplona
50. Harillo S, Prieto J, Ugarte J (2006) Historias que nos marcan: las víctimas del terrorismo en la Educación para la Paz: guía didáctica para Educación Secundaria. Gobierno Vasco, Vitoria-Gasteiz
51. Aranguren O, Ibañez-Etxeberria A (2020) Euskal kasuari lotutako motibazio politikoko indarkeriaren trataera Hezkuntzan: Adi-Adian Hezkuntza Modulua Haur Hezkuntza Graduko irakaslegaiengan. In: Gamito Gómez R, Martínez Abajo J, Vizcarra Morales MT (eds) XXVI Jornadas de Investigación en Psicodidáctica. Universidad del País Vasco, Leioa, pp 219–231
52. Albas L, Ibañez-Etxeberria A, Echeberria B, Vicent N (2021) El tratamiento de la violencia en las aulas en el País Vasco. Análisis exploratorio de la implementación del módulo educativo Adi-adian en la formación inicial del profesorado de Educación Infantil. In: de Alba N, XXXI Simposio internacional de didáctica de las ciencias sociales. Repensar el currículum de ciencias sociales: prácticas educativas para una ciudadanía crítica [Simposio]. Asociación Universitaria de Profesorado de Didáctica en las Ciencias Sociales, Valencia, España

Alex Ibáñez-Etxeberria Degree in Geography and History and doctor in Educational Sciences, he is a Full Professor of Social Sciences Didactics at the University of the Basque Country (UPV-EHU). Specialist in Heritage Education, has directed 11 doctoral theses in this field. He is a member of the research group GIPyPAC of the UPV-EHU, where he coordinates the line of education, and is also Principal Investigator of Red14: Research Network in the Teaching of Social Sciences, which coordinates the research of 10 groups in the area of history teaching from 9 Spanish universities. He has done research and teaching stays at the Autonomous University of Madrid, Bologna, Porto, Valladolid, Autonomous of Yucatan and UNAE-Ecuador. He is a member of OEPE, Heritage Education Observatory of Spain.

Leire Albás Graduate in Primary Education with mention in Educational Innovation Projects by the University of the Basque Country (2018), postgraduate in Psychodidactics: Educational Psychology and Specific Didactics by the University of the Basque Country (2019) and currently doctoral candidate in Psychodidactics: Educational Psychology and Specific Didactics at the University of the Basque Country. Participant of the Educational Innovation Project (PIE) "Memory and coexistence. The treatment of politically motivated violence in the classrooms of the Basque Country. Analysis of the implementation and proposals for adaptation of the Adi-adian module in the Social Sciences subjects of initial teacher training" (HBP2019-20/102), where she is carrying out her thesis project, evaluating the Adi-adian educational program. In addition, she is part of the project "Learning models in digital environments of heritage education" (PID2019-106539RB-I00) and of the research group "Red 14: Research network in social sciences teaching" (RED2018-102336-T).

Sara Gaskue Graduate in Primary Education with mention in Educational Innovation Projects by the University of the Basque Country (2019) and postgraduate in Psychodidactics: Educational Psychology and Specific Didactics by the University of the Basque Country (2020), she is a contracted research staff (PIC) attached to the Department of Didactics of Mathematics, Experimental and Social Sciences of the University of the Basque Country (UPV/EHU). She is part of the research group "Red 14: Research network in social sciences teaching" (RED2018-102336-T) as responsible for the management and implementation of the "Adi-adian

Educational Module: learning about human dignity, coexistence and empathy through an experience of listening to victims' testimonies" promoted by the Basque Government.

Naiara Vicent Professor of the Department of Didactics of Mathematics, Experimental and Social Sciences at the University of the Basque Country (UPV/EHU), graduated in History by the University of the Basque Country (2000), postgraduate in Museums and Education (2003) and Archaeology (2004) by the University of Barcelona and doctor in Psychological Development, Learning and Education by the Autonomous University of Madrid (2013). Her work experience has been linked in parallel to the field of archaeology/heritage and education, participating in several projects related to the didactics of history, archaeology and heritage. In this facet highlights her stage as an educator at the Museum of Art and History of Zarautz, where she carries out her doctoral thesis project (2013), evaluating a heritage education program that makes use of mobile technology. She is a member of the Research Group on Heritage and Cultural Landscapes (GIPyPAC); Red 14: Research Network in Social Sciences Education; Observatory of Heritage Education in Spain (OEPE); and International Network of Heritage Education (RIEP). Her scientific production includes her participation in several competitive research projects and international conferences, as well as the publication of several articles in indexed journals, especially those included in WOS and Scopus.

8 History Education and Democratic Memory. An Analysis of the Opinions of Social Sciences Teachers in Initial Training

Cosme J. Gómez Carrasco, Jairo Rodríguez-Medina, and Ramón López-Facal

Abstract

It is of great importance to study in depth the determining factors which enable or hinder the study of controversial issues in the classroom. Against this background, along with the bibliographic review of the treatment of conflictive issues in the teaching of history, an investigation was proposed with the main objective of analysing the opinions and perceptions of teachers undergoing their initial training regarding addressing controversial issues in the primary classroom. 659 students (395 women [70%] and 170 men [30%]), studying undergraduate primary education degrees at seven Spanish universities. An ad hoc questionnaire was designed consisting of 15 items, of which 3 were control questions. The political stance of the participants was a determining factor in the results. The differences between universities respond to the different political positions of those surveyed and the difference according to sex also responds to differences in political stances.

Keywords

Controversial issues · History education · Primary education · Teacher training · Democratic memory

C. J. Gómez Carrasco (✉)
University of Murcia, Murcia, Spain
e-mail: cjgomez@um.es

J. Rodríguez-Medina
University of Valladolid, Valladolid, Spain

R. López-Facal
University of Santiago de Compostela, Santiago de Compostela, Spain

D. Ortega-Sánchez (ed.), *Controversial Issues and Social Problems for an Integrated Disciplinary Teaching*, Integrated Science 8,
https://doi.org/10.1007/978-3-031-08697-7_8

Introduction

Teaching and learning practices often branded as traditional have a lingering presence in History classes: teaching which gives priority to the presentation of historical contents by the teacher and assessment methods based on memorisation [1–3]. In addition, the historical knowledge transmitted in the classroom has commonly been based on the narratives of nation building and on discourse which tends to exclude alternative narratives of the past [4, 5].

For several decades, studies in the field of history education have sought to reinvent teaching models, whilst placing more emphasis on the transformation of epistemological conceptions of history. The studies by Monte-Sano [6], Ledman [7], Lesh [8], Reisman [9], Van Boxtel and Van Drie [10] and Wineburg [11] are concerned with historical thinking, historical literacy and the use of primary sources in the classroom. From a different approach, the work of Carretero and Van Alphen [12], Grever et al. [13], López et al. [14], Rüsen [15] and Wilschut [16] has focused on issues of historical consciousness, identity and the study of different memories of the past in the classroom.

Recent monographs on history education have shown a significant increase in research being carried out, particularly on a change in the conceptual model of teaching [17–20]. Particularly worthy of note is the research being carried out in the Netherlands, which emphasises evaluative research focused on teaching practice, in which the aim is for students to understand the nature of historical knowledge and its construction [21–23].

However, it is becoming increasingly clearer that progress should be made beyond epistemological issues and a deeper understanding of public history, the processes of identity related with the past and the reception of narratives on the part of students are necessary [24]. It is not only a question of students acquiring skills on how knowledge of the past is built, but teachers must also be able to make their students reflect on the construction of this historical discourse beyond the academic sphere and on why and to what end they should learn history [25]. This approach should combine civic education, historical consciousness and the introduction of burning social issues along the lines of Rüsen's (among others) proposal [15]. This model focuses more on social practice than on individual cognitive processes and has been defined by Barton and Levstik [26] as a socio-cultural perspective of history education. To carry it out, it is not only necessary to handle and interpret sources, but students should be given a voice in debates on issues about the past, criticism, reflection and debate should be encouraged and controversial issues should not be avoided [27]. The research carried out shows a significant change in the conceptions of history of students when critical perspectives are introduced via research strategies [28–30].

Research on the use of conflictive issues in the classroom has increased from the beginning of the twenty-first century. In order to measure this growth, a search was carried out on the databases of the Web of Science: Social Science Citation Index (SSCI), Science Citation Index Expanded (SCI) and Emerging Sources Citation

Index (ESCI). Systematic searches have been made of the titles and abstracts of articles with the keywords "Controversial issues", "History" and "Education". As can be observed in Table 8.1 and Fig. 8.1, the increase in the number of articles on this issue has been significant in the last five years. Academic production from 2000 to 2009 was extremely low (between 1 and 3 articles per year). A second phase, between 2010 and 2017 showed an annual production of between 6 and 10 articles, with the exception of 2014 (3 articles). From 2017 onwards, there has been a phase of continuous growth, with between 13 and 23 articles being published per year.

50% of the academic production is concentrated in three countries: USA (40 articles), Spain (21 articles) and England (16 articles). Russia and Germany also muster a significant number of publications (12 and 9 respectively) and Brazil, Australia, Israel, China and South Africa each contribute between 5 and 6 articles to the sample (Fig. 8.2). No journal stands out above the others as having published a very high number of academic studies specifically on these issues. The journals with most publications are "Journal of Curriculum Studies" and "Paedagogica Historica", with six each (Table 8.2).

The Jewish Holocaust during the Second World War [31] and the way minorities are treated in the teaching of history [32] are the contents most commonly studied by researchers. Another key topic is the use of traumatic memories of the past. In this regard, studies such as those by Najbert [33] in the Czech Republic and Gerber and Van Landingham [34] in Russia demonstrate the difficulties of working with traumatic memories of contemporary events related with ethnic cleansing, torture and other forms of political violence.

It is of great importance to study in depth the determining factors which enable or hinder the study of these controversial issues in the classroom. Studies such as that by Savenije et al. [35] have explored these elements, comparing certain European countries and Israel. Among these determining factors, these authors point out teachers' conceptions of identity and the nature of their historical knowledge, along with the local context and the characteristics of the national

Table 8.1 Evolution of the frequency of publications between 2000 and 2021

Year of publication	Record count	Year of publication	Record count
2000	1	2012	10
2001	1	2013	6
2003	1	2014	3
2004	1	2015	7
2005	1	2016	7
2006	1	2017	16
2007	2	2018	13
2008	4	2019	23
2009	3	2020	19
2010	7	2021	23
2011	7		

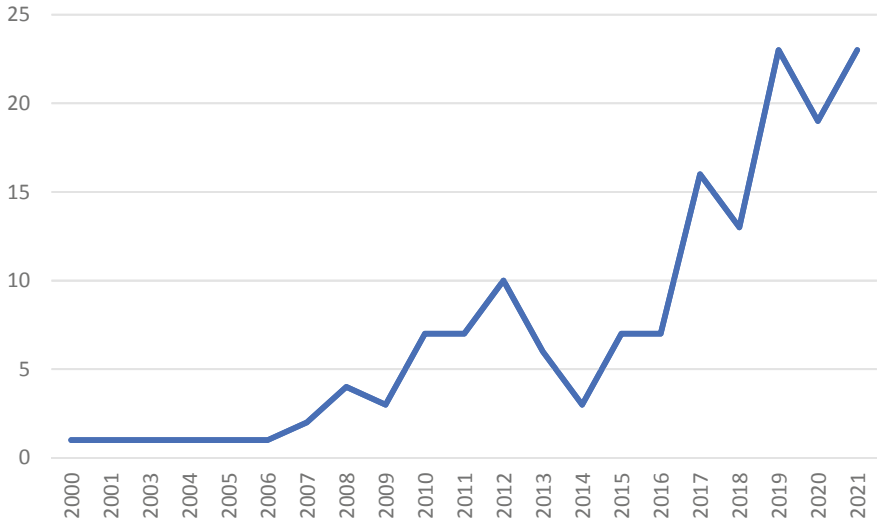


Fig. 8.1 Evolution of the frequency of publications between 2000 and 2021

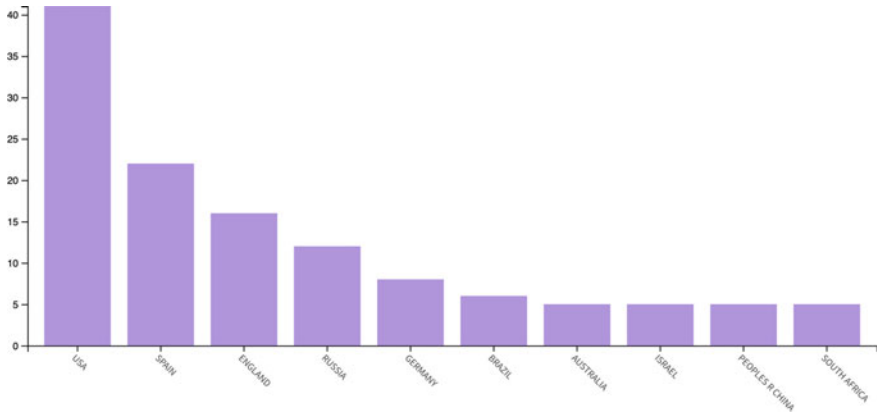


Fig. 8.2 Production according to country

Table 8.2 Frequency of publications per journal

Journal	Frequency
Journal of curriculum studies	6
Paedagogica Historica	6
Science education	4
British journal for the history of science	3
Russian historical journal Bylye Gody	3
Educational philosophy and theory	3
Oxford review of education	3

curriculum of each country. Teachers' conceptions of history and how they perceive the relationships with their students' families play a fundamental role, as Wooley [36] has pointed out in the case of United Kingdom. In South Korea, Misco [37] has demonstrated that students' fear of not finding the correct answer to problems posed in the classroom also has an impact. This is due to the fact that they are accustomed to more mechanical tasks found in textbooks. Faced with this reticence on the part of their students, teachers prefer to avoid proposing the study of conflictive issues [3]. The model put forward by Kelly [38] regarding the four teaching approaches for addressing controversial issues in the classroom is still fully in force. The *exclusive neutrality* of those who avoid discussion in the classroom because they consider that the teacher should be neutral and should avoid influencing his/her students is still an extremely generalised phenomenon [39].

In Spain, one of the burning issues around which most debates are proposed in the teaching of history concerns the Civil War and the period of Francoist dictatorship. The Historical Memory Law of 2007 has led to the controversial issues of this period being identified as "historical memory", and more recently "democratic memory". Recent studies, such as those by Sáez-Rosenkranz and Prats [40] and that carried out by the CIVES Foundation [41] have analysed the presence of these issues and how they are addressed in History classes. There has been a lack of focus on these topics in curriculums and textbooks and, when they do appear, they are usually presented from an apparently objectivist perspective [42, 43]. The article of Martínez-Rodríguez et al. [44], has also revealed the reticence of teachers to deal with these controversial issues in the classroom. However, the evaluation of interventions in the classroom demonstrates a clear improvement among students [30].

Methodology

The present study

In the cabinet meeting of the Spanish Government in July 2021, the Ministry of the Presidency, Relations with the Cortes and Democratic Memory presented the Draft Bill on Democratic Memory. This bill, in addition to establishing the regulatory bases for the recognition of the victims of the coup d'état of 18 July 1936, established that these topics should be present in school curriculums and in informal education via the so-called "places of memory". Against this background, along with the bibliographic review of the treatment of conflictive issues in the teaching of history, an investigation was proposed with the main objective of analysing the opinions and perceptions of teachers undergoing their initial training regarding addressing controversial issues in the primary classroom. This main objective is divided into four specific objectives:

1. To describe the opinions of teachers in initial training regarding the Draft Bill on Democratic Memory passed in the cabinet meeting of July 2021.

2. To analyse the degree of agreement of pre-service teachers with the opinions of the main political parties in Spain with regard to the Draft Bill on Democratic Memory passed in the cabinet meeting of July 2021.
3. To define the position of teachers in initial training regarding the role of teachers in addressing controversial issues based on Kelly's proposal [38].
4. To analyse the variables which influence the position of the pre-service teachers regarding the role of teachers in addressing controversial issues.

Participants

659 students (395 women [70%] and 170 men [30%]), studying undergraduate primary education degrees at seven Spanish universities (97 from the University of Almería [14%], 16 from the University of Castilla-La Mancha [2.4%], 33 from the University of Córdoba [5%], 218 from the University of Murcia [33.2%], 102 from the University of Santiago de Compostela [15.5%], 148 from the University of Valencia [22.6%], and 42 from the University of Valladolid [6.4%]) took part in the study. Figure 8.3 shows the distribution of the participants according to sex and university of origin.

Procedure

Contact was established with the lecturers responsible for the subjects of the teaching of the social sciences of the seven universities in order to request their participation in the study. Later, they invited their students to collaborate after providing their informed consent.

Instrument

An ad hoc questionnaire was designed consisting of 15 items, of which 3 were control questions (leading article, university and sex) while the rest (12 items) aimed to evaluate the students' opinions regarding the Democratic Memory Law, according to aspects relating to its timeliness, appropriateness and relevance (section 1, items 1–4), their degree of agreement/disagreement with the opinions of different political leaders concerning the Law (section 2, items 5–8) and their position with regard to its application in the primary classroom (section 3, items 9–12) (Table 8.3). The items from section 3 are based on Kelly's proposal [38]:

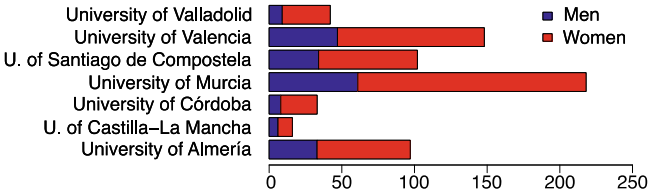


Fig. 8.3 Distribution of the participants according to sex and university of origin

exclusive neutrality (item 9); committed impartiality (item 10); exclusive partiality (item 11); and neutral impartiality (item 12).

All of the items were answered on a 4-point scale of agreement (1: Strongly disagree—4: Strongly agree). The reliability of the tool was calculated via the Ordinal Alpha [45] $\alpha = 0.85$ and McDonald's Omega [46, 47] $\omega = 0.85$, with both values being considered good.

Between sections 2 and 3, students were asked to read a leading article from a national newspaper regarding the Draft Bill on Democratic Memory as a control item. At random, half of those surveyed read a leading article from *El País*, which was in favour of the Draft Bill, whereas the other half of the participants read a leading article from *ABC*, which was against this Law. After reading the article and before responding to section 3, the students were asked to put themselves in the position of a teacher in the last year of primary education.

Results

First of all, the descriptive analysis (frequencies and percentages) are presented in accordance with the control variables (leading article, university and sex). Subsequently, the relationships between the control variables and the items are analysed and, lastly, an explanatory model of the willingness to address topics relating to democratic memory in the classroom is tested in accordance with the opinions with regard to the Law and the declarations of the political leaders.

Figure 8.4 shows the percentages of the responses in each of the categories in the items. As far as the students' opinion with regard to the Democratic Memory Law is concerned, Fig. 8.4 shows that more than 80% of the participants agreed or strongly agreed on the fact that the time was right to pass the Law (i1 = 82%); on the definition and recognition of the victims in the Draft Law (i2 = 90%); on the Law introducing topics relating to repression and the Franco regime in formal education (i3 = 91%); and on the abolishment of foundations which exalt Francoism (i4 = 87%).

With regard to the students' degree of agreement with the opinions of different political leaders (section 2), around 75% disagreed or strongly disagreed with the leader of VOX (i5); and 75% with the representative of the People's Party (i6). However, 84% agreed or strongly agreed with the representative of the PSOE (i7); and 80% with the Minister of Employment from Podemos (i8).

Lastly, as far as the participants' position regarding addressing contents related to democratic memory in the primary classroom is concerned (section 3, items 9 to 13), 28% were of the opinion that it is preferable not to study these topics in the classroom (i9), while 74% considered that it is indeed appropriate to discuss them in class (i10).

No significant differences were found for any of the variables between groups according to the leading article which the participants read. However, significant differences were found regarding sex in item 4 (Do you believe it is appropriate to

Table 8.3 Questionnaire items

Section I
i1: Do you believe that now is the right time to pass the Law on Democratic Memory?
i2: Do you believe that the definition and recognition of the victims is appropriate in the Draft Law on Democratic Memory?
i3: Do you consider that it is appropriate for the Draft Law on Democratic Memory to introduce topics on repression, exile and victims of the Civil War, the Francoist dictatorship and the Transition into formal (education curriculums) and informal (places of memory) education?
i4: Do you believe it is right for foundations which exalt Francoism to be abolished?
Section II
i5: Santiago Abascal (Leader of VOX): "[The Democratic Memory Law] attacks coexistence in peace and freedom which we have enjoyed over decades of democracy […] We are not here to condemn our history but to accept it." To what extent do you agree with this opinion?
i6: Macarena Montesinos (Member of Parliament for the PP): "[The Democratic Memory Law] fosters a spirit of confrontation among Spaniards. It stirs the spirit of the Civil War, opens up old wounds and imposes its ideological narrative. The Draft Law divides the Spanish people and has the aim of destroying the exemplary process of reconciliation of the Spanish Transition. It is a frontist and totalitarian law." To what extent do you agree with this opinion?
i7: Félix Bolaños (Minister of the Presidency and Relations with the Cortes): "The main aims of the future law concern recuperation, safeguarding, dissemination and the advocacy of democratic values and fundamental rights, as well as the recognition of all of the victims of the coup d'état of July 1936 and of the dictatorship. This is the first law which condemns and expressly renounces the coup d'état and the subsequent dictatorship, which mark the darkest period of our contemporary history." To what extent do you agree with this opinion?
i8: Yolanda Díaz (Leader of Podemos and Minister of Employment): "Democratic Memory has long been an unresolved issue in our country. The Democratic Memory Law marks a milestone in the recognition of the rights of the families of the victims of the Franco regime and asserts justice over impunity." To what extent do you agree with this opinion?
Section III
What would happen if…? *You are teaching in a village school. The following story appears in the news: During the course of construction work to extend the local cemetery, unidentified human remains have been discovered. An investigation is opened up and the scientific team responsible conclude that they correspond to a group of people executed in 1939. The news is much talked about in the village and some older people say that when they were younger they had heard the story of a group of neighbours who had fled to the hills during the Civil War (1936–1939) and had eventually been tracked down by the Civil Guard and a group of Falangists, some of them from the village, when the war was about to end. After their arrest, they had been executed next to the cemetery. Fear had prevented anyone from daring to speak out publicly about this incident until now.* *Discussions are being held in the local council about what to do with the remains and there are conflicting opinions. You are teaching Social Sciences in the 6th year of primary education and ask yourself whether you should address this case in the classroom and how to do so*
i9: You consider that it is preferable not to deal with the topic in the classroom due to the fact that it is a political issue which divides the local people and teachers should remain neutral. We do not have the right to influence the way our students think. These are matters to be addressed at home. To what extent do you agree with this position?
i10: You decide to discuss the issue in the classroom. You seek to provide all the available information, including the arguments of the different political parties represented in the local

(continued)

Table 8.3 (continued)

Section III
council. You ask your students to analyse the two alternatives and to reason the position with which they most agree. When they ask you for your opinion, you present it clearly, you explain why you consider it to be a better option than the alternative, but state that in a democracy everybody should be able to argue an opinion and that yours is just one more opinion. To what extent do you agree with this position?
i11: You decide to discuss the issue in the classroom. You consider that the best option is to present the class with only the information and arguments which in your opinion are ethically desirable because you consider that your obligation is to educate in values. To what extent do you agree with this position?
i12: You decide to discuss the issue in the classroom because you consider that it is educational to teach how to argue an opinion and to learn respect for the rules of a debate. You offer information on the two opposing positions but you stay on the side-lines of the debate. You do not express your opinion because you believe that issues relating to ideology, beliefs and values should be reserved for families and students. To what extent do you agree with this position?

abolish foundations which exalt Francoism?) ($\chi^2(3) = 8.77$, $p = 0.032$). Specifically, the proportion of men who considered it extremely inappropriate to abolish foundations which exalt Francoism (5.9%) was higher than the proportion of women with the same opinion (1.8%). In the testing of the hypotheses, significant differences were found according to the sex of the participants. Women had a higher appreciation of the words of Yolanda Díaz, more forcefully rejected the position of not dealing with the topic in the classroom and took a position in favour of addressing the topic in the classroom without hiding their own view.

There were significant differences between universities, but these were due to the different evaluations of the words of the politicians. The data collected form the Universities of Valladolid, Almería and Córdoba were more favourable to the words of Santiago Abascal and Macarena Montesinos, and, at the same time, they were more in favour of not dealing with the specific case in the classroom. On the other hand, the data collected from the Universities of Santiago de Compostela and Valencia pointed in the opposite direction.

A profile analysis was carried out via Agglomerative Hierarchical Clustering (AHC), with the results showing three profiles. There is an intermediate profile (in green, 43% of the sample), which normally responds to a score of 3 in almost all of the items, with the exception of the evaluation of the opinions of the conservative and far-right politicians (close to a score of 2). The other two profiles are conflicting. One of them, in blue and representing the majority opinion (almost 50% of the sample), scored section 2 (opinions of the Draft Law) between 3.5 and 4, scored the opinions of the progressive politicians (PSOE and Podemos) extremely highly and gave a very low score (between 1 and 1.5) to the opinions of the conservative and far-right politicians. In section 3, the teacher profile advocated addressing topics of democratic memory in the classroom and clearly rejected the position of exclusive neutrality. On the other hand, there was a minority profile (7% of the sample), which is shown in red. This profile gave the lowest scores in

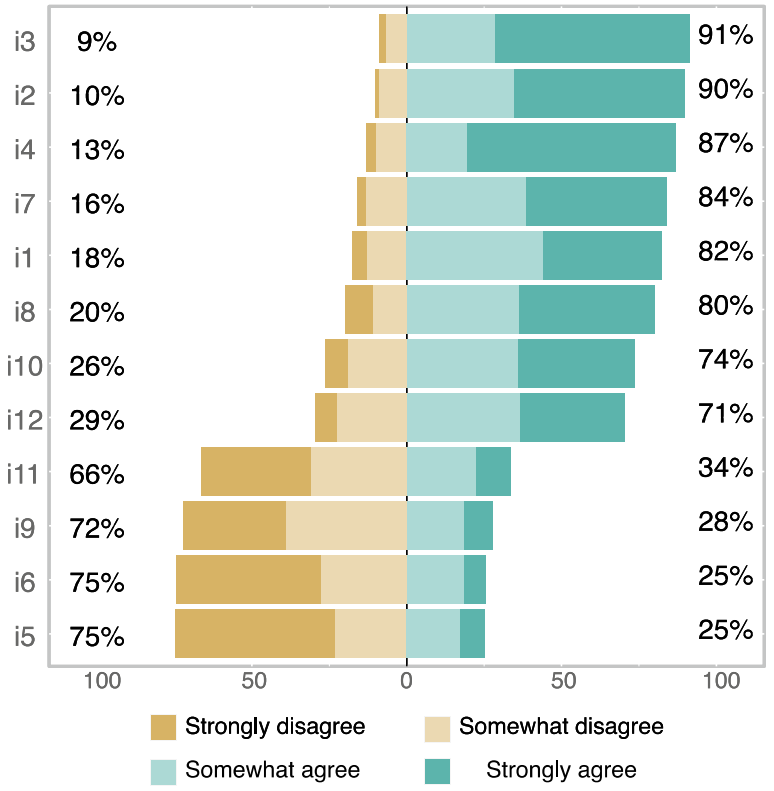


Fig. 8.4 Responses to each of the items

section 1 (evaluation of the Draft Law), scored the opinions of the conservative and far-right politicians extremely highly and gave extremely low scores to the opinions of the progressive politicians. This profile, although it also scored the position of addressing these topics in the classroom relatively highly, is that which gave the highest score to the teaching approach of exclusive neutrality (Fig. 8.5).

Last of all, an ordinal logistic regression model was tested in order to explain the probability of discussing issues related with democratic memory (item 10) and not addressing them (item 9) in the classroom. The degree of agreement with the declarations of the political representatives and with support for the Democratic Memory Law were included as explanatory variables. In the proposed model, it is assumed that the ordinal variable observed (item 9 or item 10) originates from the categorisation of a continuous (unobserved) latent variable.

The only variable which proved to be significant in explaining the response to item 9 (You consider that it is preferable not to deal with issues relating to democratic memory in the classroom) was agreement with the declaration of the representative of the People's Party (i6). As is shown in Fig. 8.6, the probability of strongly agreeing with item 9 increases in line with the increase in agreement with

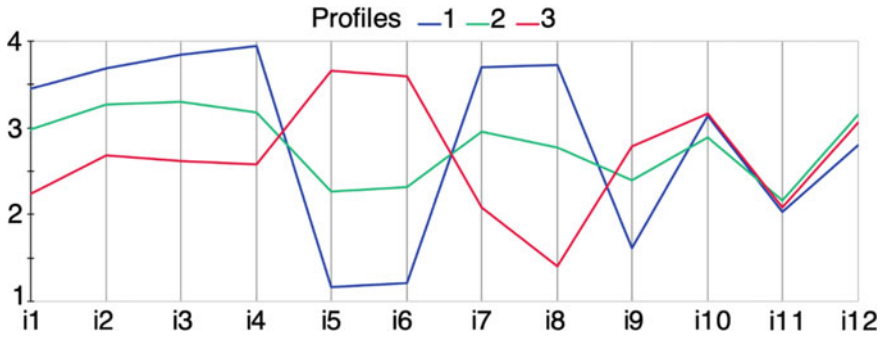


Fig. 8.5 Representation of the profiles of the classes

item 6 (Macarena Montesinos: "[The Democratic Memory Law] fosters a spirit of confrontation among Spaniards. It stirs the spirit of the Civil War, opens up old wounds and imposes its ideological narrative"). Likewise, the probability of strongly disagreeing with item 9 increases in accordance with an increase in the level of disagreement with item 3.

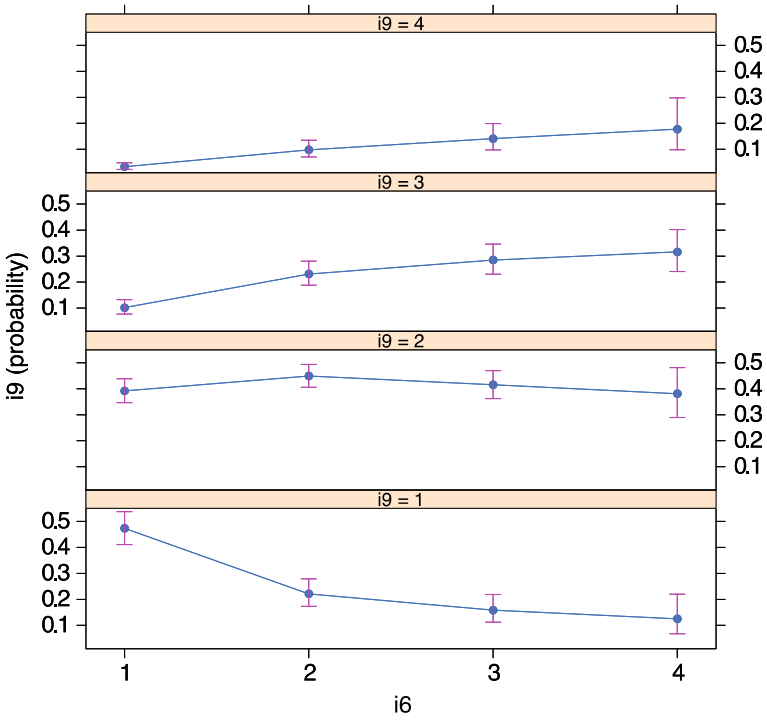


Fig. 8.6 Item 6 effect plot

Conclusions

When asked about certain specific aspects of the Draft Law on Democratic Memory, the teachers undergoing initial training demonstrated relatively broad support for this Law (between 87 and 91%). The most highly valued item is that which states the intention of the Draft Law that topics concerning the Civil War and Francoism should be present in both education laws and in informal education via the places of memory.

In spite of this support for the Draft Law, one in four participants surveyed (25–26%) positioned themselves in favour of the declarations of conservative and far-right politicians, who are clearly against this legislation.

The political stance of the participants was a determining factor in the results. The differences between universities respond to the different political positions of those surveyed and the difference according to sex also responds to differences in political stances. While only one in ten of those surveyed stated that they were against these topics being included in the curriculum, when the specific topic was proposed, this figure multiplied by 3 (28%) after reading the declarations of the political leaders. The ordinal logistic regression analysis demonstrated how support for the declarations of the politician from the People's Party (a conservative party) is what determined the teaching position regarding the introduction of these controversial issues into the classroom.

Implications

The political stance of teachers should not be the variable which influences the students' possibilities to learn, reflect, debate and reason regarding issues of democratic memory when they are presented from a controversial or conflictive perspective. This does not only lead to an imbalance between classes or between schools, but can also bring about imbalances between different territories due to support for one political party or another.

In order to mitigate this situation, it is necessary to carry out a significant intervention in initial and on-going teacher training. The introduction of these topics is a necessity in Education Faculties, both in undergraduate primary education degrees and in secondary education master's degrees. In order to do this, they should be approached from updated historiographic methods and via strategies which enable teachers to address them in the classroom. This should be carried out both from a cognitive perspective (historical thinking, handling primary sources, etc.) and from memory (historical consciousness, analysis of informal narratives and an emphasis on identity issues). On the other hand, this should be an urgent task for the Instituto Nacional de Tecnologías Educativas y de Formación del Profesorado (National Institute of Technology and Professional Development, INTEF) and the Autonomous Communities, in collaboration with research groups in the fields of education, historical memory and the ongoing training of in-service teachers.

It is also necessary to pay more attention to alternative memories. The majority of the victims of the Civil War, and particularly of the repression of the Franco dictatorship, has been silenced for many years. These long processes of inequality created through the terrible repression of Francoist times must be examined in depth. It is also necessary to broaden the current conception of democratic memory in order to highlight the history of those who have traditionally been forgotten by curriculums and textbooks (slaves, working women, people in situations of dependence, etc.).

The contents identified regarding democratic memory should also be analysed from the perspective of their long duration and of social, economic and cultural inequalities forged over the course of centuries. Is it possible to understand the different allegiances in the Civil War without understanding the differences which took shape over decades between the rural and urban worlds or the differences between the patronage and family relationships of the large landowners in relation to the land? We should escape from the short-sightedness of immediacy and of interpretative biases based only on political cultures. Insisting on this fact may lead to the ideological bias of certain teachers hindering the addressing of these historical topics in the classroom.

Funding This chapter is result of project "HistoryLab for European Civic Engagement: open e-Toolkit to train History Teachers on Digital Teaching and Learning", funded by SEPIE—ERASMUS + KA226 [2020-1-ES01-KA226-HE-095430], and thanks to the project PID2020-113453RB-I00, by "Agencia Estatal de Investigación" of Spain (AEI/https://doi.org/10.13039/501100011033) and Ministerio de Ciencia e Innovación.

References

1. VanSledright BA (2014) Assessing historical thinking and understanding. Innovate designs for new standards. Routledge, New York
2. Gómez CJ, Miralles P, Rodríguez-Medina J, Maquilón J (2020) Perceptions on the procedures and techniques for assessing history and defining teaching profiles teacher training in Spain and the United Kingdom. Educ Stud 47(4):472–490. https://doi.org/10.1080/03055698.2019.1707069
3. Voet M, De Wever B (2020) How do teachers prioritize instructional goals? Using the theory of planned behavior to explain goal coverage. Teach Teach Educ 89:103005. https://doi.org/10.1016/j.tate.2019.103005
4. Epstein T, Peck CL (2018) Teaching and learning difficult histories in international contexts. Routledge, New York
5. Lévesque S, Croteau JF (2020) Beyond history for historical consciousness. Students, narrative, and memory. Toronto University Press, Toronto
6. Monte-Sano C (2011) Learning to open up history for students: preservice teachers' emerging pedagogical content knowledge. J Teach Educ 62(3):260–272. https://doi.org/10.1177/0022487110397842
7. Ledman K (2015) Navigating historical thinking in a vocational setting: teachers interpreting a history curriculum for students in vocational secondary education. J Curric Stud 57:77–93. https://doi.org/10.1080/00220272.2014.984766
8. Lesh BA (2011) Why won't you just tell us the answer? Teaching historical thinking in grades 7–12. Stenhouse, Portland

9. Reisman A (2012) "Reading like a historian": a document-based history curriculum intervention in urban high schools. Cogn Instr 30(1):86–112. https://doi.org/10.1080/07370008.2011.634081
10. Van Boxtel C, Van Drie J (2012) "That's in the time of the Romans!" Knowledge and strategies students use to contextualize historical images and documents. Cogn Instr 30 (2):113–145. https://doi.org/10.1080/07370008.2012.661813
11. Wineburg S (2001) Historical thinking and other unnatural acts: charting the future of teaching the past. Temple University Press, Philadelphia
12. Carretero M, Van Alphen F (2014) Do master narratives change among high school students? A characterization of how national history is represented. Cogn Instr 32(3):290–312. https://doi.org/10.1080/07370008.2014.919298
13. Grever M, Peltzer B, Haydn T (2011) High school students' views on history. J Curric Stud 43(2):207–229. https://doi.org/10.1080/00220272.2010.542832
14. López C, Carretero M, Rodríguez-Moneo M (2014) Conquest or reconquest? Students' conceptions of nation embedded in a historical narrative. J Learn Sci 24(2):252–285. https://doi.org/10.1080/10508406.2014.919863
15. Rüsen J (2012) Forming historical consciousness—towards a humanistic history didactics. Antíteses 5(10):519–536. https://doi.org/10.5433/1984-3356.2012v5n10p519
16. Wilschut A (2010) History at the mercy of politicians and ideologies: Germany, England, and the Netherlands in the 19th and 20th centuries. J Curric Stud 42(5):693–723. https://doi.org/10.1080/00220270903049446
17. Carretero M, Berger S, Grever X (eds) (2017) Palgrave handbook of research in historical culture and education. Palgrave McMillan
18. Counsell C, Burn K, Chapman A (2016) MasterClass in history education. Transforming teaching and learning. Bloomsbury
19. Metzger SA, Harris LM (eds) (2018) The Wiley international handbook of history teaching and learning. Wiley
20. Rodríguez-Medina J, Gómez CJ, López-Facal R, Miralles P (2020) Tendencias emergentes en la producción académica de educación histórica. Revista de Educación 389:211–242. https://doi.org/10.4438/1988-592X-RE-2020-389-460
21. De Groot-Reuvekamp M, Anje R, Van Boxtel C (2019) 'Everything was black and white …': primary school pupils' naive reasoning while situating historical phenomena. Int J Primary Elementary Early Years Educ 47(1):18–33. https://doi.org/10.1080/03004279.2017.1385642
22. De Groot-Reuvekamp M, Ros A, Van Boxtel C (2018) A successful professional development program in history: what matters? Teach Teach Educ 75:290–301. https://doi.org/10.1016/j.tate.2018.07.005
23. Van Straaten D, Wilschut A, Oostdam R (2018) Measuring students' appraisals of the relevance of history: the construction and validation of the Relevance of History Measurement Scale (RHMS). Stud Educ Eval 56:102–111. https://doi.org/10.1016/j.stueduc.2017.12.002
24. Létourneau J (2014) Je me souviens? Le passé du Québec dans la conscience de sa jeunesse. Fides
25. Gómez CJ, Miralles P, López-Facal R (2021) Handbook of research on teacher education in history and geography. Peter Lang
26. Barton K, Levstik L (2004) Teaching history for the common good. Lawrence Erlbau
27. Domínguez-Almansa A, López Facal R (2017) Patrimonios en conflictos. Competencias cívicas y formación profesional en educación primaria. Revista de Educación 375:86–109
28. Blevins B, Magins K, Salinas C (2020) Critical historical inquiry: the intersection of ideological clarity and pedagogical content knowledge. J Soc Stud Res 44:35–50
29. Ender T (2019) Counter-narratives as resistance: creating critical social studies spaces with communities. J Soc Stud Res 43(2):133–143

30. Pedrouzo FA, Castro-Fernandez B (2021) From the Pazo de Meiras to the Oseira's Crime: educational intervention about memory, heritage and conflict. Revista Interuniversitaria de Formacion del Profesorado-RIFOP 96:11–28. https://doi.org/10.47553/rifop.v96i35.3.91335
31. Gross M (2014) Struggling to deal with the difficult past: polish students confront the Holocaust. J Curric Stud 46(4):441–463
32. Le Cordeur M (2015) The issue of Kaaps: Afrikaans teaching at school needs a more inclusive approach. Tydskrif Vir Geesteswetenskappe 55(4):712–728
33. Najbert J (2020) Guarding against the "loss of national memory": the communist past as a controversial issue in Czech history education. Hist Encounters-J Hist Conscious Hist Cultures History Educ 7(2):63–78
34. Gerber TP, Van Landingham ME (2021) Ties that remind: known family connections to past Events as Salience Cues and collective memory of Stalin's Repressions of the 1930s in contemporary Russia. Am Sociol Rev 86(4):639–669
35. Savenije GM, Brauch N, Wagner W (2019) Sensitivities in history teaching across Europe and Israel. Pedagogy Culture Soc 27(1):1–6. https://doi.org/10.1080/14681366.2019.1566163
36. Woolley M (2017) The attitudes and perceptions of beginning teachers in relation to teaching controversial issues in the history classroom. Revista Electrónica Interuniversitaria de Formación del Profesorado 20(2):1–16
37. Misco T (2016) "We are only looking for the right answers": the challenges of controversial issue instruction in South Korea. Asia Pac J Educ 36(3):332–349. https://doi.org/10.1080/02188791.2014.940031
38. Kelly T (1986) Discussing controversial issues: four perspectives on the teacher's role. Theory Res Soc Educ 14:113–138
39. López-Facal R, Santidrián V (2011) Los «conflictos sociales candentes» en el aula. Íber Didáctica de las Ciencias Sociales, Geografía e Historia 69:8–20
40. Sáez-Rosenkranz I, Prats J (2021) Memoria histórica y enseñanza de la historia. Trea
41. Ayala F (2021) Investigación sobre la incorporación de la memoria democrática al currículo escolar. Situación, retos y propuestas pedagógicas. Madrid: Ministerio de Presidencia, Relaciones con las Cortes y Memoria Democrática
42. Díez Gutiérrez EJ (2014) La memoria histórica en los libros de texto escolares. Revista Complutense de Educación 25(2):393–409
43. Fuertes C (2018) La dictadura franquista en los manuales escolares recientes: una revisión crítica. Revista Historia Autónoma 12:279–297
44. Martínez-Rodríguez R, Muñoz Labraña C, Sanchez-Agustí M (2019) Teacher knowledge and beliefs and their relationship with the purpose of teaching recent history. The transition to democracy in Spain as a controversial case. Revista de Educación 383:11–35. https://doi.org/10.4438/1988-592X-RE-2019-383-399
45. Gadermann AM, Guhn M, Zumbo BD (2012) Estimating ordinal reliability for Likert-type and ordinal item response data: a conceptual, empirical, and practical guide. Pract Assess Res Eval 17:1–13. https://doi.org/10.7275/n560-j767
46. McDonald RP (2013) Test theory: a unified treatment. Psychology Press
47. Revelle W, Zinbarg RE (2009) Coefficients alpha, beta, omega and the glb: comments on Sijtsma. Psychometrika 74:145–154. https://doi.org/10.1007/s11336-008-9102-z

Cosme J. Gómez Carrasco is Senior Lecturer in Social Sciences Teaching at University of Murcia. He is PhD in history from the University of Castilla-La Mancha, and he has been postdoctoral researcher at the EHESS (Paris) and at the Carlos III University of Madrid, visiting professor at the Center de Recherches Historiques (EHESS) and Honorary Researcher Associate at University College of London - Institute of Education. He is the coordinator of the DICSO group (University of Murcia), and he has coordinated national and european projects (ERASMUS + KA220). He has published more than 100 articles and book chapters in books and journals of high national and international impact. He has collaborated with evaluation agencies (State Research

Agency, Andalusian Knowledge Agency), with the Ministry of Education and Vocational Training in the review of the LOMLOE curricular development in geography and history for Primary and Secondary, and is part of the group of experts from the Observatory of History Teaching in Europe (Council of Europe).

Jairo Rodríguez-Medina is Assistant Professor of Research Methods at University of Valladolid (Department of Pedagogy) and member of the recognized research group Psychology, Health and Neuroeducation. His lines of research focus on the evaluation of programs for the school, social and labor inclusion of people with intellectual disabilities and other neurodevelopmental disorders, the application of observational methodology, mixed research methods and network analysis. He has published more than 30 articles in scientific journals of recognized international prestige. He has supervised a doctoral thesis and five master's theses in research applied to education.

Ramón López-Facal is Ad Honorem professor of Didactics of Social Sciences at the University of Santiago de Compostela (Spain), where he supervised nine doctoral theses related to historical and heritage education. Before teaching in the university he was secondary school teacher of History and Social Sciences, and during that time he led educational innovation projects and coordinated teams of teachers committed to pedagogical renewal, such as Aula Sete and Sine Nomine. His research interests are historical thinking, citizenship education and heritage education. His doctoral thesis deals with the concept of nation in the teaching of History. He has collaborated with Spanish Agencies for the evaluation of Research in Education (Agencia Estatal de Investigación, AQU of Catalonia, DEVA of Andalusia...). He currently collaborates with the Spanish Ministry of Education in the development of the History curriculum.

9 The Use of Controversial Issues in Higher Education for Citizenship Learning

Noelia Pérez-Rodríguez, Nicolás de-Alba-Fernández, and Elisa Navarro-Medina

Abstract

Today's society needs citizens who are critical and committed to their reality. The study we present is part of a broader research with university professors in training. They carry out teaching innovations on their subjects, with the aim of improving their practice. One of the issues they work on in this training is the introduction of controversial problems or topics. In this context, we will focus on the perception that students participating in these innovations have of the impact of the practice developed in their training as citizens (more complex vision of reality, skills developed, among others). In general, we are interested in knowing what role they believe the university should play in their training as citizens and what role it really plays. In the research, of an interpretative nature, 143 students from different areas of knowledge participated. A reflective questionnaire of open and closed questions was used. The analysis procedure combines quantitative and qualitative techniques. The most relevant results of the study indicate that most students consider that the university should train them as citizens (79.7%), although a smaller percentage (58%) believe that it really does. In relation to innovations, the students' perception of the more frequent use of disciplinary problems (75.6%) over professional problems (24.4%) or controversial or current topics (49%) is noteworthy. The differences by areas of knowledge reveal significant nuances. The latter is valuable for understanding the possible difficulties in incorporating citizenship education in the different disciplines, from the students' point of view.

N. Pérez-Rodríguez (✉) · N. de-Alba-Fernández · E. Navarro-Medina
Department of Experimental and Social Sciences Education, Faculty of Education Sciences, University of Seville, Seville, Spain
e-mail: nperez4@us.es

D. Ortega-Sánchez (ed.), *Controversial Issues and Social Problems for an Integrated Disciplinary Teaching*, Integrated Science 8,
https://doi.org/10.1007/978-3-031-08697-7_9

Keywords

Controversial issues · Citizenship education · Students · Educational innovations · Higher education

Educating *for* and *in* Democracy, also at the University

> Higher education should be broadly understood as a democratic public sphere - a space in which education enables students to develop a keen sense of prophetic justice, reclaim their political and moral agency, utilize critical analytical skills, and cultivate an ethical sensibility through which they learn to respect the rights of others. [1, p. 24]

Reflecting on Giroux's ideas in these lines leads us to think about what higher education should be and what it really is. We live in a time of uncertainty, in which the different crises (health, environmental, economic, among others) lead us to a constantly changing reality. Along with this, the debate on citizenship education is accentuated, what kind of citizenship do we need to face these challenges? The situation is even more worrying when these crisis situations, such as the one derived from Covid-19, are also transformed into political and ideological crises [2]. However, it is also an invitation to rethink and imagine different futures, in which democracy and social justice are the starting point and the goal.

In this context, the university cannot remain on the sidelines. In the Spanish context, citizenship education has been relegated, at least in a more organized way, to compulsory educational stages [3]. However, as stated above, higher education should be a place in which to develop a critical and committed sense, to go beyond a scientific-technical training that favors the development of global workers at the service of a neoliberal market and to build a professional and citizen training [5, 6]. In the latter, in addition to considering the contents and competencies to be good professionals [7, 8] it is also necessary to foster the skills to live in democracy, to read, interpret and act from a social, political, and ideological level [9]. Therefore, the public university must educate for democracy and in democracy [10], facilitating students not only to participate in the hegemonic model of democracy but to build alternative and radical democratic models [11]. It is time to advocate for the development of a dangerous citizenship "that takes seriously the social and economic inequalities and oppression resulting from neoliberal capitalism" [12, p. 76]. The university and the various academic disciplines that comprise it constitute a privileged space for this. However, this requires reformulating strategies at different levels (social function, research, teaching, transfer…) [13]. At the level of teaching, professors and their work in the university classroom have a relevant role in the change. But how can we humanize teaching in a more critical sense? [14, 15].

Controversial Issues at the University for Citizenship Education

Since the implementation of the European Higher Education Area (EHEA) in the European context, there has been a commitment to a model that trains students in competencies [16]. Specifically, there was a commitment to strengthen the commitment of higher education to citizenship education. This was stated in the Yerevan Communiqué [17, p. 2]:

> We will support higher education institutions in enhancing their efforts to promote intercultural understanding, critical thinking, political and religious tolerance, gender equality, and democratic and civic values, in order to strengthen European and global citizenship and lay the foundations for inclusive societies.

However, the proposed reforms and policies seem to have had little impact on the actual transformation of universities, at least in terms of teaching and learning [18]. It seems, therefore, that a Transmissive Model, focusing on the professor and material (TM) through transmissive classes from the professor to the students has continued to predominate [19, 20]. Despite this, although this reality still exists, it is not homogeneous, since other strategies have also been progressively incorporated that have favored student participation, focusing the teaching model more and more on the students [19, 21]. Among other strategies we find problem-based learning [22], case studies, flipped learning [23], among others. If we analyze these strategies from the perspective of critical pedagogy, although they focus on students playing a more active role in the learning process, the use of these teaching methodologies is not necessarily linked to the development of citizenship competencies that involve a critical, political, or ideological position, since they may be working on a disciplinary problem or even pose professional problems, detached from the social and citizen reality. Previously we asked ourselves how we could humanize teaching and learning in a critical and social justice sense. From our perspective, it is necessary not only to increase student participation, but to go further, introducing controversial issues and relevant social and environmental problems. Working around relevant social problems, controversial topics or socially live issues is a strategy supported and defended by multiple authors [24–26]. Therefore, we should aim to develop "a process of students investigating the world and constructing personally meaningful understandings that aid them in the struggle to overcome oppression and achieve freedom" [15, p. 371] by developing their critical thinking from a dialectical approach [27]. Figure 9.1 shows a hypothesis of progression of the different models of citizenship education in the university, from the simplest, which does not consider it, to the most complex level, which we consider desirable from the approach presented [9].

In the context of higher education, different methodological strategies have been shown to be successful in the introduction and treatment of controversial issues, among others: Service Learning [28], or Development Education from Nussbaum's human capacity development approach [29, 30]. Beyond methodological aspects or novel currents, the problems, and controversial issues that we introduce must go

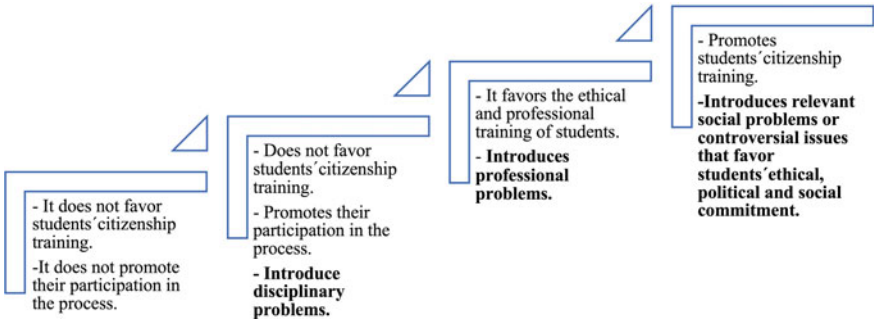


Fig. 9.1 Models of citizenship education at the university

beyond constituting disciplinary and professional problems that although they may favor technical development and professional ethics in students [31], they forget citizenship education.

However, although there is different research that have tried to define what kind of citizenship, we should achieve in our contemporary societies characterized by diversity less attention has been paid to analyze the pedagogical and curricular changes that should occur or are occurring to develop a democratic citizenship in the university [32], being the found isolated experiences. From the students' point of view, some research, such as the one developed by Astaíza-Martínez et al. [33] with 210 university students from different areas of knowledge, shows how developing projects based on reflection, identification and resolution of environmental problems makes students have a conception of their role as citizens based on activity, participation and social transformation and move away from a simpler and reductionist view of their role as citizens from a legal condition. On the other hand, Repáraz et al. [5] point out in their study with 1250 university students that the major to which they belong has an impact on the degree of civic knowledge of the students. Thus, for example, students from disciplines related to communication faculties seem to have a greater civic knowledge. They defend the idea of resolving the situation, considering that civic education should be the subject of any university discipline. In the same sense, the study developed by Boni et al. [4] shows how engineering students in their last year of undergraduate studies have received an exclusively technical training, without any content related to politics, culture, or society. After working with them on local and global problems, students develop a more critical analysis of the problems, as well as a sense of responsibility for them.

Therefore, for this successful perspective to be further expanded and incorporated into the university, we must continue to investigate what happens in university classrooms when working on controversial problems or issues and how this issue is linked to the formation of citizenship. The study we present here hopes to provide clues about citizenship education and the treatment of controversial issues by giving voice to students and knowing their perception as involved in change.

Method

The study presented here, which is qualitative and interpretative in nature, is part of a broader investigation with university teachers in training [9, 21, 34]. The training they receive, of a continuous nature, seeks to improve teacher practice through what is called Classroom Improvement Cycles (CIMA in Spanish) [34]. This training strategy is based on well-founded educational principles such as, among others, the necessary relationship that should exist between theory and teaching practice [35], and the connection between reflection and action [36]. One of the issues addressed in the training course is epistemological and ideological reflection on teaching content. To this end, teachers are invited to select the content based on different sources, such as: relevant disciplinary content, students' ideas, relevant social and/or environmental issues, and metadisciplinary content [37]. About education for citizenship, the introduction of problems and controversial issues explicitly promotes the connection of its disciplines with social reality, going beyond merely disciplinary or professional problems and, ultimately, incorporating knowledge, competencies, values, and citizenship attitudes [9].

The research aims to know the perception of students, whose teachers have participated in this training process, which has made them work on social problems, on the development of their citizenship education at the university, attending on the one hand to a general perception of the role of the university, and specifically, on the teaching innovations in which they have participated, in the framework described above.

Participants

The study consisted of a total of 143 students from the University of Seville (US) participating in teaching innovations. The average age of the participants was 21 years, with a maximum of 65 and a minimum of 17. Of the total, 88 (61.5%) were women, while 55 (38.5%) were men. The students are distributed among the five areas of knowledge covered by the US, with the Social Sciences (53.8%) and Health Sciences (28.7%) being the most represented (Table 9.1).

Table 9.1 Participants by areas

Areas of knowledge	F (%)
Arts and humanities	4 (2.8%)
Sciences	7 (4.9%)
Engineering and architecture	14 (9.8%)
Health Sciences	41 (28.7%)
Social sciences	77 (53.8%)
Total	143 (100.0%)

The sample used was purposive, because in addition to our interest in knowing the students' perception of the role of the university in their training as citizens, we were also interested in knowing their perception of the innovation received. This justifies the fact that the sample is not similar in each of the areas of knowledge.

Research Problems

The research problems we intend to answer are three:

1. Do students think that their formation as citizens is the task of the university, in fact, do they think that the university forms them as citizens?
2. From the perspective of university students, does working on controversial problems and/or issues shape them as citizens, and what citizenship skills/competencies do they develop by working on controversial problems or issues in class?
3. Are there differences among students according to their area of knowledge, which ones?

Instrument and Analysis Procedures

The instrument used was a questionnaire of open and closed questions administered by the Google Forms platform. The questionnaire consists of a total of 30 questions and 3 sections: (1) Sociodemographic information; (2) Role of the university in their formation as citizens; (3) Teaching received: influence of problems and controversial issues in their formation as citizens. The questionnaire is open-ended, as the purpose was to encourage reflection on the questions posed. A total of 496 quotations and 135 codes were obtained from the open-ended questions.

For the data procedure, quantitative analysis techniques (descriptive, frequency and comparative analyses) were combined with qualitative analysis techniques (content analysis, interpretation networks, analysis of co-occurrences between codes) to understand in depth the arguments and reflections of the students. The combination of both techniques saves possible reductionism in the interpretation of the data. SPSS v.27 and Atlas.ti v.8 tools were used.

Results

The results of the study are presented according to the two major research problems. For each of the problems, an analysis is made according to the areas of knowledge, which constitutes the third research problem.

What Do Students Think About the Role of the University in Their Formation as Citizens?

Of the total number of students participating in the study, the majority (79.7%) believe that the university should train them as citizens, while the remaining (20.3%) explicitly believe that it should not. The analysis by areas of knowledge (Table 9.2) shows that Science students (71.4%) are those who are most dissatisfied.

The arguments given by students as to why the university should train them as citizens are diverse. Of the 38 resulting categories, seven are the most significant, being above 4% (Fig. 9.2).

As can be seen, the most significant arguments are that citizenship education should be an "integral training" (17.3%) and, therefore, the university should be involved:

> Because it is a stage in which we are still developing our personality, which includes the formation of ourselves as citizens and as persons. (Stud33HealthSc)

Because of a question of "values" (11%):

> Being a good citizen is as important as learning about metaphysics or history. It is what makes us live harmoniously in society (we all know that we are subject to it). You must learn about values and education. In the future you will not only be chosen or liked by others for your knowledge in mathematics (for example) but for your ability to know how to be and the good impression you make of yourself. By your respect and your values towards others and the environment. (Stud3SocialSc)

Or to build a "better society" (9.4%):

> Because before being professionals, we must be good people who contribute to the creation of a favorable environment for the prosperity of society. (Stud10SocialSc)

The analysis by areas reflects that it is the students of Social Sciences and Health Sciences who give arguments linked to the question of values and the future.

However, there are also students who argue that the university should not train them as citizens. In this case, seven types of arguments are presented (Fig. 9.3).

Table 9.2 University responsibility in citizenship education by areas

Areas of knowledge	No F (%)	Yes F (%)	Total F (%)
Arts and humanities		4 (100%)	4 (100%)
Sciences	5 (71.4%)	2 (28.6%)	7 (100%)
Engineering and architecture	1 (7.1%)	13 (92.9%)	14 (100%)
Health Sciences	10 (24.4%)	31 (75.6%)	41 (100%)
Social sciences	13 (16.9%)	64 (83.1%)	77 (100%)
Total	29 (20.3%)	114 (79.7%)	143 (100%)

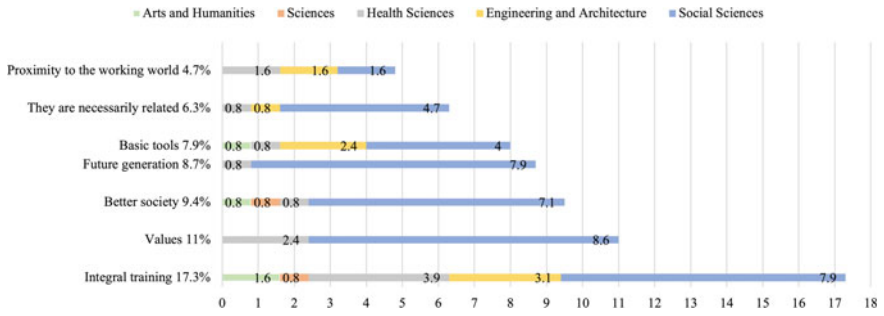


Fig. 9.2 Arguments in favor of university responsibility in citizenship education by area

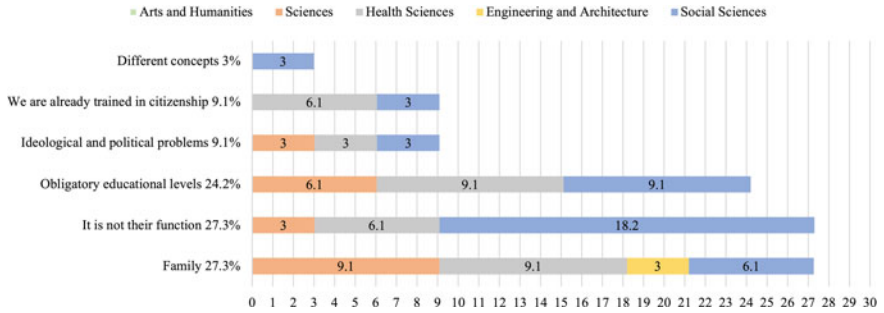


Fig. 9.3 Arguments against the university's responsibility in citizenship education by area

The most frequent arguments in this case are that citizenship education is the responsibility of "families" (27.3%):

> Whether you are a good citizen or not is not the responsibility of the university; it is the responsibility of oneself and one's parents to educate you in good values. (Stud31HealthSc)

Directly that "it is not the university's function" (27.3%), with this argument being very prominent in Social Sciences students (18.2%):

> The university should train you as a good professional, in my case as a good jurist, but training me as a citizen is something that does not have to be involved in university teaching. (Stud35SocialSc)

That it is the responsibility of "obligatory educational level" (24.2%):

> It should form me in the best possible way as a professional in my field of study. To form me as a citizen should be the primary and secondary educational institutions. (Stud18SocialSc)

Or that problems would develop among the student body because of the inclusion of "ideological and political problems" (9.1%):

> Because ideological and political topics would enter into debate that would end up developing problems among the student body. (Stud5SocialSc)

In the same sense, we were interested in knowing if, in fact, they believed that the university formed them as citizens. Of the total number of students, 58% believe that the university really trains them as citizens, while the remaining 42% believe that it does not. The distribution by areas (Table 9.3) indicates similar tendencies, although the students of Sciences seem to be the most inclined to believe that it does not (85.7%), together with those of Engineering and Architecture (50%).

The arguments given by students who think, in fact, that the university forms them as citizens are grouped into 36 categories, of which five are the most frequent (Fig. 9.4).

Those who believe that it does so point out as relevant the "value of new learning" (17.6%) in relation to current issues or to the content of the subjects, this argument being very present in both Health Sciences (5.5%) and Social Sciences (11%) students:

> Because we are constantly dealing with current issues and analyzing them from other points of view. (Stud11SocialSc)

> Because there are professors who debate other topics outside of academia. (Stud23HealthSc)

Other students point out "values" as relevant (11%), linked for example to commitment:

> It trains you in values, and that is citizenship. (Stud4SocialSc)

> Because, indirectly, it teaches values that help to see the world and our environment in a different, more mature and committed way. (Stud2SocialSc)

Or the idea of "living together" (8.8%) with other people who are different from you:

> You learn to coexist with others. (Stud8SocialSc)

> Because it teaches me to relate to others and to reflect on issues. (Stud1Art)

Table 9.3 Citizenship education at the university by areas

Areas of knowledge	No F (%)	Yes F (%)	Total F (%)
Arts and humanities	1 (25%)	3 (75%)	4 (100%)
Sciences	6 (85.7%)	1 (14.3%)	7 (100%)
Engineering and architecture	7 (50%)	7 (50%)	14 (100%)
Health Sciences	14 (34.1%)	27 (65.9%)	41 (100%)
Social sciences	32 (41.6%)	45 (58.4%)	77 (100%)
Total	60 (42%)	83 (58%)	143 (100%)

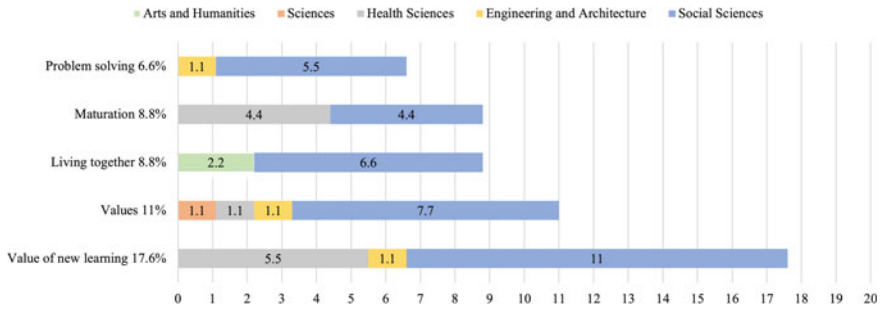


Fig. 9.4 Arguments of agreement on citizenship education in the university by area

Students who believe that the university does not form them as citizens also offer arguments to justify their ideas (Fig. 9.5).

Among other issues, they point out as more frequent that the "theoretical contents" (34.9%), giving more importance to the knowledge itself, this argument being more frequent in Social Sciences (23.8%) and Health Sciences (7.9%):

> Because only theoretical content is given. (Stud1SocialSc)
>
> I believe that the university does not form me as a citizen because currently the educational system is based on good grades rather than on forming us as people. (Stud6HealthSc)

They also point out that "citizenship education is not directly addressed" (17.5%), again reiterating that university training is focused on academics, and does not specifically program content that considers it:

> It focuses on the academic trying to exploit it to the maximum often forgetting that we are people and, we have and are much more apart from the strictly academic. (Stud33SocialSc)
>
> The university gives a broader vision of society and even numerous opportunities that can form us as citizens. But we are not formed as citizens since neither the contents of the subject nor the programming nor the way of evaluating allows us to be formed as citizens.... (Stud2SocialSc)

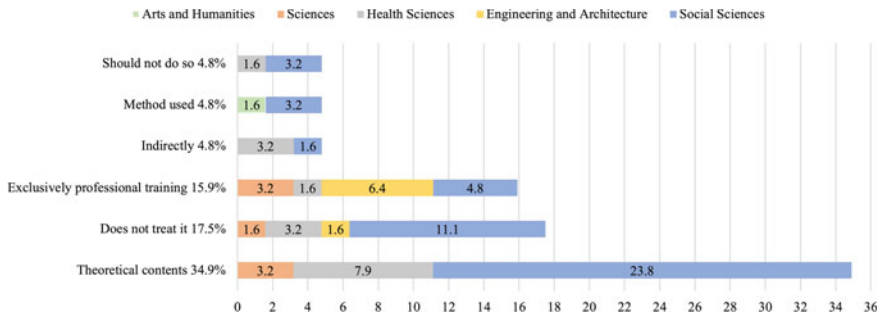


Fig. 9.5 Arguments in disagreement on citizenship education at the university by area

In the same sense, others point out that the training is focused on being "exclusively professional" (15.9%). It is therefore based on providing knowledge to students in subjects related to their future profession:

> At present I don't think this is the case, the university provides you with superior knowledge on a specific subject. (Stud15SocialSc)

> It focuses only on topics related to our professional training, not personal. (Stud14Eng)

> Because I study a technical career in which citizenship issues are not addressed. (Stud3Sci)

What Do Students Think About the Role of the Problems and/or Controversial Issues Worked on During CIMA in Their Formation as Citizens?

The students in this study, as previously mentioned, are participating in what are called CIMAs or teacher teaching innovations, in which teachers were specifically asked to make a work design with their students that revolved around a problem.

76.2% of the students believe that during the development of the innovation they have posed problems, projects, or cases to be solved. When observing the differences by areas of knowledge (Table 9.4), the most significant differences are in Health Sciences, where 41.5% of the students consider that no work has been done on problems, projects, or cases.

Although in the previous question, most students believe that they have worked on problems, projects or cases, when giving examples (Fig. 9.6), 75.6% of the total allude to disciplinary problems related to the reference subjects, both in Social Sciences (71.2%) and in Science (77.8%):

> Study of language from the analytical perspective. Linguistic theories of the main analytical authors (Frege, Wittgenstein, Alfred Tarski). Pragmatics and epistemology of language. (Stud1SocialSc)

> The elements of optical systems, their construction and their graphical and mathematical resolution. (Stud3Sci)

Table 9.4 Problems/issues/cases raised during the topic worked on by areas

Areas of knowledge	No F (%)	Yes F (%)	Total F (%)
Arts and humanities		4 (100.0%)	4 (100%)
Sciences	1 (14.3%)	6 (85.7%)	7 (100%)
Engineering and architecture		14 (100%)	14 (100%)
Health sciences	17 (41.5%)	24 (58.5%)	41 (100%)
Social sciences	16 (20.8%)	61 (79.2%)	77 (100%)
Total	34 (23.8%)	109 (76.2%)	143 (100%)

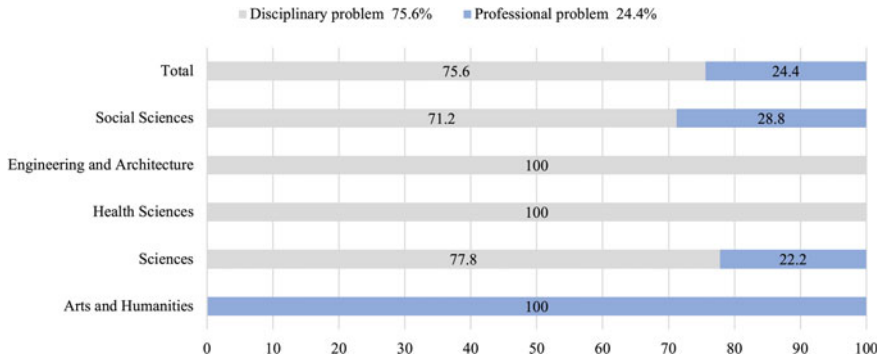


Fig. 9.6 Types of problems worked by areas

It is noteworthy that in the cases of Engineering and Architecture and Health Sciences the total number of students allude to disciplinary problems (100%):

> Establishing urban or plot boundaries in question being worked on. (Stud1Eng)

> Case studies of molecules, organic compounds and drugs. (Stud12HealthSc)

While a smaller part (24.4%) refers to professional problems linked to the subjects of reference:

> Cases about stalking, sexting, harassment, etc. heard by the Courts or Tribunals. (Stud17SocialSc)

> Several among them, the growth of the company, the point of view of the company, as from a researcher point of view we had to go beyond the problem itself and look for the real cause that generated that problem. As the Harley directive wanted to convey with its products something beyond that, it wanted to convey a philosophy. (Stud15SocialSc)

The differences by areas indicate to us that in Arts and Humanities there is a total perception by students on the use of professional problems. The use of professional problems is also perceived in Sciences (22.2%) and in Social Sciences (28.8%), although to a lesser extent.

In turn, students believe (87.4%) that the contents worked on during the subject help them to have a more complex vision of the reality of today's world (Table 9.5). Those of Social Sciences (93.5%) and those of Engineering and Architecture (92.9%) are the ones who agree the most with this.

However, when delving into controversial topics, only approximately half of the students (49%) affirm that some controversial or topical issue has been worked on (Table 9.6). It is noteworthy that students of Arts and Humanities (100%) and Social Sciences (70.1%) are those who most perceive the use of controversial or topical issues during the innovation implemented while students of Health Sciences (85.4%) and Engineering and Architecture (78.6%) state the opposite.

The examples of controversial or topical issues (Fig. 9.7) are grouped into 13 categories:

Table 9.5 Perception more complex vision by areas

Areas of knowledge	No F (%)	Yes F (%)	Total F (%)
Arts and humanities		4 (100%)	4 (100%)
Sciences	2 (28.6%)	5 (71.4%)	7 (100%)
Engineering and architecture	1 (7.1%)	13 (92.9%)	14 (100.0%)
Health sciences	10 (24.4%)	31 (75.6%)	41 (100.0%)
Social sciences	5 (6.5%)	72 (93.5%)	77 (100.0%)
Total	18 (12.6%)	125 (87.4%)	143 (100.0%)

Table 9.6 Use of controversial or topical issues by area

Areas of knowledge	No F (%)	Yes F (%)	Total F (%)
Arts and humanities		4 (100%)	4 (100%)
Sciences	4 (57.1%)	3 (42.9%)	7 (100%)
Engineering and architecture	11 (78.6%)	3 (21.4%)	14 (100%)
Health sciences	35 (85.4%)	6 (14.6%)	41 (100%)
Social sciences	23 (29.9%)	54 (70.1%)	77 (100%)
Total	73 (51%)	70 (49%)	143 (100%)

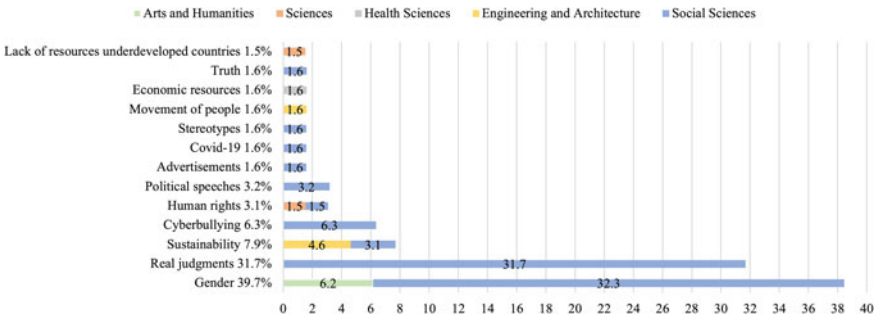


Fig. 9.7 Typology of controversial or topical issues by area

Of all, four are the most frequent: "Gender" (43.1%), "Real judgments" (33.4%), "Sustainability" (7.9%) and "Cyberbullying" (6.3%) (Fig. 9.8).

In addition, the students believe (74.8%) that the topic worked on forms them as citizens. The analysis by area (Table 9.7) shows that most students agree, except in the case of Health Sciences, where almost half of the participants (41.5%) believe that they are not trained as citizens through the topic worked on.

Finally, students present examples of some skills or learning obtained during the topic to solve problems in their environment (Fig. 9.9).

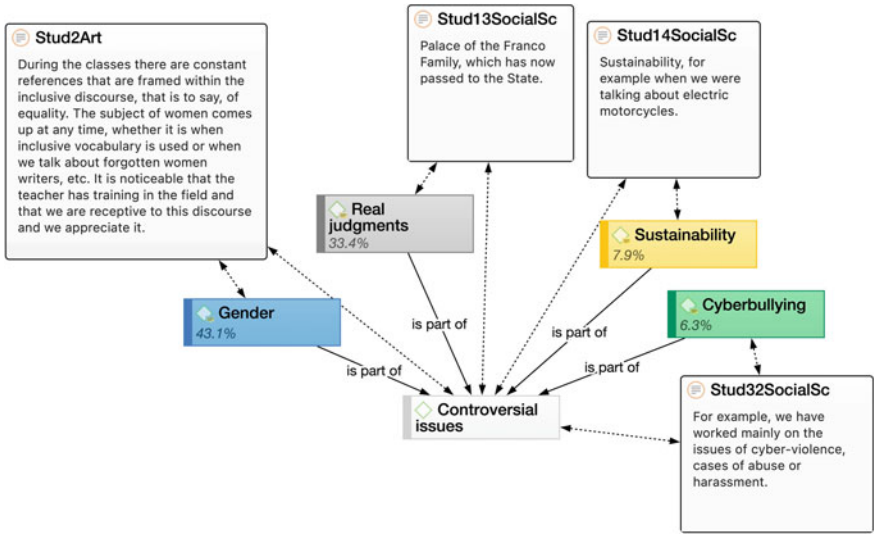


Fig. 9.8 Network of the most frequent controversial issues and allusion quotations

Table 9.7 Topics worked on and citizenship education by area

Areas of knowledge	No F (%)	Yes F (%)	Total F (%)
Arts and humanities		4 (100%)	4 (100%)
Sciences	1 (14.3%)	6 (85.7%)	7 (100%)
Engineering and architecture	1 (7.1%)	13 (92.9%)	14 (100%)
Health sciences	17 (41.5%)	24 (58.5%)	41 (100%)
Social sciences	17 (22.1%)	60 (77.9%)	77 (100%)
Total	36 (25.2%)	107 (74.8%)	143 (100%)

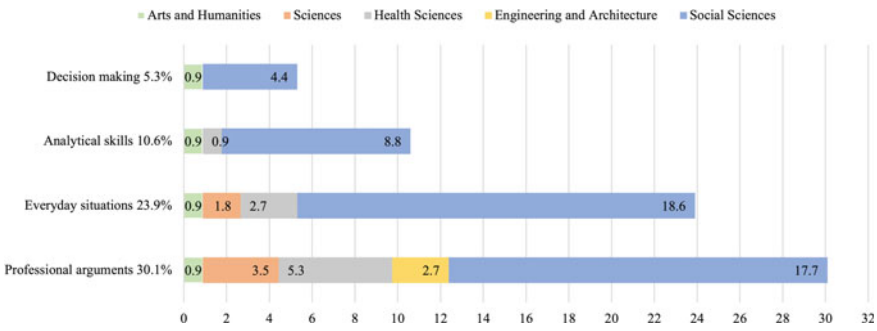


Fig. 9.9 Citizenship skills/competencies developed by area

As can be seen, the majority refer to skills linked to their profession, providing "professional arguments" (30.1%) in which they apply the knowledge they have acquired:

> Thanks to the work done I know better the competences of the different jurisdictional bodies and where a certain sentence or procedure has to go through. (Stud35SocialSc)

> The knowledge imparted in these classes has helped me to understand the optical systems that I encounter in my day-to-day life. (Stud3Sci)

Other students refer to the application of the skills developed to "everyday/real situations" (23.9%):

> When it comes to reading package inserts of everyday medicines. (Stud23HealthSc)

> My work dealt with stalking, and I realized that some of its behaviors are normalized and frequently committed by my own surroundings. (Stud34SocialSc)

Developing their analytical skills (10.6%):

> The ability to analyze in a more thoughtful way. (Stud10SocialSc)

Or "decision making" (5.3%):

> In any problem, you could look for what the root of it is before making a decision, create a hypothesis and consult secondary data or create it yourself through primary data. (Stud14SocialSc)

Discussion and Conclusions

The study presented here assumes that the introduction of relevant social problems or controversial issues is a fundamental strategy at the university to develop the skills that allow students to face present and future challenges from a citizenship perspective.

We recognize some limitations in the study, such as the fact that students are participating in specific teaching innovations with teachers in training, so that the reality they perceive is not necessarily extensible to the rest of the subjects they are studying. Nonetheless, apart from the above, it presents us with an opportunity to learn about their ideas and impressions of the changes implemented.

Analyzing this issue takes on more meaning and relevance when there is research that has observed that some disciplines, such as business administration and management [31] or engineering [30] do not include content on professional ethics or citizenship, being relegated to isolated, specific and optional subjects. In the study presented here, 79.7% of students consider that the university should train them as citizens, although only 58% believe that it really does so. These percentages vary when considering the areas of knowledge. It is noteworthy, in this sense, that in the case of Science students 71.4% consider that the university should not train them as citizens and, in fact, 85.7% affirm that it does not do so. Therefore, we

could affirm that there is also a lack of citizenship education, at least in the context analyzed. Those who state that the university does not train them as citizens point out, among other issues, the predominance of theoretical contents (34.9%) detached from current affairs and social reality. It is not surprising that other studies, such as that developed by Repáraz et al. [3], point to a lack of attitudes linked to the political participation of university students. If the university really presents mostly theoretical contents, aseptic and far from controversial issues on which they must reflect and activate their dialectical thinking [27], we are not training them for political and social participation.

Regarding the students' vision of the teaching practice developed, 76.2% affirm that, during the innovation, they have worked on problems, projects, or cases to be solved, although when giving examples they allude to the use of disciplinary problems (75.6%) and, to a lesser extent, to the treatment of professional problems (24.4%). In relation to the treatment of controversial issues, the students of Arts and Humanities (100%) and Social Sciences (70.1%) perceive to a high degree the use of controversial or current issues, something that does not occur in Health Sciences (85.4%) or in Engineering and Architecture (78.6%). Therefore, a priori, the academic discipline seems to influence the incorporation of controversial or current issues in the university classroom. In the same sense, Repáraz et al. [3] found that students in Communication area had a higher civic knowledge than students in other areas and pointed to the influence of the social discipline in the formation of students. This should make us reflect and think that any university discipline, regardless of its nature, should incorporate these controversial issues to form a critical citizenship. In turn, it allows us to reaffirm the results obtained with professors in training that pointed to the existence of epistemological and ideological resistance to incorporate controversial issues in the university classroom [9]. In relation to this, it is noteworthy that, of all the skills and citizenship competencies that students believe they have developed, the most outstanding refers to professional skills (30.1%), with the development of their analytical capacity (10.6%) or the ability to make decisions (5.3%) remaining in the minority.

In conclusion, the study presented points out that we must continue working on the incorporation of controversial issues in the university classroom, paying special attention to the epistemological difficulties of professors who do not belong to disciplines of a social nature. From a general point of view, we must also continue to analyze whether the introduction of controversial issues or relevant social problems is done rather from an anecdotal and isolated perspective or whether they really involve the development of real research processes linked to practice, with an open character, political and ideological positionings and related not only to knowledge, but also to action [15]. For this, we must continue to count on the necessary voice and experience of students, who ultimately constitute our current citizenship and our future.

Acknowledgements This work was supported by the Spain's Ministry of Economy and Competitiveness under Grant number EDU2016-75604-P *University Professor Training: Participants' progress and obstacles in a program based on their teaching practice improvement cycles*; University of Seville (5th University Plan for Research and Exchange Funding Agency) under Grant number USE-18648-H *doctoral thesis by Noelia Pérez-Rodríguez.*

References

1. Giroux HA (2015) Democracia, Educación Superior Y El Espectro Del Autoritarismo. Revista Entramados-Educación y Sociedad 2(2):15–27
2. Giroux H (2020) La pandemia de Covid-19 está exponiendo la plaga del Neoliberalismo. Praxis Educativa 24(2):1–13
3. Repáraz M, Arbués E, Naval C, Ugarte C (2015) El índice cívico de los universitarios: sus conocimientos, actitudes y habilidades de participación social. Revista Española de Pedagogía 260:23–51
4. Boni A, MacDonald P, Peris J (2012) Cultivating engineers' humanity: fostering cosmopolitanism in a technical university. Int J Educ Dev 32(1):179–186
5. Díez Gutiérrez EJ (2018) Universidad e investigación para el bien común: la función social de la Universidad. Aula Abierta 47(4):395–402
6. Hammond CD, Keating A (2018) Global citizens or global workers? Comparing university programmes for global citizenship education in Japan and the UK. Compare: J Comp Int Educ 48(6):915–934
7. Martínez M (2006) Formación para la Ciudadanía y Educación Superior. Revista Iberoamericana de Educación 42:85–102
8. Naval C, García R, Puig J, Santos MA (2011) La formación ético-cívica y el compromiso social de los estudiantes universitarios. Encounters Educ 12:77–91
9. Pérez-Rodríguez N, de-Alba-Fernández N, Navarro-Medina E (2021) Los contenidos de educación para la ciudadanía. Itinerarios de cambio en la formación docente universitaria. Formación Universitaria 14(3):149–162
10. Bolívar A (2016) Democratic education for an active citizenship. Revista Internacional de Educación Para La Justicia Social (RIEJS) 5(1):69–87
11. Sant E (2021) Educación política para una democracia radical. Forum. Revista Departamento de Ciencia Política 20:138–157
12. Ross EW, Vinson KD (2012) La educación para una ciudadanía peligrosa. Enseñanza de las Ciencias Sociales 11:73–86
13. Martínez-Usarralde MJ, Lloret-Catalá C, Mas-Gil S (2017) Responsabilidad Social Universitaria (RSU): Principios para una universidad sostenible, cooperativa y democrática desde el diagnóstico participativo de su alumnado. Archivos Analíticos de Políticas Educativas 25 (75):1–25
14. Ross EW (2017) Rethinking social studies: critical pedagogy in pursuit of dangerous citizenship. Information Age Publishing
15. Ross EW (2018) Humanizing critical pedagogy: what kind of teachers? What kind of citizenship? What kind of future? Rev Educ Pedagogy Cult Stud 40(5):371–389
16. European Comission, EACEA, Eurydice (2018) The European higher education area in 2018. Bologna process implementation report. Publications Office of the European Union
17. Yerevan Communiqué (2015) The Bologna process revisited: the future of the European higher education area
18. Fernández I, Madinabeitia A (2020) La transformación docente de la universidad a veinte años de Bolonia: balance y claves para un futuro por definir. Profesorado 24(2):28–52
19. de-Alba-Fernández N, Navarro-Medina E, Porlán R, Pérez-Rodríguez N (2020) La progresión de los modelos docentes universitarios: Resultados del primer estudio. In: Docentes universitarios. Una formación centrada en la práctica. Morata, pp 191–230

20. Jiménez Hernández D, González Ortiz JJ, Tornel Abellán M (2020) Metodologías activas en la universidad y su relación con los enfoques de enseñanzas. Profesorado 24(1):76–94
21. Pérez-Rodríguez N, Navarro-Medina E, De-Alba-Fernández N (In press) University professor's teaching conceptions questionnaire: an instrument to understand the teaching models. Pedagogika 144(4)
22. Escribano A, del Valle Á (2008) El aprendizaje basado en problemas. Una propuesta metodológica en Educación Superior. Narcea Ediciones
23. Prieto A (2017) Flipped learning: Aplicar el Modelo de Aprendizaje Inverso. Narcea
24. Evans RW, Saxe DW (1996) Handbook on teaching social issues. NCSS
25. Santisteban A (2019) La enseñanza de las Ciencias Sociales a partir de problemas sociales o temas controvertidos: estado de la cuestión y resultados de una investigación. El Futuro del Pasado 10:57–79
26. Legardez A (2017) Propositions pour une modélisation des processus de didactisation sur des Questions Socialement Vives. Sisyphus J Educ 5(2):79–99
27. Ross EW, Gautreaux M (2018) Pensando de Manera Crítica sobre el Pensamiento Crítico. Aula Abierta 47(4):383–386
28. Opazo H, Aramburuzabala P, Mcilrath L (2019) Aprendizaje-servicio en la Educación Superior: once perspectivas de un movimiento global. Bordón. Revista de Pedagogía 71 (3):15–23
29. Nussbaum MC (2001) Women and human development: the capabilities approach. Cambridge University Press
30. Boni-Aristizábal A, Calabuig-Tormo C (2016) Enhancing pro-public-good professionalism in technical studies. High Educ 71(6):791–804
31. Mellen T, Tey A, Esteban F (2017) Formación ética en el grado de administración y dirección de empresas en España: Posibles contrariedades. Bordón, Revista de Pedagogía 69(4):51–62
32. McCowan (2014) Democratic citizenship and the university curriculum: three initiatives in England. In: Civic pedagogies in higher education. Teaching for democracy in Europe, Canada the USA. Palgrave MacMillan, pp 81–101
33. Astaíza-Martínez AF, Castillo-Bohórquez MI, Rojas-León GA, Mazorco-Salas JE, Prieto-Cruz OA (2019) Concepciones sobre ciudadanía en estudiantes y docentes universitarios: convivencia y transformación social. Revista Educación 44(1):1–28
34. de-Alba-Fernández N, Porlán R (2020) Docentes universitarios. Una formación centrada en la práctica. Morata
35. Stenhouse L (2007) Investigación y desarrollo del currículum. Morata
36. Schön DA (1992) La formación de profesionales reflexivos: hacia un nuevo diseño de la enseñanza y el aprendizaje en las profesiones. Ediciones Paidós
37. García E, Porlán R, Navarro E (2017) Los fines y contenidos de enseñanza. In: Enseñanza universitaria. Cómo mejorarla. Morata, pp 55–72

Noelia Pérez-Rodríguez is Ph.D. Student in Social Studies Education area. She is a predoctoral researcher (PIF in spanish) in the Department of Didactics of Experimental and Social Sciences. She belongs to the research group Didactics and School Research (DIE) (PAIDI HUM319 group). Her teaching and research are developed in Didactics of Social Sciences, especially in the lines of education for citizenship and teacher training. His approach in the field focuses especially on considering education for citizenship from a critical and transformative perspective. She has participated in scientific dissemination events linked to the line of education for citizenship at national and European level.

Nicolás de-Alba-Fernández holds a Ph.D. in Pedagogy in Social Studies Education area. He is a professor in the Department of Didactics of Experimental and Social Sciences. He belongs to the research group Didactics and School Research (DIE) (PAIDI HUM319 group). His teaching and research are focused on the professional development of teachers in Didactics of Social Sciences, with special emphasis on the line of education for citizenship. He is the author of numerous publications that have served to disseminate the results of his research and as an element of transfer to practice. He has participated in many events of scientific dissemination at national and international level, among which recently include the XXX Symposium on Didactics of Social Sciences, held in Lisbon (Portugal), "Teaching and learning didactics of social sciences: teacher training from a socio-critical perspective" or the International Congress XVIII International Conference on Research in Social Sciences Didactics "Democratic Culture and Education for the Future", held in Barcelona (Spain).

Elisa Navarro-Medina holds a Ph.D. in Education in Social Studies Education area. She is a professor in the Department of Didactics of Experimental and Social Sciences. She belongs to the research group Didactics and School Research (DIE) (PAIDI HUM319 group). Her academic background has allowed her to develop a consolidated teaching and research career, linked to the area of Didactics of Social Sciences. Her lines of research and training are focused on the professional development of primary and secondary school teachers and education for citizenship. Her main contributions in the area are linked to citizenship education: "The positioning of young people in Spain with respect to the Civil War and Historical Memory: between reproduction and critical thinking" or "School inquiry in Secondary Education: The experience of the Fiesta de la Historia Youth Congress in Seville". She has participated in different national and international events of scientific dissemination. She has been part of the Organizing Committee of several dissemination and training meetings, among which are the scientific dissemination activity "Fiesta de la Historia" in Seville (Spain), as well as the Conference on "Formación e Innovación Docente del Profesorado" (Seville, Spain).

10 Perceptions of STEAM+CLIL Integration: Results of a Co-teaching Proposal During Initial Teacher Training

Almudena Alonso-Centeno, Jairo Ortiz-Revilla, Ileana M. Greca, and Esther Sanz de la Cal

Abstract

There is a real need to promote integrated thinking within education in a globalised world whose problems are increasingly complex and interdependent every day. Integrated STEAM education has become one of the most relevant approaches within educational activities that integrate various disciplines. However, teachers often encounter difficulties with its implementation, due to its complexity. The aim of this study is to investigate perceptions of interdisciplinary integration among trainee teachers after the implementation of an iSTEAM+CLIL co-teaching proposal through a two-phase quasi-experimental pre-post study. The results pointed to an improvement in the levels of disciplinary integration that students perceived before and after the intervention. There was also some improvement in the level presented after the second intervention when teachers worked in ways that were more integrated than after the first intervention. Further action is therefore needed in this respect to encourage teacher training and to facilitate the implementation of this interdisciplinary approach in integrated teaching.

A. Alonso-Centeno
Area of Didactics of Social Sciences, Department of Specific Didactics, Faculty of Education, University of Burgos, Burgos, Spain

J. Ortiz-Revilla (✉) · I. M. Greca
Area of Didactics of Experimental Sciences, Department of Specific Didactics, Faculty of Education, University of Burgos, Burgos, Spain
e-mail: jortizr@ubu.es

E. Sanz de la Cal
Area of Didactics of Language and Literature, Department of Specific Didactics, Faculty of Education, University of Burgos, Burgos, Spain

D. Ortega-Sánchez (ed.), *Controversial Issues and Social Problems for an Integrated Disciplinary Teaching*, Integrated Science 8,
https://doi.org/10.1007/978-3-031-08697-7_10

Keywords

iSTEAM · CLIL · Integration · Co-teaching · Teacher training · Teacher education

Introduction

We live in a reality that is composed of multidimensional events and processes based on highly diverse relations, self-regulations, and interconnections within increasingly scientific-technological environments. A reality that accentuates the complexity, the dynamism and the interdependence of many real-world problems. Innovations are therefore required that can offer rapid solutions that are in coherence with this globalised reality [1]. A global analysis is necessary for a proper analysis of this complexity and for an adequate understanding of our reality and the problems that can develop within it, in which different aspects are interrelated within an intricate network. In the words of Delgado [1]: "in order to understand this complex and perhaps even paradoxical reality, systemic thinking is required that allows the integration of knowledge under a globalising dialectical approach in which the parts are understood and interpreted from the whole and the whole, in turn, from the parts" (p. 17). This approach to our environment is only possible from a multidimensional approach, from a theoretical perspective and from the point of view of pedagogical practice [2]. Otherwise, we will fall into a biased or partial treatment of what we wish to study and, therefore, to know [3].

The fragmentation and disciplinary reductionism promoted by traditional teaching is therefore not congruent with the needs that the public require, in order to function in today's world, evidence of which is the mediocre development of the competences the students may achieve over various educational stages. Thus, a global perspective through which we can observe human beings, their relationships both with natural and with human-made systems will in turn provide an integrated, coherent, and deeper understanding of reality.

From an epistemological perspective, the study of integration goes back several decades. Within the literature and among the most recurrent questions on disciplinary integration, attempts have often been made to sequence a set of levels of integration. For instance, it has been suggested that the most sophisticated manifestation of this globalising perspective is transdisciplinarity, representing the highest degree of knowledge integration [4]. It has also been commented that interdisciplinarity can effectively connect different disciplines, so that their inter-permeability increases constant and necessary interrelations that contribute to a holistic understanding of the environment. Thus, there are various approaches to the concept of interdisciplinarity. In the field of education, Freire [5] stated that "interdisciplinarity can be seen as a pedagogical strategy that involves the interaction of several disciplines, understood as the dialogue and collaboration of these

to achieve the goal of new knowledge" (p. 4). So too in education, interdisciplinarity is understood as the main path towards an understanding of observable phenomena and related problems that constitute the environment. It is seen as a coherent whole, irreducible to any one single disciplinary vision [1, 2], which allows the integration of knowledge through a globalising dialectical approach in which disciplinary integration establishes contributory and cooperative relationships and permeability that help us to understand and to interpret the world, on which basis we may be motivated to solve complex and practical problems. The greater the degree of permeability, the greater the transfer and the interrelation and, therefore, the greater the degree of integration [1]. In this sense, some authors [6] have sought to analyse and to define the integration that could take place in schools from its lowest level to its highest degree of integration. It should also be noted that, given the epistemological and operational complexity of disciplinary integration, some authors have suggested that in the educational area it would be advisable to use the notion of multi-referentiality [7], which represents a more modest framework for the combination of multiple references or perspectives that converge towards the solution of problems.

Although the discussion in this regard remains broad, it is clear that, whether we see it as a pedagogical strategy, or as an approach, or as a way of thinking and/or proceeding, the fragmentation of knowledge into disciplinary blocks, lacking relations and inter-connections with the whole, results in decontextualization, reductionism, and bias [1]. For us, the sequencing of a series of levels of integration represents a useful and interesting tool for practicing interdisciplinary classifications.

Among the possibilities offered by disciplinary integration for teaching, one approach that has gained prominence in recent years is Integrated Science, Technology, Engineering, Art and Mathematics Education (iSTEAM). This approach is consistent with the implicit scientific-technological character of today's society. However, difficulties are often encountered in its implementation by teachers, largely due to the complexity of disciplinary integration [8], which has led to the idea of co-teaching as a key tool for disciplinary integration. Furthermore, although the implementation and evaluation of iSTEAM proposals is increasing, very few proposals have been developed in university education. This issue is of great interest and all the more so when we talk of teacher training courses where this approach will in the future be transposed into the classroom. It is of relevance both for the implementation of actions along these lines and to understand the earliest perceptions of teachers towards disciplinary integration during their initial teacher training courses when working with this approach.

Against this backdrop, we posed the following research question. How do trainee teachers understand integration after the implementation of an iSTEAM +CLIL proposal?

Theoretical Framework

Co-teaching as a Tool for Disciplinary Integration

The growth of knowledge and technological advances throughout the twenty-first century is a challenge to develop integrated curricula within Higher Education [9], which must be extended to all levels of education. However, at none of the educational levels, including the university level, is the practice of integration widespread. The reason is to be found in the characteristics of the system itself, based on the rigidity of the curriculum and standardised assessment, as well as the lack of collaboration between teachers from different areas [10].

The practice of integration implies handling theoretical concepts through different disciplines, with their own methodology and procedures. The ability to observe and to reflect are essential, in order to understand the relationships and interconnections established between them. On the other hand, it is also necessary to have working groups with specific characteristics: collaborative and cooperative teams with a vocation to teach and to learn, to contribute, and to receive, to accept diversity and, in short, to understand that the problem is a shared one that is perceived in different ways depending on the discipline in use at any one time [1].

The European Higher Education Area (EHEA) and the results of research into education point to a need to train teachers whose horizons go beyond the limits of the classroom, whose capabilities extend to working in a team, cooperating and becoming involved with their environment and committing themselves to their students, with a vocation for social transformation [11]. Given that a comprehensive training for professional teachers requires quality at all levels, in educational, human scientific, and personal development [12], it is therefore necessary to focus on these values within teacher training. Co-teaching, from this point of view, is understood as a guarantor of integration [13], insofar as the presence of work teams involved in an integrated, collaborative process for a single group of students is essential, with the aim of promoting the learning of content that might otherwise be impossible to achieve individually [14]. Bouck [15] understands co-teaching, also called Collaborative Co-Teaching (CCT) or team teaching, as a process through which two teachers of equal status share planning, teaching–learning strategies, and assessment within a teaching partnership. However, we understand that teachers working in harmony in the development of objectives need not be limited to a specific number of teachers, as this depends on the objective to be achieved.

Co-teaching applied to disciplinary integration not only offers the possibility of being enriched and nourished through the different perspectives of various disciplines, but also through the students becoming involved in decision-making, orientations and suggestions that each teacher can offer [13]. Thus, the diversity of opinions and approaches are valued, in order to produce a final product together, for instance, a solution to a problem. We should understand co-education as a process of joint planning, with the involvement of all co-teachers, in which ideas are shared, past experiences are reflected upon and a mutual understanding of practice is developed with goals that are held in common [16].

Combining iSTEAM and CLIL

STEAM comes from adding the "A" for Arts to STEM, the earlier acronym, reminding us of the aim to achieve a more balanced and holistic educational approach. Precisely in this sense, the most interesting notion of iSTEAM not only involves the integration of the arts under the disciplinary umbrella, but also the introduction of disciplines from the humanities [17]. This approach, as with STEM, has been welcomed with particular interest in the Didactics of Experimental Sciences and is spreading to other academic disciplines.

Within this educational approach there is some controversy over the epistemological issues that its disciplinary integration implies [18]; perhaps for this reason the theoretical frameworks that we can find for this approach are diverse, but no less relevant [19]. In any case, the consensus is clear that the disciplinary integration implied by iSTEAM, oriented towards problem-solving, can produce much broader and contextualised student learning. Indeed, there is ample evidence of its positive effects in a variety of contexts [20–22].

Among the concrete models that could be used to implement iSTEAM in the classroom, we find those in which it is integrated with Content and Language Integrated Learning (CLIL). It is this view that has been adopted as the theoretical reference for this research.

Specifically, we adhere to the pedagogical model that is proposed as part of the European project STEAM educational approach and foreign language learning in Europe (SelFiE 2020-1-ES01-KA201-081850) [23]. This model combines iSTEAM and the CLIL approach and proposes the integration of STEAM disciplines and second language learning for bilingual educational contexts. The use of

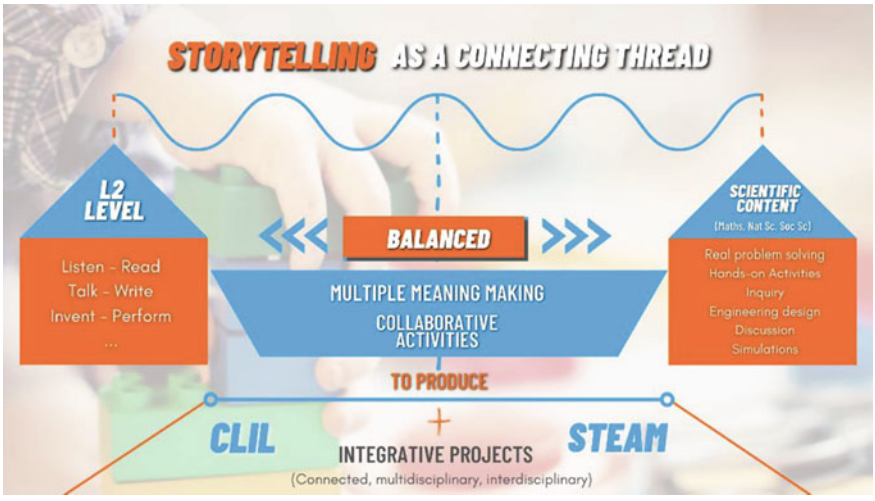


Fig. 10.1 The SelFiE model for STEAM+L2 learning at primary level [23]

storytelling provides the motivating thread between the different activities of the integrated subject areas, as well as linking scientific content with foreign language learning. As shown in Fig. 10.1, student participation in project work is conceptualised in the model, in which authentic STEAM activities and practices that arise from the storyline that is presented through inquiry methodology, engineering design, and collaborative work.

Methodology

Design

A two-phase quasi-experimental pre-post study was conducted [24].

Context and Participants

The first phase of the study was conducted during the academic year 2020–2021 and the second phase, in 2021–2022. A total of 44 students, studying in the fourth year of the Bachelor's Degree in Primary Education (English Language) at the University of Burgos (Spain), participated in this research. The sample was divided into two experimental groups, with 21 and 23 students participating in the first and second phases, respectively.

Teaching Proposal

In the first phase, a didactic proposal was implemented from the areas of Didactics of Language and Literature, Didactics of Experimental Sciences, and Didactics of Social Sciences among the teachers of the subjects Encouragement to read in English and Research and Innovation in the Teaching and Learning of Natural and Social Sciences. In turn, the subject Research and Innovation in the Teaching and Learning of Natural and Social Sciences is structured into two parts, corresponding to the natural environment and the social environment. The common students of the two subjects (three disciplines) worked in an integrated way during the first semester of the academic year (September–December 2020), developing an innovation project based on the combination iSTEAM+CLIL in the framework of a bilingual context, which had as its starting point a story in a foreign language, in this case English. The aim of this proposal was to contribute to the improvement of the English skills of students during the initial teacher training for the management of the iSTEAM+CLIL approach.

The didactic proposal was developed following the SelFiE pedagogical model for bilingual education described above. During the semester, the students jointly created, designed and developed their interdisciplinary innovation projects in small

groups under the supervision of the three teacher-tutors of the aforementioned subjects. At the end of the semester, each group presented their projects both in written and oral form for subsequent shared evaluation. It should be noted that the oral presentation took the form of a short video (15–20 min), during which the students were asked to select activities from the three areas and present them as they would do in class with the children. The choice of the story in English for each group of pupils was also the structural framework in which to articulate the contents of Encouragement to read in English, as well as inquiry and design of an engineering project as part of the natural environment; and the contents of the social environment. In the social and cultural framework, an approach to history was proposed that would break with the prevailing Eurocentric, androcentric and reductionist tendency, as part of the subject Research and Innovation in the Teaching and Learning of Natural and Social Sciences. The theme and development of the story served to establish different problems of a social, cultural, experimental, environmental, nature, which formed the bulk of the project in which it was proposed that the pupils develop research, inquiry, problem-solving, and critical thinking skills.

In addition, this integrated proposal involved shared the teaching load between the three teachers in charge. In this way, using the focus group technique [25], the teachers carried out tasks such as joint planning of the proposal, in terms of project design, timetable, content, joint monitoring of student work in the three subjects and joint evaluation.

For the second phase, some new measures were established, in order to improve those aspects that were considered a priority, based on the experience of the previous year. Firstly, the story was considered the starting point, so that its choice in the subject of Encouragement to read favoured the articulation of the project activities, based on the problems raised in its development. This allowed the work phases to be pre-established in advance and closely followed throughout the process. Secondly, it was essential to have previous experience, in order to increase confidence and shared knowledge of the didactics and their integration in the project. Coordination between the teaching staff was a key point from the beginning of the course to the end, so that decisions were agreed and unanimously supported. The three didactics (Didactics of Language, Didactics of Experimental Sciences, and Didactics of Social Sciences) were assessed at the same level, without considering one as a subsidiary to another, or one relying on the contents of another, so that they all worked with common objectives and criteria.

From another perspective, the resources were discussed among the three teachers for their improvement, so that the same materials were used simultaneously, for instance, in the presentation of the subject or the description of the project, in the allocation of dates and the procedure for handing in the project. In addition, the amount of tutoring time dedicated to students in each subject was increased, as well as the amount of class time spent on project development. Integration was given a place as content within each subject, with the aim of making the purpose of the project more accessible and comprehensible. At the same time, not only was the time dedicated to the students increased, but communication with them was channelled through the three teachers who all signed off each message. It should be

noted, however, that with the exception of the presentation of the subjects, the students had no theoretical lessons on integration.

Data Collection

The pre-test and post-test data collection was carried out by using a questionnaire developed ad hoc for this research, consisting of two questions on the perception of disciplinary integration from a general point of view, as well as its relation to the CLIL approach:

- What do you understand by disciplinary integration in Primary Education?
- Do you see any relationship between disciplinary integration and CLIL?

In addition, they were asked to complement their answers to each question with a graphic representation that concretised and/or exemplified them.

Data Analysis

Initially, at the end of the first phase, each of the first two authors of the research deductively categorised the responses of the students participating in the first experimental group, assigning a level of perception of disciplinary integration based on the following proposals from Gresnigt et al. [6, p. 6]:

(1) Isolated/Cellular: Separate and distinct subjects or disciplines. Often viewed as the fragmented traditional way of teaching.
(2) Connected/Aware: Explicit connection is made between the separate disciplines, deliberately relating subjects rather than assuming that students will understand the connections automatically.
(3) Nested/Fused: A skill or knowledge from another discipline is targeted within one subject/discipline. Content from one subject in the curriculum may be used to enrich the teaching of another subject.
(4) Multidisciplinary: Two or more subject areas are organized around the same theme or topic, but the disciplines preserve their identity.
(5) Interdisciplinary: In the interdisciplinary course, there may be no reference to individual disciplines or subjects. There is a loss of the disciplines' perspectives, and skills and concepts are emphasized across the subject area rather than within the disciplines.
(6) Transdisciplinary: The curriculum transcends the individual disciplines, and the focus is on the field of knowledge as exemplified in the real world.

In cases of disagreement, a consensus was reached between the two evaluators. At the end of the second phase of the research, the same process was carried out for

Table 10.1 Kolmogorov–Smirnov test

		Kolmogorov-Smirnov[a]		
	Group	Statistic	gl	Sig.
Pre-post difference	Total sample	0.254	44	0.000
Pre-post difference	Experimental 1	0.297	21	0.000
Post		0.679	21	0.000
Pre-post difference	Experimental 2	0.299	23	0.000
Post		0.700	23	0.000

[a] Lilliefors' significance correction

the second experimental group. Finally, to ensure the thoroughness of the analysis, this process was repeated three months later for the entire sample.

Secondly, both descriptive and inferential statistics were used for the analysis of the data obtained.

Version 26.0 of the statistical software IBM SPSS Statistics was used for inferential statistics. The Kolmogorov–Smirnov test was used to assess the normality of the data distribution, which in all cases yielded results of a significant p-value < 0.05, indicating a violation of the normality assumption. The results of this test are shown in Table 10.1.

Non-parametric statistics were therefore used for the data-analysis process.

Results

After categorization, the perceived levels of disciplinary integration among the students were determined. First of all, Table 10.2 shows an example of a definition and graphical representation for each category that emerged from the analysis of the answers to the question `What do you understand by disciplinary integration in Primary School Education?

As can be seen, the category of transdisciplinarity does not appear in any definition or graphic representation in the sample under analysis.

Table 10.3 shows the general descriptive statistics for both the total sample and each of the experimental groups.

As can be seen, both in the total sample and in the two experimental groups, there was an improvement in the perceived levels of disciplinary integration that the students presented before and after the intervention. There was also an improvement in the level presented after the second intervention with regard to the first one. Table 10.4 shows the detailed frequencies and percentages corresponding to each level of perception both for the total sample and for each of the experimental groups.

It can be observed that, in both the total sample and each experimental group, there is a good percentage of the sample that flows from the connected level (the most abundant in the pre-tests) to the multidisciplinary level (the most abundant in the post-tests).

Table 10.2 Example of a definition and graphical representation for each category

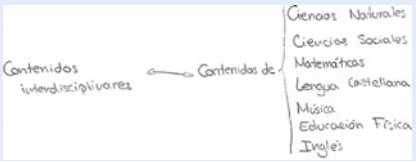
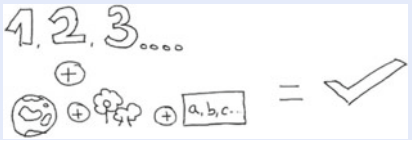
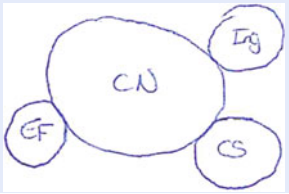
Category	Definition	Graphical representation
(1) Isolated/ cellular	The contents or the skills are taught at the same time as the contents of the subjects	
(2) Connected/ aware	Several disciplines are combined in one classroom	
(3) Nested/fused	Implemented when other subjects are covered in one subject	
(4) Multidisciplinary	Implementation of joint work within several subjects around the same common thread	
(5) Interdisciplinary	Integration of content from two or more subject areas, in order to solve problems	

Table 10.3 General descriptive statistics on the perceived levels of disciplinary integration

	Group	*N*	*M*	*SD*
Pre	Total sample	44	2.5	0.976
Post		44	3.45	0.875
Pre	Experimental 1	21	2.43	1.076
Post		21	3.24	0.944
Pre	Experimental 2	23	2.57	0.896
Post		23	3.65	0.775

The pre-test and post-test scores were then compared. Both in the total sample and taking each of the experimental groups, the Wilcoxon signed-rank test revealed the existence of statistically significant differences. Table 10.5 shows the results of this test.

Table 10.4 Table of detailed frequencies for each level of perception

		Pre		Post	
		Frequency	Percentage	Frequency	Percentage
Total sample (N = 44)	Isolated	2	4.5	0	0
	Connected	30	68.2	10	22.7
	Nested	1	2.3	5	11.4
	Multidisciplinary	10	22.7	28	63.6
	Interdisciplinary	1	2.3	1	2.3
	Transdisciplinary	0	0	0	0
Experimental 1 (n = 21)	Isolated	2	9.5	0	0
	Connected	14	66.7	7	33.3
	Nested	0	0	2	9.5
	Multidisciplinary	4	19	12	57.1
	Interdisciplinary	1	4.8	0	0
	Transdisciplinary	0	0	0	0
Experimental 2 (n = 23)	Isolated	0	0	0	0
	Connected	16	69.6	3	13
	Nested	1	4.3	3	13
	Multidisciplinary	6	26.1	16	69.6
	Interdisciplinary	0	0	1	4.3
	Transdisciplinary	0	0	0	0

Table 10.5 Wilcoxon signed-rank test for the total sample and by groups

	Group	Post–pre
Z	Total sample	− 4.453[a]
Asymptotic sig. (bilateral)		0.000
Z	Experimental 1	− 2.774[a]
Asymptotic sig. (bilateral)		0.006
Z	Experimental 2	− 3.505[a]
Asymptotic sig. (bilateral)		0.000

[a] Based on negative ranges

Table 10.6 Mann–Whitney U-test for the groups

	Post
Mann–Whitney *U* test	187.500
Z	− 1.486
Asymptotic sig. (bilateral)	0.137

Next, the scores achieved in the post-test were compared between the two experimental groups. In this case, the Mann–Whitney U test revealed no statistically significant differences. Table 10.6 shows the results of this test.

Table 10.7 Hedges' g for pre-post effect size per group

	Pre-test	Post-test			
	M (*SD*)	*M* (*SD*)	Z	*p*	δ
Experimental 1	2.42 (1.07)	3.23 (0.94)	− 2.774	0.006	0.75
Experimental 2	2.56 (0.89)	3.65 (0.77)	− 3.505	0.000	1.22

The results shown in the above table are very positive in both groups. However, the independent effect sizes of the statistically significant differences between the pre-test and post-test scores in both experimental groups were estimated with Hedges' g. Table 10.7 shows the results of this test.

A statistically significant increase in scores between the first and second measurement can be identified, with a moderate effect size in the first experimental group (Hedges' $g = 0.752$) and a large effect size in the second (Hedges' $g = 1.224$). Therefore, it can be stated that the improvements implemented in the second experimental group had an outstanding influence on the results.

Discussion and Conclusions

The aim of this research was to establish the perceptions of disciplinary integration of trainee teachers after the implementation of an iSTEAM+CLIL co-teaching proposal.

From a general perspective, on the one hand, we can affirm that the experience of designing a short integrated iSTEAM+CLIL project favoured the development of competences that led to a better understanding of the process of disciplinary integration among students. The CLIL approach, implemented through activities linked to the Natural and Social Sciences and using the story as the main structural thread, has not only offered students the chance to articulate the activities of the different areas, but also to improve their initial lack of understanding of integration. In fact, CLIL has been identified as a catalyst or a 'facilitator of integration' in many of the students' responses. In this regard, Schietroma [26] demonstrated that CLIL is suitable for increasing motivation, developing European key competences and promoting integration. In this case, chemistry learning was performed for adolescent and adult learners in a multicultural context, through experiments, group work, and PBL. These types of methodologies, similar in nature to those used in this research, facilitated the learning of subjects with a high degree of complexity, using a language other than the native one as a facilitating element, which, together with an innovative methodology, considerably increased student motivation. In summary, CLIL appears to be well suited to promote a positive attitude towards STEAM and an improved conception of integration. However, we must bear in mind that the integration of STEAM and foreign language will be effective when it combines the acquisition of disciplinary knowledge with the mastery of the foreign language in a comprehensive way, so that, rather than facilitating its

comprehension, the use of a foreign language will not hinder an understanding of disciplinary content [27]. Thus, conceptual integration with foreign language learning is more fruitful if the learning experience is connected to real life and involves the use of cognitively challenging tasks [28], an issue that has been covered in this proposal through the use of specific methodologies in the two disciplinary areas that are involved. The inquiry methodology was used in the area of Social Sciences, which at the same time develops critical thinking skills that, starting with current social problems, connect with historical reality and consolidate the acquisition of disciplinary contents of both History and historical research skills. In the area of Natural Sciences, the inquiry methodology and engineering design led students to approach scientific concepts through manipulative, experimental and collaborative activities, giving meaning to concepts that can otherwise be very abstract.

It is also necessary to clarify that for a CLIL class to be effective, teacher qualification is essential, so the didactic skills of teachers must be expanded through compensatory strategies, focusing on multimodality, and the incorporation of language teaching into disciplinary classes, in combined learning [29]. For example, del Gaudio [30] remarked that the results of the Innovative Continuous Professional Development and Learning (ICPDL) activities carried out by implementing CLIL teaching, ICT tools, and IBSE (Inquiry-Based Science Education) methodology, made it possible to involve and to motivate students in scientific experiences and communication in a foreign language (English), also acquiring the relevant vocabulary and language skills.

From a more detailed perspective, we agree with Novotná and Procházková [29] that new technologies, in our case through videos of the didactic proposals that the students filmed for oral presentations, appear to facilitate the acquisition of various contents. Chubko et al. [31] also conducted a CLIL and STEM integration project through the use of an educational-technological intervention based on Digital StoryTelling (DST). In this case, the digital storytelling or video production as an expression of DST also produced a positive influence on the learning of English as a foreign language and the acquisition of disciplinary literacy. Anderson et al. [32] also highlighted the potential of DST to integrate multiple disciplines, so that students could develop higher-order thinking skills.

On the other hand, based on the results of this research, it appears that co-teaching is a major element in working on disciplinary integration, which is in accordance with Scantlebury et al. [16], who highlighted the importance of co-teaching among teachers, reducing the feeling of isolation with the support of a working group, and balancing the act of giving and receiving. According to Yoo et al. [33], co-teaching is an indispensable element of risk-taking and responsibility, and the teachers in their study learned to observe their practice from a 'growth-oriented' perspective by engaging in a co-generative and reflective dialogue, such as the one conducted in this research using the focus group technique. Moreover, these authors highlighted the importance of co-teachers for students in so far as they provide both logistical and emotional support in the classroom, which were aspects that the students participating in this study explicitly mentioned.

In conclusion, we propose that on the basis of the results of this research there is a need to continue working along these lines, in particular the work on co-teaching in primary and secondary education teacher training courses. In this way, we will be able to train teachers who understand disciplinary integration as something natural and relevant, in order to achieve teaching in accordance with the current times. It is also necessary to continue evaluating the results derived from this type of proposal, given the scarce literature available to date. In this sense, we propose to build on this study to develop further research, including control groups that will shed further light on the subject under study.

References

1. Delgado R (2009) La integración de los saberes bajo el enfoque dialéctico globalizador: la interdisciplinariedad y transdisciplinariedad en educación. Investigación y Postgrado 24(3): 11–44
2. Barrios Silva C (2020) La formación interdisciplinaria del maestro primario desde la educación agropecuaria en la escuela cubana actual. Mendive. Revista de Educación 18(2): 394–411
3. Gutiérrez Cordero R, Cremades Begines A, Perea Díaz B (2011) La interdisciplinariedad de la música en la etapa de educación primaria. Espacio y Tiempo, Revista de Ciencias Humanas 25:151–161
4. Klein JT (1990) Interdisciplinarity: history, theory, and practice. Wayne State University Press
5. Espinoza Freire EE (2018) Interdisciplinary planning in the education of professionals in education. Maestro y Sociedad 15(1):77–91
6. Gresnigt R, Taconis R, van Keulen H, Gravemeijer K, Baartman L (2014) Promoting science and technology in primary education: a review of integrated curricula. Stud Sci Educ 50(1): 47–84
7. Revel Chion A, Adúriz-Bravo A (2021) In sickness and in health. Science & Education. Published online August 16, 2021
8. Ryu M, Mentzer N, Knobloch N (2019) Preservice teachers' experiences of STEM integration: challenges and implications for integrated STEM teacher preparation. Int J Technol Des Educ 29(3):493–512
9. Chian MM (2020) Tracing the development of literacy practices for integrating interdisciplinary curriculum in higher education: international ethnographic study. Trabalhos em Linguística Aplicada 59(1):173–212
10. Bautista A, Tan L, Ponnusamy L, Yau X (2015) Curriculum integration in arts education: connecting multiple art forms through the idea of 'space.' J Curric Stud 48(5):610–629
11. Imbernón F, Colén MT (2015) Los vaivenes de la formación inicial del profesorado. Una reforma siempre inacabada. Tendencias Pedagógicas 25:57–76
12. Lazo Pérez MA (2011) La interdisciplinariedad y la integralidad: una necesidad de los profesionales de la educación. Atlante. Cuadernos de Educación y Desarrollo 3(27)
13. Folch Dávila C, Córdoba Jiménez T, Ribalta Alcalde D (2020) The performance: an interdisciplinary proposal from the departments of physical education, music education and visual arts education in the initial teacher training. Retos 37:613–619
14. Suárez-Díaz G (2016) Co-teaching: teachers' conceptions and practices in a school of education in Peru. Revista Electrónica de Investigación Educativa 18(1):166–182
15. Bouck E (2007) Coteaching… not just a textbook term: implications for practice. Prev Sch Fail 51(2):46–51

16. Scantlebury K, Gallo-Fox J, Wassell B (2008) Coteaching as a model for preservice secondary science teacher education. Teach Teach Educ 24(4):967–981
17. Zeidler DL (2016) STEM education: a deficit framework for the twenty first century? A sociocultural socioscientific response. Cult Sci Edu 11(1):11–26
18. Ortiz-Revilla J, Adúriz-Bravo A, Greca IM (2020) A framework for epistemological discussion around an integrated STEM education. Sci Educ 29(4):857–880
19. Ortiz-Revilla J, Sanz-Camarero R, Greca IM (2021) Una mirada crítica a los modelos teóricos sobre educación STEAM integrada. Revista Iberoamericana de Educación 87(2):13–33
20. Aguilera D, Ortiz-Revilla J (2021) STEM vs. STEAM education and student creativity: a systematic literature review. Educ Sci 11(7):331
21. Colucci-Gray L, Burnard P, Cooke C, Davies R, Gray D, Trowsdale J (2017) Reviewing the potential and challenges of developing STEAM education through creative pedagogies for 21st learning: how can school curricula be broadened towards a more responsive, dynamic, and inclusive form of education? BERA
22. Kang N-H (2019) A review of the effect of integrated STEM or STEAM (science, technology, engineering, arts, and mathematics) education in South Korea. Asia-Pacific Sci Educ 5(6):1–22
23. Sanz de la Cal E, Alonso Centeno A (2021, Oct 15–17) Propuesta piloto de intervención del modelo selfie "STEAM Educational Approach and Foreign Language Learning in Europe" para la educación bilingüe en Primaria: su implementación y resultados (conference sesión). VII Congreso Internacional de Enseñanza Bilingüe en Centros Educativos (CIEB), Valladolid, España
24. Creswell JW, Guetterman TC (2019) Educational research: planning, conducting, and evaluating quantitative and qualitative research, 6th edn. Pearson
25. Onwuegbuzie AJ, Dickinson WB, Leech NL, Zoran AG (2009) A qualitative framework for collecting and analyzing data in focus group research. Int J Qual Methods 8(3):1–21
26. Schietroma E (2019) Innovative STEM lessons, CLIL and ICT in multicultural classes. J e-Learn Knowl Soc 15(1):183–193
27. Ting YLT (2017) STEM-education through a foreign language plus a dash of digital (E-FL-STEM): addressing both the content- and the language-dimension of knowledge. In: EDULEARN17 proceedings. IATED, pp 9109–9118
28. Álvarez Sánchez B (2016) Combining PBL and CLIL in the scientific laboratory in secondary education [master's thesis, International University of La Rioja]. Re-UNIR. https://reunir.unir.net/bitstream/handle/123456789/3613/ALVAREZ%20SANCHEZ%2C%20BEATRIZ.pdf?sequence=1
29. Novotná J, Procházková L (2013) Searching for the ideal CLIL course design. In: Proceedings of the 12th European conference on e-learning. ACPI, pp 354–359
30. del Gaudio R (2020) How to implement CLIL teaching methodology to bring secondary education students to a real science laboratory to improve their creativity and develop transversal skills in practical team activities. In: INTED2020 proceedings. IATED, pp 9108–9184
31. Chubko N, Morris JE, McKinnon DH, Slater EV, Lummis GW (2020) Digital storytelling as a disciplinary literacy enhancement tool for EFL students. Educ Tech Res Dev 68(6):3587–3604
32. Anderson J, Chung Y, Macleroy V (2018) Creative and critical approaches to language learning and digital technology: findings from a multilingual digital storytelling project. Lang Educ 32(3):195–211
33. Yoo J, Heggart K, Burridge N (2019) Collaborative coteaching (CCT): practitioner learning through shared praxis. Austr J Teacher Educ 44(4):65–77

Almudena Alonso-Centeno is a teacher of Didactics of Social Sciences in the Department of Specific Didactics at University of Burgos, Spain. She holds a Ph.D. in Humanities. Her scientific work focuses in the teaching–learning process of Social Sciences.

Jairo Ortiz-Revilla is an Assistant Professor of Didactics of Experimental Sciences in the Department of Specific Didactics at University of Burgos, Spain. He holds a Ph.D. in Education. His scientific work focuses primarily on competence development, integrated science education and integrated STEM/STEAM education.

Ileana María Greca is a Full Professor of Specific Didactics at the Universidad de Burgos (Spain), with a Ph.D. in physics teaching (2000), by the Federal University of Rio Grande do Sul (Brazil). Her main research interests are the improvement of science teaching using psychological, epistemological and didactic frameworks and the introduction of topics of modern physics for secondary and high school students.

Esther Sanz de la Cal is a Lecturer of Didactics of Language and Literature in the Department of Specific Didactics at University of Burgos, Spain. She holds a Ph.D. in Education. Her scientific work focuses primarily on foreign language teacher training and Content and Language Integrated Learning at schools.

11 The Contribution of Interdisciplinary Education to the Development of Students Competences with Intellectual Disabilities. An Analysis from the Social and Rights Model

María Teresa Ortega-Camarero and Vanesa Baños-Martínez

Abstract

Interdisciplinary education is presented as an opportunity to address the challenges of education, especially in the case of the most vulnerable groups. People with intellectual disabilities, because of their specific cognitive processes that influence their learning, have particularly suffered the consequences of school exclusion. In recent years, international treaties have addressed the inclusive education of people with disabilities as one of the problems to be tackled, in a context of diversity and learning for all, and at all stages of life. In the face of difficulties, the foundations that define interdisciplinary education make it a good practice for achieving equal educational opportunities, by addressing content in a holistic way that is close to real problems. This chapter delves into interdisciplinary education as a strategy available for the learning of people with intellectual disabilities, under the approach of the social and rights model, establishing links between the context and the person through new approaches, thus offering a new framework of opportunities for lifelong, quality and inclusive learning.

Keywords

Interdisciplinary teaching · Disabled people · Inclusive education · Lifelong learning

M. T. Ortega-Camarero · V. Baños-Martínez (✉)
University of Burgos, Burgos, Spain
e-mail: vbanos@ubu.es

D. Ortega-Sánchez (ed.), *Controversial Issues and Social Problems for an Integrated Disciplinary Teaching*, Integrated Science 8,
https://doi.org/10.1007/978-3-031-08697-7_11

Introduction

The educational inclusion of students with intellectual disabilities is one of the current social problems related to education in a context in which it is urgent to implement models that guarantee equal opportunities [1]. Disability is nowadays a matter of rights. The activism of the disability social movement and the demands of people with disabilities themselves [2] have put disability on the political agenda as well as on a level of social recognition. In the field of education, the right to inclusive education has a relevant position in the United Nations Convention on the Rights of Persons with Disabilities (CRPD) [3], although it is true that this has not always been the case.

Inclusive education implies the transformation of educational cultures, policies and practices in order to eliminate or minimise the barriers that prevent the presence, participation and progress of excluded groups. In short, it would be a matter of aligning educational regulations and experiences with the principles that define the social model of disability, as a current conceptual framework in which learning problems, and others that affect people with disabilities, are not so much in the person, but in an environment that is not adapted, not accessible and that prevents the development of the competences of these students [4]. Underlying this conception is the rights model and the recognition of inclusive, free and quality education [3].

Among the new learning approaches, interdisciplinary education is beginning to gain special relevance, as a response to a changing and complex environment, which can help to understand reality from a holistic conception and beyond the sum of disciplines [5].

In this chapter we address interdisciplinary education as a strategy for success in the teaching–learning process of people with intellectual disabilities, showing how it can compensate for some of the peculiarities that prevent them from achieving success in their educational processes, both formal and non-formal. Based on the current conceptualisation of disability and, therefore, on the importance of having friendly and adapted environments, education is presented as a permanent right for people with intellectual disabilities, a right that should not only be recognised, but also become a reality through new approaches and specific actions.

A New Paradigm for Interpreting Disability: The Social and Rights Model

The evolution of what we understand by disability, its conceptualisation and intervention policies are undoubtedly the result of the application of scientific, genetic and therapeutic advances, but also of social changes and how disability is interpreted sociologically. These interpretations have given rise to models that broadly coincide with different historical periods, and with their corresponding definition of the individual, in accordance with the philosophy of each era [6, 7].

The traditional or eugenic model, the medical or rehabilitative model and the social model have given rise to successive theories that over the years have explained disability from a sociological perspective, but have also had important consequences on the lives of people with disabilities and the way in which they have been supported, also in the educational sphere.

The three aforementioned models are conditioned by different explanations of the causes of disability (divine, medical or social) and the role that society provides for disabled people [4]. Depending on how these questions are considered, each society has generated individual and collective responses to people with disabilities, and even plans and designs its care policies [8], including those of an educational nature [4].

The current interpretation of the social and rights model emphasises people's capabilities over disabilities. At the educational level, it focuses on developing competences rather than on limitations in functioning [9]. It stems from the demand of disabled people themselves to be recognised for the great contribution they can make to society if it accepts them as they are [10]. Universal accessibility, design for all and mainstreaming in disability policies become its differentiating elements, inspired by the activists, people with disabilities, who created a basic model for understanding the new paradigm of disability [11].

A longitudinal historical analysis of the explanatory models of disability shows a conflicting, even confrontational, relationship between the so-called medical model and the current social model, a relationship of tension resulting in an important conceptual change of disability which is produced by definitively overcoming this confrontation [8].

The medical or rehabilitative model, which has prevailed since the second half of the twentieth century, makes it possible to overcome the approaches of a first traditional model of disability, which considered it to be the consequence of a tragedy or divine punishment, and which condemned disabled people to social isolation or, in the worst case scenario, to extermination.

This new medical model results from the application to disability of medical-biological approaches to explain diseases, considering disability as a permanent consequence of diseases or accidents [12]. It inspires the International Classification of Impairments, Disabilities and Handicaps of the World Health Organisation [13], offering for the first time an excellent category of useful tools and research for medical approaches linked to disability, by emphasising aspects related to the health and well-being of the person [14].

It was also the time of the origin of the associative movement that began to raise its voice about the needs of disabled people and which would later demand the exercise of their rights [15]. Another aspect of interest is that, based on this interpretation of disability, the question arises that disability cannot only be "rehabilitated", but also prevented [7].

Reactions to the principles of the medical or rehabilitative model generated, around the 1960s, the so-called social model of disability, which marked the beginning of a profound change in the treatment and definition of disability at an

international level, generating a very active current of positioning led by people with disabilities themselves [16–19].

The social model is full of interpretations and manifestations [8] that bring it closer to a paradigm than a model [20]. Furthermore, it generates academic, social and political consensus by considering that disability is no longer exclusively a personal problem caused by an impairment, so that social factors become a first level element in the situation of the person with disability [4]. In its more integrative interpretation, the social model explains that social causes are enormously influential in disability, but without forgetting the medical and psychological substrate that sustains them [21], establishing relationships between the different levels that interfere in disability (biological, personal and social) in order to implement coordinated interventions on each of them in a balanced way [8]. Under this new interpretation, the problem of integration or the possibilities of participation of disabled people in different environments would not be so much in the person, but in a context that does not allow that participation, that disables [20].

This approach inspired the publication of a new International Classification of Functioning, Disability and Health (ICF) [22], after identifying the need to modify the excessively medicalised approaches of the 1980 Classification [13]. It incorporates personal and environmental factors, which implies that the context is also a determining aspect in the construction of disability, and explicitly states the need to operate on the basis of individuality and not on the basis of collectivity [23].

Currently, the social model has just been shaped by incorporating the field of rights, with two new foundations for understanding disability: the need to give equal value to all the lives of all human beings; and the obligation to guarantee the same rights and opportunities to all people [24]. Both should currently inspire policies and methodologies of attention to diversity [25], finding international recognition for the first time in the United Nations International Convention on the Rights of Persons with Disabilities [26].

This implies that educational systems must be adapted and adequate to the learning peculiarities of disabled people, especially those who have greater difficulties. The application of new systems of educational intervention will help people with intellectual and developmental disabilities to develop their competences and prepare themselves for life, solving some of the main difficulties that conventional education generates for them.

Historical Approach to Interdisciplinarity from the Integrated Approach and Theoretical Foundations

Studies on interdisciplinarity and transdisciplinarity have gained prominence and relevance over the last 30 years [27], with many researchers focusing on interdisciplinarity [28–30]. However, some of the classical authors of ancient Greece, such as Plato and Aristotle, had already managed to systematise the knowledge available up to that time in a global way, involving different areas of knowledge.

It was not until the fifteenth century when, in the Renaissance, the objects of study of the different sciences began to be studied in greater depth. It was from that moment onwards when knowledge began to be fragmented and greater specialisation was sought, leaving the disciplines with no links between them [31].

Gradually, during the seventeenth and eighteenth centuries, autonomous areas of knowledge appeared and a strong specialisation took place, particularly in the natural sciences, with the development of new, independent and differentiated scientific disciplines, thanks to which many scientific and technical advances were made [32]. This disciplinary organisation was finally institutionalised in the nineteenth century, with the creation of the modern university and the development of the concept of discipline in France [27], which legitimised the study of fragmented knowledge, based on the benefit for a process of industrialisation that was beginning [33]. However, some authors such as Ortega y Gasset [34] were critical and argued that the specialisation of knowledge had distorted the real vision of the world, leading many researchers to take a reductionist view of the problems and revealing a certain nostalgia for an integrated culture.

Thus, from the second half of the twentieth century onwards, hybrid disciplines began to emerge that sought to break down disciplinary boundaries in order to confront the problem of ultra-specialisation and address phenomena from various areas of knowledge [35]. Interdisciplinarity was thus born as a reaction to specialisation, due to the dissatisfaction that the perspective of classical science generated in various fields of knowledge.

At present, the changing nature of knowledge and the complexity of problems due to their multidimensional nature mean that the concept of discipline must be broadened and new concepts such as multidisciplinarity, interdisciplinarity and transdisciplinarity have appeared [30]. Therefore, we can say that there are three different approaches to talk about integration [36]. These approaches make us move from an integration of disciplines without transforming them when we speak of multidisciplinarity to a full fusion with a holistic perspective in transdisciplinarity, passing through the convergence or connection of interdisciplinarity [37]. Transdisciplinarity is a young term and its initiators include Jantsch et al. [27]. According to Morin [38], we must be able to understand the complexity that surrounds us and seek explanations to problems in a broad context, going beyond a simple sum of disciplines [5].

The concept of interdisciplinarity was defined by Unesco [39] as the cooperation of various disciplines, which contribute to a common goal and which, through their association, contribute to the generation of new knowledge, new languages and a common perspective, breaking disciplinary boundaries in search of the circulation of concepts and the formation of hybrid disciplines [5, 40]. In this way, the concept of interdisciplinarity is understood as a level of collaboration between disciplines that implies reciprocity and mutual enrichment, to the point of elaborating broader conceptual frameworks that modify the disciplines in contact and make them dependent on each other [41]. Consequently, an interdisciplinary vision generates integrative qualities that disciplines did not have in isolation, which provides an organisation of knowledge that is more closely linked to reality [42].

Therefore, if integrated learning content can be designed in multidisciplinary, interdisciplinary or transdisciplinary ways [43], in the proposal we are presenting we will take as a reference the interdisciplinary approach whose characteristics are close to the needs of people with intellectual disabilities. We consider that it can be a first step to work with this group in which such an approach is already innovative.

The Concept of Interdisciplinary Teaching

In the field of education, problems of an interdisciplinary nature constitute an opportunity to educate in a non-fragmented perspective of the world. Most of today's major social problems (immigration, inclusion, climate change or ageing) must necessarily be addressed through interdisciplinary studies and, in this context, an interdisciplinary pedagogy seeks to deepen the teaching–learning processes so that students acquire a holistic view of complex phenomena in both nature and society [44]. In this sense, despite the different meanings of interdisciplinarity, there is consensus that this term is the principle of all curricular design and didactic methods, so it must be assumed by teachers and students and as a process of enriching the curriculum and the learning of its actors [45].

We therefore understand interdisciplinary teaching as the educational act where interrelationships and reciprocal actions between academic disciplines at curricular, didactic and pedagogical levels are established and manifested. This leads to articulations, complementarities and convergences, strictly speaking, from different aspects (purposes, concepts, learning strategies, values, skills, etc.) so that the student integrates the learning processes and their knowledge in the context of a contextualised and complex object of study; and the management of diverse teams.

According to Hasni [46], Lenoir [47] and Lenoir and Sauvé [29], there are three processes in this approach: one is carried out by the teacher, the integrative approach, where there is a curricular articulation of the study programme; at the didactic level, in the planning of the educational intervention and its reflection; and at the pedagogical level, by providing the activities and methods. The other is carried out by the learner: integrating learning processes by engaging in mediating processes that encompass stages of learning, for the objectification between the learner and the objects of learning. And as a result of the two processes an internal cognitive product is generated, the integration of knowledge (integrated knowledge), defined by the learning outcome acquired by the learner (knowledge, skills, learned and integrated and/or developed competences). Therefore, an integrated teaching–learning process has to be related not only with learning content, but also with personal development in a social sphere, according to students' abilities.

Approaches in the literature, including the Handbook of Interdisciplinarity [48, 49], state that there is no single interdisciplinary didactic model, since achieving the purposes of interdisciplinary teaching requires higher cognitive

processes, inter- and intrapersonal learning that are not addressed by a single model. According to research [29, 50], one or several interdisciplinary pedagogical models can be adopted.

A very common teaching and learning strategy in interdisciplinary teaching is problem solving, as it favours the understanding of concepts and the establishment of connections between them [51], promotes the ability to integrate knowledge in order to apply it [52], benefits the development of self-directed learning skills, information gathering and self-assessment techniques and, in addition, prepares for professional performance [53]. On the other hand, other authors confirm that interdisciplinary teaching reaches students at a cognitive level, as it improves relational skills, has the ability to adapt knowledge in unexpected and changing contexts [54], generates flexible thinking, favours the development of learning skills or the integration of different contexts and at the level of values contributes to developing sensitivity towards others, learning to move in diversity or to be more confident [55]. In short, it seeks to develop competences through intellectual challenge, the relationship with everyday life and its relationship with the context, and contributes to critical thinking. The efficiency of integrated teaching–learning is justified with the connection of learning to life, because life is a whole [43].

As outlined above, the process of interdisciplinary teaching is mediated by the management of diverse teams, since the formation of interdisciplinary teams is required both at the level of teachers and students and, if possible, with the participation of the community. At the level of teachers because it is with them that the process of carrying out the aforementioned articulation is initiated and developed. Diverse teams of students because they reflect the diversity of cultures, attitudes, abilities, etc., and they are the ones who will carry out the integrative activities. It has also been shown that diverse and effective teams enhance the process and result of the work [56] and that they must be managed in such a way to develop relationship skills within them, because dialogue is fundamental for the objective of interdisciplinary teaching to be achieved.

Thus, teachers need to re-evaluate their role in the classroom as this strategy involves organisational changes that can promote more meaningful learning experiences by connecting academics with real problem solving. In this sense, it is of great importance because combining several educational paradigms offers the possibility for each learner to learn in his/her own style [57]. The training of future teachers for integrated teaching must therefore be addressed, as it consists of organising content on the basis of its interdependencies and interrelationships in order to unify subject matter that is taught independently and in isolation [58].

Interdisciplinary or integrated teaching is believed to develop critical thinking, self-learning skills, deep learning and problem-solving skills [59]. In this sense, education is seen as the cornerstone for supporting not only active citizenship but also equal opportunities and social cohesion.

Conceptualisation of Intellectual Disability and Educational Problems Faced by People with Different Special Educational Needs

Disability, to a greater extent intellectual or developmental disabilities, is a term that is frequently associated with more or less significant difficulties in adaptive skills and in the acquisition of learning, especially in the learning of all those tasks and areas in which psychological functions of reasoning and metacognition are involved. These difficulties affect both formal and informal educational processes and manifest themselves in all contexts or domains of life [60].

If we stick to the concept and the current classification of intellectual disability, we notice that, as in the rest of the disabilities, an "ecological perspective" has been imposed that allows, in the case of intellectual disability, not to understand it as an absolute or fixed feature of the person, but that leads us to consider the interaction of the person with his/her environment, and especially the effect that supports can provide for his/her better functioning in society [61].

There is currently a certain academic and scientific consensus on the definition of intellectual disability coined by the American Association on Intellectual and Developmental Disability (AAIDD), which is the most widely recognised internationally [62]. This definition refers to limitations in both intellectual functioning and adaptive behaviour as expressed in conceptual, social and practical adaptive skills [63].

According to what has been pointed out so far, in the case of intellectual disability, probably more than in any other disability, it deserves special consideration to be analysed from a biopsychosocial approach, and to be understood as a particular state of functioning, which entails limitations in reasoning, problem solving, academic learning or abstract thinking [64].

Learning difficulties, which in most cases are linked to intellectual disability or developmental disabilities, generally have their origin in intrinsic factors, or limitations in brain functions or structures, in neurological alterations or dysfunctions that cause delays and alterations in the development of psychological functions and, often, a below average IQ. Therefore, it is not uncommon to find difficulties related to reasoning, attention, working memory, development and application of learning strategies and metacognition, directly involved in learning and adaptation to the environment.

The interaction of the person with the environment can be a condition that significantly decreases or increases the effects of the disability. Although intellectual disability may occur in conjunction with other disorders (e.g. sensory impairment, severe emotional disturbance, attention deficit hyperactivity disorder, specific learning difficulties) or with extrinsic influences (such as cultural differences, educational deficiencies, inappropriate or insufficient instruction), it is not the result of these conditions or influences.

According to the above, intervention in both formal and informal teaching and learning processes should be based on a number of methodological principles, as argued by Frith [65], Cuesta et al. [66], Howlin [67], Rios et al. [68], Mesibov and Shea [69], Martos-Pérez and Llorente-Comí [70] and Guerra and López-Gómez [71]:

1. As an initial condition, any intervention must be individualised, combining the interests, abilities and needs of each person. The learning style and pace of work of each person with a disability will be a determining factor when programming any activity. Prior to this programming, and after the analysis of individual needs, an individualised planning of support will be carried out, which may be natural, professional, technological or material.
2. Programmes, and therefore educational intervention, will be aimed at enhancing personal development in all areas of daily life, and therefore in all disciplines. Their planning will focus on relevant achievements and their development and organisation will be evaluated regularly among all the professionals involved in the teaching–learning process.
3. Understanding people's psychological functioning is essential for successful learning. It is necessary to go beyond behaviour and understand the way people feel and understand the world, as well as the way they construct learning and social development.
4. The starting point should be a close knowledge of the person, through known tasks organised in small sections of gradual difficulty (step-by-step learning), taking into account their emerging capacities and potential, adapting the objectives to the changes that occur during the learning process. This methodology allows everyone to carry out adapted activities, since the activity is understood as a process, thus facilitating participation in one or another step of the process by means of reduced groupings to promote individualised attention.
5. The teaching of a new task or content, or of another step in the sequence of a process, has to be done using the errorless learning technique, establishing a small distance between the acquired skill and the skill being worked on. This strategy helps to minimise the effort of acquiring new learning and allows individuals to achieve reinforcement through small accomplishments that are a lot of work for them. In addition, the inclusion of small, gradual changes makes people's tendency to routine more flexible.
6. At the beginning of any teaching–learning process, all necessary aids should be offered. As teaching progresses, support should be gradually withdrawn, enabling the progressive acquisition of control over the activity and, therefore, greater independence. In this way, each teaching–learning process is adapted to the support needs of the individual.
7. The introduction of alternative communication systems develops communication in people without verbal language or with great communication difficulties. The expressive possibilities of each person are assessed and an intervention programme adapted to the person is carried out, making use of all possible means of communication.

8. It is effective to use meaningful and active experiences, through which they can learn to function in a natural way. The principle of functionality and meaningful learning should be used as a starting point when carrying out different activities and, as far as possible, using real materials worked on in natural contexts or selecting learning objectives that are useful in the environments where the person develops. It is also important to maximise, through a variety of support options and formulas, the participation, enjoyment and meaningful learning of people for their inclusion in the community.
9. The adaptation to age in terms of direct treatment, materials and activities, derived from considering users as adults with their own rights and duties, makes it necessary to constantly design and elaborate materials adapted to the evolutionary period of the person. The participation of the person him/herself in their production makes it easier for them to acquire full meaning and for them to learn how to use them better.
10. The creation of a predictable environment will facilitate the perception of contingencies through the control of stimuli, responses, material or space, so that the person knows where he/she is and what is expected of him/her and can, at the same time, exercise some control over the environment and manage within it. This entails the need to anticipate, either visually or verbally, all relevant information in order for the person to understand each situation, especially when it comes to changes and unexpected events.
11. The use of behavioural techniques based on Positive Behavioural Support, the construction of prevention spaces and materials, and the substitution of maladaptive behaviours with communicative or adaptive behaviours that fulfil the same function for the person [72] is effective.
12. The teachers must assume their immersion in a process of continuous improvement that drives them to implement the most innovative techniques and principles and to carry out a constant self-evaluation that leads to the optimisation of the care and services provided, through the evaluation of the strengths and weaknesses of the intervention and its adjustment to the needs of the people.

We consider that an approach to intellectual disability from an integrated perspective is possible and necessary in order to include all the methodological principles outlined above, however, as we have seen, it would also be necessary for teachers to take into account not only the characteristics of disabled people but also their own ability to work in an interdisciplinary environment applying complex methodologies.

Contributions of Integrated Education to the Learning Difficulties of People with Intellectual Disabilities

The educational inclusion of children and young people with intellectual disabilities is a right recognised and guaranteed by the United Nations International Convention [39] as well as by education legislation. The underlying question is whether

these students are developing all their competences in the school environment, or whether, on the contrary, the formal educational model lacks specific methodologies and resources that respond to their learning peculiarities [71], in what may be one of the great social problems in the field of the education of people with intellectual disabilities [73].

In this sense, interdisciplinary education deserves to be taken into account. The cooperation of different disciplines when dealing with contents solves the difficulties for generalisation and abstraction that characterise the learning of people with intellectual disabilities, thus overcoming a fragmented vision of the world, and contributing to understand the whole as the sum of the parts and graduating the difficulty of the contents to the different levels.

The perspective of interdisciplinary education, which requires coordination between teachers, disciplines and methodologies, also contributes to the development of the competences of this type of student, enhancing their personal development and thus responding to the necessary joint organisation and planning between all the professionals involved in the teaching–learning process.

If anything characterises this educational methodology, it is contextualised learning and the connection of content with reality. It trains students in problem solving [59], developing not only knowledge but also social skills. This perspective is fully in line with the model of functioning of people with intellectual disabilities, insofar as their learning abilities are conditioned both by their intellectual abilities and by other dimensions of functioning such as adaptive skills [74]. Interdisciplinary education contributes to the principle of functionality and meaningful learning that should guide the teaching and learning process for people with intellectual disabilities [66]. The interconnection of diverse materials, with different disciplines and in flexible groupings of teachers and students contributes to the generalisation of learning, which is one of the major deficits associated with the learning of people with intellectual disabilities. The incorporation of the environment and the knowledge linked to the reality offered by the interdisciplinary perspective responds to the need to consider the impact of the context on the opportunities for inclusion of people with intellectual disabilities as defined by the social model.

In short, the deficits linked to attention, reasoning or working memory deficits of people with intellectual disabilities that condition their learning can be mitigated if teachers apply the fundamentals of interdisciplinary education that contribute to the development of learning skills [29], and of self-directed learning, which can contribute to the gradual withdrawal of supports and foster the independence of people with intellectual disabilities.

Finally, interdisciplinary education, by requiring the generation of diverse teams also from the point of view of the students, thus incorporates diversity as a key to learning. This is undoubtedly an essential contribution to fostering inclusion and to the mutual enrichment of the group of students. In short, it also enables the development of inclusion skills in groups of students, also contributing to the strategic objective of interdisciplinary education.

Conclusion

As previously stated, we can see a clear and beneficial relationship between the characteristics of interdisciplinary education and the learning needs of people with intellectual disabilities. An adequate educational approach to this type of students, both from the formal and non-formal fields, would contribute decisively to achieve progress towards a true social model and rights of people with intellectual disabilities. Integrating the interdisciplinary perspective means placing the education of people with disabilities in a transformative dimension, capable of responding to many of the demands not only educational but also social. In any case, there are obstacles that hinder teaching from an interdisciplinary perspective such as, for example, the fact that the training of teachers is disciplinary, so they must break a training paradigm when facing a new way of structuring their activity and interacting with other knowledge in which they are not specialists; the usual lack of experience in interdisciplinary work or the shortage of teachers in Special Needs Education.

International and supranational bodies are promoting the visibility of the most vulnerable groups, including people with disabilities, from a perspective based on the development of skills and, in educational terms, access to a system that until recently was not adapted to their needs. For example, in the Sustainable Development Goals (SDGs) of the 2030 Agenda [75] there are direct references to persons with disabilities in five SDGs. From the European institutions we find multiple references both to persons with disabilities and to their right to education. Thus, in the European Education Area by 2025 [76], it is stated that Education Systems at all levels should comply with the CRPD and it addresses six dimensions among which inclusive education and lifelong learning for all stand out. Interdisciplinary education has a place, therefore, not only in the formal systems but also in the organisations working with people with intellectual disabilities where there is a great field of action in which to combine contents, methodologies and forms of intervention that result in a greater autonomy through meaningful and active experiences linked to them.

Moreover, the European Skills Agenda [77] states learning is not limited to a single, specific phase in life and happens in different contexts, over the course of a lifetime and openly exposes the need to ensure social fairness, putting into practice the first principle of the European Pillar of Social Rights [78]: access to education, training and lifelong learning for everybody, everywhere in the EU.

On the other hand, the New European Agenda for Adult Learning [79] explains that a balanced allocation of resources for adult learning in education and training is needed, especially with regard to adult target groups which are from disadvantaged background, have disabilities or are affected by other factors that may cause exclusion. We cannot limit our attention to people with disabilities to formal education and the years of compulsory schooling, we have to claim the role of interdisciplinary or integrated education in all areas of life as it has been shown to develop critical thinking, self-learning skills, deep learning and problem-solving skills [59].

Finally, we come to the Strategy for the rights of persons with disabilities 2021–2030 [80] which states that education creates the foundations for combating poverty and for creating fully inclusive societies. Persons with disabilities have the right to participate in all educational levels and forms. A very interesting element is also included as it talks about the possibility of establishing an effective bridge to the mainstream educational system, continued training or to the labour market. The European approach to micro-credentials, through flexible and modular learning pathways, can positively impact employability and the lifelong learning process of persons with disabilities [81]. Education and training systems will find solutions to deliver more learner-centred, accessible and inclusive learning to a more diverse student body and also for recognition and accreditation. The Action Plan on Educational Support and Inclusive Education [82] proposes an adaptation of curricula to the needs of learners with disabilities, for example, through alternative leaving certificates allowing for continuation of education, training courses for teacher to develop competences to manage diversity in the classroom, etc. These proposals and the initiatives they entail are closely related to interdisciplinary teaching in the sense that they favour the development of interesting actions that are adapted to the needs of the individual, the market and the education systems.

There is still a long way to go in this respect, however, the issue of disability is already on all agendas and in the medium term, if all plans are implemented and move from the theoretical level to practical reality, educational opportunities for people with disabilities will open up. For its part, interdisciplinary education can be a strategy on which to anchor the foundations for a personalised, participatory and competency-based education. It could focus on the key competences for lifelong learning adopted in May 2018 [83] which are at the heart of the European Education Area. Finally, competences become relevant if they can be assessed and validated and thus made meaningful and in the near future probably, as stated before, this will become a reality for all and, of course for persons with disabilities.

In this sense, through this proposal of joining disability and integrated teaching, which is not only educational but also social in nature, equal opportunities are sought in access to different educational actions that contribute to the development of relevant skills, both in terms of personal fulfilment and employment, that have an impact on the well-being of all those who take part, generate social participation and social cohesion in their community

References

1. UNESCO (2016) Educación 2030: Declaración de Incheon y Marco de Acción para la realización del Objetivo de Desarrollo Sostenible 4: Garantizar une aducación inclusiva y equitativa de calidad y promover oportunidades de aprendizaje permanente para todos
2. Valle Escolano R (2020) La protección de los derechos de las personas con discapacidad en situaciones de crisis. Rev española Discapac 8:85–106
3. United Nations (2016) Convention on the rights of persons with disabilities (CRPD)

4. Palacios A (2008) El modelo social de discapacidad: orígenes, caracterización y plasmación en la Convención Internacional sobre los Derechos de las Personas con Discapacidad, CERMI. CINCA
5. Garcia R (2011) Interdisciplinariedad y sistemas complejos. Rev Latinoam Metodol las ciencias Soc 1:66
6. Barnes C, Mercer G (2005) Disability, work, and welfare: challenging the social exclusion of disabled people. Work Employ Soc 19:527–545. https://doi.org/10.1177/0950017005055669
7. Velarde-Lizama V (2012) Los modelos de la discapacidad: un recorrido histórico. Empres y Humanismo 15:115–136
8. Jiménez Lara A (2007) Conceptos y tipologías de la discapacidad: documentos y normativas de clasificación más relevantes. Tratado sobre discapacidad. ISBN 978-84-8355-138-7, pp 177–205
9. Palacios A (2017) El modelo social de discapacidad y su concepción como cuestión de derechos humanos. Rev Colomb Ciencias Soc 8:14–23. https://doi.org/10.21501/22161201.2190
10. Asís Roig RF de, Bariffi FJ, Palacios Rizzo A (2007) Principios éticos y fundamentos jurídicos. Tratado sobre discapacidad. ISBN 978-84-8355-138-7, pp 83–113
11. Palacios A, Romañach J (2006) El modelo de la diversidad: la bioética y los derechos humanos como herramientas para alcanzar la plena dignidad en la diversidad funcional
12. Díaz Velázquez E (2018) La investigación social en la esfera de la discapacidad: realidad y tendencias. Rev española Discapac 6:191–203. https://doi.org/10.5569/2340-5104.06.02.10
13. World Health Organization (1980) International classification of impairments, disabilities, and handicaps: a manual of classification relating to the consequences of disease, published in accordance with resolution WHA29.35 of the Twenty-ninth World Health Assembly, May 1976
14. Ortega Camarero MT (2020) Los itinerarios individualizados para el empleo: una metodología clave para el tránsito de una escuela inclusiva a una sociedad inclusiva. In: Fernández-Hawrylak MF, Heras Sevilla D, Gómez Monedero JA (eds) Ampliando horizontes en educación inclusiva [Recurso electrónico]: XVII Congreso Internacional y XXXVII Jornadas de Universidades y Educación Inclusiva. 21, 22 y 23 de septiembre de 2020 (aplazado en abril por Covid-19). Servicio de Publicaciones e Imagen Institucional, Burgos, pp 845–851
15. Albor J, Ortega M, Peña C, Muñoz M (2006) Itinerarios formativos hacia el empleo de los jóvenes con discapacidad en España. Temas a repensar y propuestas a debatir. In: Libro verde sobre los itinerarios hacia el empleo de los jóvenes con discapacidad intelectual. AFEM, pp 449–464
16. Abberley P (2008) El concepto de opresión y el desarrollo de una teoría social de la discapacidad. Superar las barreras la Discapac 18 años. Disability Soc:34–50
17. Barnes C (1998) Las teorías de la discapaciad y los orígenes de la opresión de las personas discapacitadas en la sociedad occidental. Discapac y Soc:59–76
18. Oliver M (1998) ¿Una sociología de la discapacidad o una sociología discapacitada? Discapac y Soc:34–58
19. Oliver M (2008) Políticas sociales y discapacidad: algunas consideraciones teóricas. Superar las barreras la Discapac 18 años. Disability Soc:19–33
20. Ortega Camarero MT (2020) El envejecimiento de los trabajadores con discapacidad Intelectual de los centros especiales de empleo: una propuesta de medidas de intervención para mejorar su calidad de vida
21. Seelman CD (2004) Tendencias en la Rehabilitación y en la Discapacidad: Transición desde un Modelo Médico a un Modelo de Integración. Disabil World 22
22. World Health Organization (2001) International classification of functioning, disability and health (ICF)
23. Verdugo Alonso MA (2003) La concepción de discapacidad en los modelos sociales. Amarú
24. Guzmán Castillo F, Toboso Martín M, Romañach Cabrero J (2010) Fundamentos éticos para la promoción de la autonomía: hacia una ética de la interdependencia. Altern Cuad Trab Soc 45. https://doi.org/10.14198/ALTERN2010.17.3

25. Seoane JA (2011) José Antonio Seoane ¿Qué es una persona con discapacidad? Ágora-Papeles Filos 30:143–161
26. Barranco Avilés M del C (2011) Diversidad de situaciones y universalidad de los derechos
27. Pérez Matos NE, Setién Quesada E (2008) La interdisciplinariedad y la transdisciplinariedad en las ciencias: una mirada a la teoría bibliológico-informativa. ACIMED 18
28. Laberge Y (2013) The oxford handbook of interdisciplinarity. Sociol Časopis/Czech Sociol Rev 49:1016–1019
29. Yves L, Lucie S (1998) De l'interdisciplinarité scolaire à l'interdisciplinarité dans la formation à l'enseignement: un état de la question: 2 - Interdisciplinarité scolaire et formation interdisciplinaire à l'enseignement. Rev française pédagogie:109–146
30. Pombo O (2013) Epistemología de la interdisciplinariedad. La construcción de un nuevo modelo de comprensión. Interdisciplina 1. https://doi.org/10.22201/ceiich.24485705e.2013.1.46512
31. Gutiérrez Escobar M (2004) Interdisciplinariedad en la formación del licenciado en Estudios socioculturales. Rev Pedagog Univ 9:85–101
32. Araya Crisóstomo S, Monzón Godoy VH, Infante Malachias ME (2019) Interdisciplinariedad en palabras del profesor de Biología: de la comprensión teórica a la práctica educativa. Rev Mex Investig Educ 24:403–429
33. Vilar S (1997) La nueva racionalidad. Comprender la complejidad con métodos transdisciplinarios. Cairos, Barcelona
34. Ortega y Gasset J (1975) Historia como sistema
35. Ander-Egg E (1996) Interdisciplinariedad en educación
36. Drake S. M, Burns RC (2004) Meeting standards through integrated curriculum. ASCD
37. Blanco Aspiazu O, Díaz Hernández L, Cárdenas Cruz M (2011) El método científico y la interdisciplinariedad en el abordaje del Análisis de la Situación de Salud. Educ médica Super 25:29–39
38. Morin É (1995) Introducción al pensamiento complejo. Gedisa, Barcelona
39. UNESCO (1985) Coloquio Internacional sobre la Interdisciplinariedad en la Enseñanza General. París
40. Morin E (2010) Anotaciones para un nuevo Emilio: transmision sistemica del conocimiento. Signo y Pensam 29:42–49
41. Torres J, Torres S (1994) Globalización e interdisciplinaridad: el curriculum integrado
42. Che Soler J, Soler Martínez M, Peña Martín J (2006) Las relaciones interdisciplinarias en la formación inicial del Profesor General Integral de Secundaria Básica. Varona. Rev Científico-Metodológica 42:16–21
43. Helmane I, Briška I (2017) What is developing integrated or interdisciplinary or multidisciplinary or transdisciplinary education in school? Signum Temporis 9:7–15. https://doi.org/10.1515/sigtem-2017
44. Karppinen S, Kallunki V, Komulainen K (2017) Interdisciplinary craft designing and invention pedagogy in teacher education: student teachers creating smart textiles. Int J Technol Des Educ 29:57–74. https://doi.org/10.1007/s10798-017-9436-x
45. Alemán Rodríguez R, Yera Carbonell G del C (2011) La interdisciplinariedad en ciencias médicas y la matemática. Rev Cubana Hig Epidemiol 49:490–498
46. Hasni A, Lenoir Y, Larose F, Squalli H (2012) Interdisciplinarité et enseignement des sciences, technologies et mathématiques au premier cycle du secondaire: place, modalités de mise en oeuvre, contraintes disciplinaires et institutionnelles
47. Lenoir, Yves (2015) Interdisciplinariedad en educación: una síntesis de sus especificidades y actualización. INTERdisciplina 1. https://doi.org/10.22201/CEIICH.24485705E.2013.1.46514
48. De Zure D (2010) Interdisciplinary pedagogies in higher education. In: Frodeman R, Thompson Klein J, Mitcham C (eds) The oxford handbook of interdisciplinarity. Oxford University Press, Oxford, pp 372–387
49. Klein JT (2015) Interdisciplining digital humanities: boundary work in an emerging field. University of Michigan Press, Ann Arbor

50. Lyall C, Bruce A, Tait J, Meagher L (2011) Interdisciplinary research journeys, 1st edn. Bloomsbury Publishing Plc, London
51. Gijbels D, Dochy F, Van Den Bossche P, Segers M (2016) Effects of problem-based learning: a meta-analysis from the angle of assessment 75:27–61. https://doi.org/10.3102/00346543075001027
52. Gijbels D, Segers M, Struyf E (2008) Constructivist learning environments and the (IM)possibility to change students' perceptions of assessment demands and approaches to learning. Instr Sci 36:431–443. https://doi.org/10.1007/s11251-008-9064-7
53. Froehlich DE, Beausaert S, Segers M, Gerken M (2014) Learning to stay employable. Career Dev Int 19:508–525. https://doi.org/10.1108/CDI-11-2013-0139
54. Klein JT (2006) A platform for a shared discourse of interdisciplinary education. JSSE-J Soc Sci Educ 5:10–18
55. Carvajal Escobar Y (2010) Interdisciplinariedad: desafío para la educación superior y la investigación. Rev luna azul:156–169
56. Corbacho, María A (2018) El aprendizaje interdisciplinario, intensivo e integrado como herramienta para el desarrollo de conocimientos, habilidades y aptitudes en estudiantes de grado. INTERdisciplina 5:63–85. https://doi.org/10.22201/CEIICH.24485705E.2017.13.62384
57. Csorba D (2013) Design and delivery of a training program for teachers in primary education: interdisciplinary organization for the key competences training for young schoolchildren, from pre-school class to class IV. Proc Soc Behav Sci 76:285–290. https://doi.org/10.1016/j.sbspro.2013.04.114
58. Harden RM, Sowden S, Dunn WR (1984) Educational strategies in curriculum development: the SPICES model. Med Educ 18:284–297. https://doi.org/10.1111/j.1365-2923.1984.tb01024.x
59. Vashe A, Devi V, Rao R, Abraham RR, Pallath V, Umakanth S (2019) Using an integrated teaching approach to facilitate student achievement of the learning outcomes in a preclinical medical curriculum in India. Adv Physiol Educ 43:522–528. https://doi.org/10.1152/advan.00067.2019
60. Schalock RL (2017) Introduction to the special issue on disability policy in a time of change. Intellect Dev Disabil 55:215–222. https://doi.org/10.1352/1934-9556-55.4.215
61. Schalock R, Borthwick-Duffy S, Bradley V (2010) Intellectual disability: definition, classification, and systems of supports. American Association on Intellectual and Developmental Disabilities, Washington DC
62. Verdugo Alonso MÁ (2011) Discapacidad intelectual: definición, clasificación y sistemas de apoyo
63. Luckasson R, Borthwick-Duffy S, Buntinx WHE, Coulter DL, Craig EM, Reeve A, Schalock RL, Snell ME, Spitalnik DM, Spreat S, Tasse MJ (2002) Mental retardation: definition, classification, and systems of supports, 10th edn. American Association on Mental Retardation, Washington DC
64. Flórez J (2018) La comprensión actual de la discapacidad intelectual. Sal terrae Rev Teol Pastor 106(1234):479–492. ISSN 1138-1094
65. Frith U (2011) Lectura 9. La teoría de la mente: Uta Frith. La teoría de la mente. El autismo (1989). Lect Psicol Evol I:207–232
66. Cuesta Gómez JL, Sánchez Fuentes S, Orozco Gómez M, Valenti A, Cottini L (2016) Trastorno del espectro del autismo: intervención educativa y formación a lo largo de la vida. Psychol Soc Educ 8(2):157–172. ISSN 1989-709X, ISSN-e 2171-2085
67. Howlin P (2004) Autism: preparing for adulthood. Routledge, Londres
68. Ríos-Gallardo Á, Cuéllar L, Zambrana A, Losada M (2015) Estimulación del potencial de aprendizaje en niños y niñas con discapacidad intelectual. Apunt Psicol 33:77–81
69. Mesibov GB, Shea V (2009) The TEACCH program in the era of evidence-based practice. J Autism Dev Disord 40:570–579. https://doi.org/10.1007/s10803-009-0901-6
70. Martos Pérez J, Llorente Comí M (2013) Tratamiento de los trastornos del espectro autista:: unión entre la comprensión y la práctica basada en la evidencia. Rev Neurol 57(S01):185–191. ISSN 0210-0010

71. Guerra García P, López-Gómez E (2018) Aprendizaje permanente de personas con Déficit Intelectual: necesidades formativas y respuestas educativas (Permanent learning of adults with intellectual deficit: training needs and educational responses). Rev Nac e Int Educ Inclusiva:1889–4208
72. Rueda P, Novell R (2021) Conductas que nos preocupan en personas con discapacidad intelectual y del desarrollo: ¿Qué debes saber? ¿Qué debes hacer? Plena Inclusión, Madrid
73. Plena Inclusión (2017) Posicionamiento de Plena inclusión sobre la educación inclusiva
74. Verdugo Alonso MÁ, Gutiérrez B (2009) Discapacidad intelectual, adaptación social y problemas de comportamiento. Pirámide, Madrid
75. The 17 goals sustainable development. https://sdgs.un.org/goals. Accessed 8 Jan 2022
76. European Commission (2020a) COM(2020) 625 final. On achieving the European education area by 2025
77. European Commission (2020b) COM(2020) 274 final. European skills agenda for sustainable, competitiveness, social fairness and resilience
78. European Commission, Directorate-General for Employment SA and I (2021) The European pillar of social rights action plan. Brussels
79. Council of the European Union (2021) Council resolution on a new European agenda for adult learning 2021–2030
80. European Commission (2021) COM(2021) 101 final. Union of equality: strategy for the rights of persons with disabilities 2021–2030
81. European Commission (2021) COM/2021/770 final. Proposal for a council recommendation on a European approach to micro-credentials for lifelong learning and employability
82. European Commission (2020) COM(2020) 758 final. Action plan on integration and inclusion 2021–2027
83. European Commission, Directorate-General for Education, Youth S and C (2019) Key competences for lifelong learning

María Teresa Ortega-Camarero holds a Ph.D. in Education and a Bachelor's Degree in Sociology. Associate lecturer at the University of Burgos and researcher at Miradas Foundation. She is currently researching on the social impact of disability and its social exclusion; training and employment pathways; and the premature ageing and deterioration of workers with disabilities and its impact on their quality of life.

Vanesa Baños-Martínez holds a Ph.D. in Education and a Master in Social Gerontology. Professor Assistant Doctor in University of Burgos and coordinator of the Senior University. At present, she is investigating about life-long training processes, elderly training, social and educational networks, e-learning, quality of life and active ageing.

COPACUL: An Innovative Didactic Project on Heritage Conservation for High School Students

12

Manuel García-Heras, Cristina Gil, Fernando Agua, Alejandro Pinilla, Fátima Quijada, and María Ángeles Villegas

Abstract

The present contribution discloses the didactic project called COPACUL, which is an innovative didactic experience on Heritage conservation for high school students developed within the background of a more general research project focused on the systematization of methods and protocols for integral conservation of Cultural Heritage materials and their social valorization. The project is based on the current Spanish educational law as the framework from which to build a didactic proposal with transversal competences between different areas of knowledge such as Biology and Geology, Geography and History, Physics and Chemistry, as well as Plastic, Visual and Audiovisual education, using didactic tools under the perspective of Science, Technology and Society (STS). The COPACUL project comprises either didactic sequences in classrooms or

M. García-Heras (✉) · F. Agua · A. Pinilla · F. Quijada · M. Á. Villegas
Institute of History, Spanish National Research Council (CSIC), Madrid, Spain
e-mail: manuel.gheras@cchs.csic.es

F. Agua
e-mail: fernando.agua@cchs.csic.es

A. Pinilla
e-mail: alejandro.pinilla@cchs.csic.es

F. Quijada
e-mail: fatima.quijada@cchs.csic.es

M. Á. Villegas
e-mail: mariangeles.villegas@cchs.csic.es

C. Gil
Faculty of Education, María Zambrano Campus in Segovia, University of Valladolid, Segovia, Spain
e-mail: cristina.gil.puente@uva.es

D. Ortega-Sánchez (ed.), *Controversial Issues and Social Problems for an Integrated Disciplinary Teaching*, Integrated Science 8,
https://doi.org/10.1007/978-3-031-08697-7_12

practical workshops complemented with visits or combining workshops and visits to museums. Project implementation will be accomplished with the collaboration of three museums and three high schools.

Keywords

Cultural Heritage · Conservation · Didactics · High school · Science · Technology · Society

Introduction. Why a Didactic Project?

The research group CERVITRUM is located at the Institute of History in Madrid within the Spanish National Research Council (CSIC). One of the main goals of the group is transmitting and spreading the knowledge generated by their research to society in general and, particularly, to educational centers. Social dissemination is a key factor for the research group since it cannot be forgotten that society is eventually what sustains research and innovation and what demands solutions and strategies for Cultural Heritage conservation.

How does the group transmit and spread the knowledge generated? Through the design and development, among other initiatives, of didactic units and other educational materials to promote the approach of science to classrooms of Primary and Secondary levels of mandatory education. From this perspective the group always faces the challenge of making either academic or social diffusion plans in every proposal, project or contribution it carries out. The research group CERVITRUM looks therefore for educational proposals on the basis of the following question: what can each of us do for society feels responsible and inheritor of its Cultural Heritage?

The present contribution discloses the didactic project called COPACUL, which is an innovative didactic experience on Heritage conservation for high school students developed within the background of the more general research project HERICARE (https://hericare20.wixsite.com/hericare). This project is focused on the systematization of methods and protocols for integral conservation of Cultural Heritage materials and their social valorization, and is being financed by the Spanish Ministry of Science and Innovation through the State Research Agency (AEI as the acronym in Spanish).

The didactic proposal arises from the social and educational need to find solutions in order to society feels responsible and inheritor of its Cultural Heritage. The review of recent literature on this subject allows the elaboration and justification of such a proposal, which aims to aware students of Mandatory Secondary Education (ESO as the acronym in Spanish) of the need to know and protect surrounding Cultural Heritage, all through a transdisciplinary approach that invites reflection. The educational proposal specifically focuses on transmission of Cultural Heritage

through a Science-Technology-Society (STS) approach in order to acquire the skills, knowledge and attitudes to understand the work of scientists in this field and show the emotional component of science to encourage positive attitudes.

It is important to do not forget that complexity of today's society requires other educational factors to be taken into account, such as the need to developed higher-order skills. Since science education is an ideal framework for this, the visible thinking approach is intended to be introduced by means of the thinking routines methodology. These routines will contribute to create a classroom atmosphere in which students will be able to learn to think and learn to learn in order to their learning be meaningful and lasts over time.

Science and technology acquire a very important role in nowadays society. Accordingly, both subjects should be part of educational processes from an early age, since science is a source of discovery that allows the individual to understand natural phenomena, as well as to comprehend the relationships between society, science and technology. Learning these concepts offers the tools and the skills necessary to imagine and build a fairer and more sustainable world [1]. In addition, scientific literacy has become a fundamental element in the whole development of students to the extent that there are studies which consider necessary to take educational measures to early promote scientific literacy [2].

It must be taken into consideration also that the society of the information and the knowledge requires teachers to transform their vision of learning. The goal should no longer be to memorize information, but to develop higher-order skills which allow the students to adapt to the changing world and to transform it. In this sense, it must be highlighted that learning is a product of thought. To answer these needs the Zero Project was developed by Harvard University, which focuses on the visible thought, whose main goal is to integrate the development of the students' thinking with the learning of the different curricular contents at any educational stage [3]. This approach allows the introduction in the classroom of strategies to acquire skills, especially those of learning to learn (and also to think) to ensure deep and permanent learning, which make leaving behind the transmission-reception model and favour constructivist models. Scientific education must be therefore accessible to everyone due to its high value in promoting autonomy, reinforcing formation of critical and committed citizens and deepening into essential intellectual competences to the new society.

Outstanding Previous Experiences

In the last few years the research group CERVITRUM has successfully developed educational materials such as didactic units and specifically a didactic unit for Childhood education and another one for Primary/Secondary education levels, that can be seen as the precedent or the basis from which the didactic project COPACUL here exposed has been developed.

The didactic unit for Childhood education (Fig. 12.1 left) was divided into five sessions and included a complete set of work documents, a notebook for teachers and an annex of images for helping teachers at all times. The practical part of the unit was implemented in an educational center at Alcalá de Henares (Madrid, Spain): the García Lorca public school (Fig. 12.1 right). The didactic unit for Primary/Secondary education (Fig. 12.2 left) was also divided into five sessions and also included a set of work documents, along with a notebook for teachers and an annex of images. In this case the practical part of the unit was more widely implemented in three educational centers located in the autonomous community

Fig. 12.1 Cover of the childhood education didactic unit (left) and practical implementation in a public school (right)

Fig. 12.2 Cover of the primary/secondary education unit (left) and practical implementation in one of the schools (right)

region of Madrid (Spain): the García Lorca (Alcalá de Henares) and the Eugenio Muro (Cadalso de los Vidrios) public schools, and the Lagomar concerted school (Valdemoro) (Fig. 12.2 right).

Both didactic units were published with their corresponding ISBN number [4, 5] and both are free download available either at the research group website (https://cervitrum.wixsite.com/cervitrum/libros-publicados) or at the Calameó website. The Childhood didactic unit at (https://es.calameo.com/read/003341477e2017e8b0ee8) and the Primary/Secondary didactic one at (https://es.calameo.com/read/003341477e94ff2b11da8). In addition, some papers derived from both didactic experiences were also published [6, 7].

The Current Spanish Educational Law as a Framework

From the different levels in which the Spanish educational system is articulated, the present didatic project is framed at the national level in the *Real Decreto 1105/2014* of December 26 [8], which establishes the basic curriculum for mandatory Secondary Education and Bachelor. It deals with the need to frame the didactic proposal within the legislative framework as far as to foster the acquisition of scientific and technological competences, the ability to learn to learn and the critical thinking are concerned.

After reviewing other different laws it was found that they may support also the main purpose of the didactic proposal. The *Ley Orgánica 8/2013 (LOMCE)* of December 9 [9] includes in Section IV of the Preamble the need to acquire transversal skills such as critical thinking from an early age, since cognitive skills, although essential, are not enough. On the other hand, the *Real Decreto 1105/2014* [8] includes in Article 2 the need for students to acquire a set of basic skills in science and technology; digital competence; learn to learn; cultural awareness and expressions and social and civic proficiencies. In addition, the promotion of learning by competencies integrated into the curricular elements is highlighted to promote a renewal in the teaching practice and in the processes of teaching and learning.

Contents, evaluation criteria and learning standards worked throughout the didactic project are framed in the *Real Decreto 126/2014* of February 28 [10] and are directly related to the area of Biology and Geology in blocks 1 "Abilities, skills and strategies. Scientific Methodology" and 7 "Research project", as well as with block 10 of the Geography and History area "The relationship between the past, the present and the future through History and Geography". It should be noted that other areas of knowledge such as Plastic, Visual and Audiovisual Education (block 1) and Physics and Chemistry (blocks 1, 2 and 3) are also transversally addressed. The methodology should be communicative, active and participatory. This is why innovative methodologies are introduced, which are based on inquiry, experimentation and the development of thought. In short and to sum up, the didactic proposal can be framed at the current Spanish legislation. It tries to go beyond the curriculum and intends to be a reference to provide a quality response to students.

Based on this framework a flexible didactic tool is proposed, which may be adapted by the teacher to either his/her educational context or the corresponding stage of his/her students. In addition, some outside the classroom agents such as scientific researchers and visits to thematic museums will be used as didactic resources. Thus, the didactic project comprises five sessions divided into a didactic sequence in the classroom of two days, practical and experimental activities in workshops and museums of another two days and a final fifth day devoted to reflection and evaluation activities. Each group of sessions will be shown in the following sections.

Didactic Sequence in the Classroom

This sequence lasts two days. The first day is divided into three phases. A previous short questionnaire of test type is made to students in the first phase to find what they know about Heritage conservation. In the phase two the teacher will present basic concepts of Cultural Heritage with the support of images. During this second phase students will be asked to provide some examples of Cultural Heritage in general and of cultural goods in particular. The teacher will show, in the final third phase, materials classification of cultural goods (e.g., organic, inorganic, and multicomponent materials) also with the support of images. In the same way, students will be asked to provide some examples.

The second day is in turn divided into two phases. In the first one the teacher will present basic concepts of preventive conservation of Cultural Heritage with the support of images and students will be likewise asked to provide some examples of preventive conservation. Finally, in the second one, the teacher will present those parameters affecting conservation, such as relative humidity, temperature, light, pollutants, and so on, also with the support of images. In this final case, students will be asked to find and photograph some examples of these parameters to show in the final activity session.

Practical and Experimental Activities in Workshops and Museums

They will be carried out in two days. An experimental workshop inside the classroom will be undertaken in the first day. It will be supervised by a teacher and/or a scientist of the research group CERVITRUM and will be based on the *Aronson puzzle* or *specialist tables* methodology [11, 12]. The classroom will be consequently divided into groups of 5–6 students. Suggested topics for workshops would be those engaged to main research lines of the group, such as conservation of ceramics, glass and stained glass windows and environmental pH optical sensors.

After the workshop, the teacher will verbally review basic concepts in the classroom.

A museum will be visited in the second day. The visit will be accomplished not only from a cultural or historical perspective but also, and especially, from a conservation perspective thanks to collaboration in the project of three very different museums, either from the nature of collections housed or location in different climatic environments, namely the Naval Museum in Madrid, the National Museum of Natural Sciences also in Madrid, and the Glass and Crystal Museum in Málaga. During the visit and individually or in groups the students will make contributions following the "I see, I thing, I wonder" routines such as those of the columns of Fig. 12.3. After the visit, the teacher will undertake a compilation of basic concepts in the way back to classroom by making an oral quiz of quick questions that students will be able to answer by freehand.

Another possibility in the making of practical and experimental activities is to join the two days into one, that is, carrying out experimental workshops inside the own museums, under a joint educational and conservation perspective. An activity of this type is highly recommended.

Through practical and experimental activities by means of workshops either inside the classroom or in the museums themselves, it is intended to promote the following ideas with the aim to highlight the importance of Cultural Heritage and how the students can get involved in its conservation:

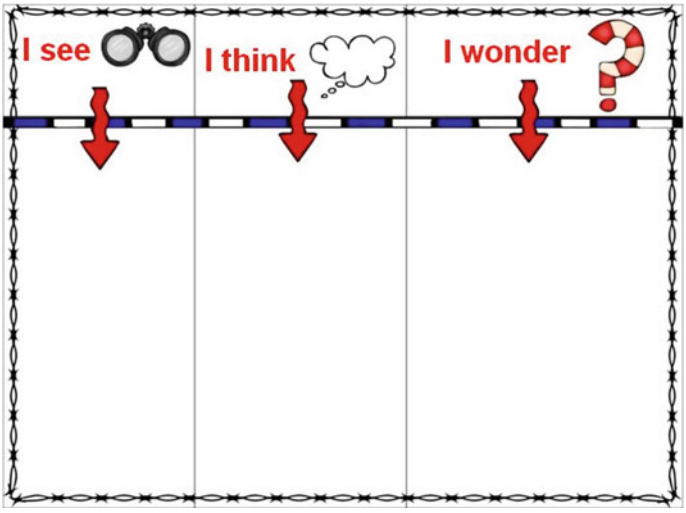


Fig. 12.3 "I see, I thing, I wonder" routines

- To value the importance of Cultural Heritage and its conservation.
- To promote respect for the use and enjoyment of Cultural Heritage.
- To know the different types of cultural goods, their constitution, their threats, and their problems of conservation.
- To make connections between the different material objects and their conservation environments.
- To develop thinking, reflection, and responsibility between students [13].

Final Activity of Reflection, Evaluation and Conclusions

After the didactic sequence in the classroom (2 days) and the practical and experimental actions (2 days more), a final fifth day will be devoted to reflection and evaluation activities. The teacher will first verbally review basic concepts and then he/she will undertake a short written test to students to assess their degree of assimilation. Reflection and evaluation will be always accomplished following routines of "Before I thought, now I think" as shown in Fig. 12.4.

Next, the students will be asked to carry out a small investigation about a cultural good located in their immediate surroundings. In the making of this investigation they should take some photographs of the cultural good chosen, look for some information on Internet and social media and ask other people for their opinion about this cultural good. They should evaluate visually also its state of conservation. Finally, the students will have to publish their results with the help of graphic materials in a physical or digital panel enabled by the education center.

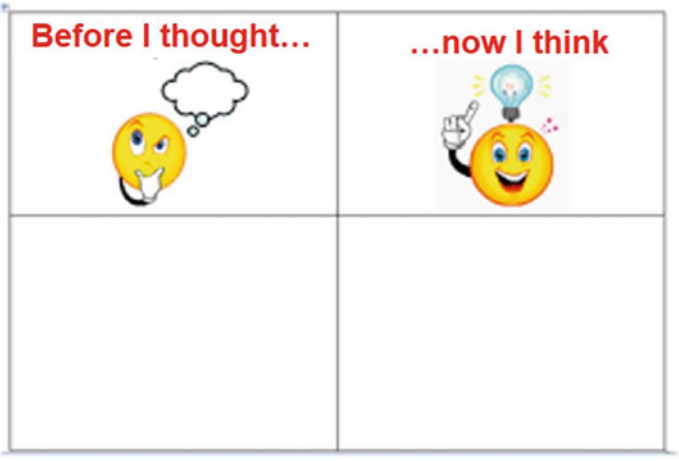


Fig. 12.4 "Before I thought, now I think" routines

The students will be evaluated through a metacognition staircase by means of the following five metacognition questions:

1. What have you done or what have you learned?
2. How have you done it or how have you learned it?
3. What difficulties have you had?
4. What has it served for you?
5. On what other occasions could you use what you have learned this way of learning?

Materials

The didactic project COPACUL will provide with the following materials for the development of all the activities mentioned:

- Previous questionaire of test type for students.
- Definitions and example images for teachers.
- Scripts for experimental workshops for the collaborating teacher/researcher.
- Scripts for museum visits for the collaborating teacher/researcher.
- Short written test to assess the degree of students assimilation.
- Quick questions for the oral quiz.
- Indicative scheme to undertake the small investigation about a cultural good.

This didactic project will be implemented in three high schools: the IES Las Lagunas (Rivas Vaciamadrid, Madrid), the Lagomar school (Valdemoro, Madrid), and the IES Vicente Espinel (Málaga). The workshops to be accomplished will take place according to these couples of institutions: (1) The IES Las Lagunas with the Naval Museum (Madrid); (2) The Lagomar school with the National Museum of Natural Sciences (Madrid); and the IES Vicente Espinel with the Glass and Crystal Museum (Málaga).

Acknowledgements This contribution was funded under the Challenges of Society Research Program HERICARE from the Spanish Ministry of Science and Innovation (PID2019-104220RB-I00/MCIN/AEI/10.13039/501100011033), and Program TOP Heritage: Technologies in Heritage Sciences from the Regional Government of Madrid (S2018/NMT-4372). Professional support from the TechnoHeritage network of Science and Technology for the Conservation of Cultural Heritage and from CSIC Interdisciplinary Thematic Platform Open Heritage: Research and Society (PTI-PAIS) are also acknowledged. The close collaboration of Susana García Ramírez (Naval Museum, Madrid), Josefina Barreiro Rodríguez and Ángel Luis Garvía Rodríguez (National Museum of Natural Sciences, Madrid), and Gonzalo Fernández-Prieto González (Glass and Crystal Museum of Málaga) is gratefully appreciated, as well as collaboration of José Luis Arcos Fernández and Ana Taboada Sánchez (IES Las Lagunas, Rivas Vaciamadrid, Madrid), Víctor Monzón García and Darío Sánchez Gutiérrez (Lagomar school, Valdemoro, Madrid), and Julia del Pino and María José Carmona Mato (IES Vicente Espinel, Málaga).

References

1. Pujol RM (2003) Didáctica de las ciencias en la educación primaria. Síntesis, Madrid
2. Toma RB, Ortiz-Revilla J, Greca I (2018) ¿Qué actitudes hacia la ciencia posee el alumnado de Educación Primaria que participa en actividades científicas extracurriculares? Ápice. Revista de Educación Científica 3(1):55–69. https://doi.org/10.17979/arec.2019.3.1.4599
3. Ritchhart R, Church M, Morrison K (2011) Making thinking visible: how to promote engagement, understanding, and independence. Graduate School of Education, Harvard, MA, USA
4. Gil C, Peña J, Gómez P, Agua F, García-Heras M, Villegas MA (2018) Aprendemos a conservar nuestro Patrimonio. Unidad didáctica para Educación Infantil. Editado por Proyecto Geomateriales 2 Comunidad de Madrid (S2013/MIT-2914). Madrid, p 142. ISBN 978-84-09-00512-3
5. Gil C, Peña J, Gómez P, Agua F, García-Heras M, Villegas MA (2017) La importancia de la conservación del Patrimonio. Unidad didáctica para Educación Primaria/Secundaria. Editado por Proyecto Geomateriales 2 Comunidad de Madrid (S2013/MIT-2914). Madrid, p 160. ISBN 978-84-697-8521-8
6. Peña-Poza J, Gil C., Gómez P., Conde JF, Agua F, García-Heras M, Villegas MA (2017) Design of didactic units on Heritage conservation. What kind of teaching heritage conservation topics require? Ge-Conservación 11:121–127. https://doi.org/10.37558/gec.v11i0.462
7. Gil C, Peña-Poza J, Agua F, García-Heras M, Villegas MA (2018) Diseño y ejecución de un proyecto didáctico sobre la conservación del Patrimonio Cultural para EI, EP y ESO. Ensayos 33(2):161–180. https://doi.org/10.18239/ensayos.v33i2.1858
8. Real Decreto 1105/2014 of December 26, BOE 2015-01-03
9. Ley Orgánica 8/2013 of December 9, BOE 2013-12-10
10. Real Decreto 126/2014 of February 28, BOE 2014-03-01
11. Brandt RS (ed) (1991) Cooperative learning and the collaborative school. Association for Supervision and Curriculum Development, Alexandria, VA, USA
12. Martínez JP, Gómez F (2010) La técnica puzzle de Aronson: descripción y desarrollo. In: Arnaiz P, Hurtado MªD, Soto FJ (Coords) 25 Años de Integración Escolar en España: Tecnología e Inclusión en el ámbito educativo, laboral y comunitario. Consejería de Educación, Formación y Empleo, Murcia, pp 1–6
13. Ortega-Quevedo V, Gil C (2021) Desarrollo del pensamiento crítico en didáctica de las ciencias experimentales. In: Gómez G, Ramos M (Coords) Teoría y práctica en investigación educativa. Una perspectiva internacional. Dykinson S.L., Madrid, pp 499–510

Manuel García-Heras is PhD in History with honorary award (1997 Complutense University, Madrid, Spain). Post-doctoral Fulbright visiting fellow at the Smithsonian Institution (Washington D.C., USA, 1999–2001), and post-doctoral researcher of the program I3P at the National Center for Metallurgical Research (CENIM-CSIC, Madrid, Spain, 2002–2005). Current position from 2005: Senior Research Scientist at the Institute of History (IH, Madrid) of the Spanish National Research Council (CSIC). He is also vice-president of the Art, Archaeometry, and Heritage Section of the Spanish Ceramic and Glass Society (SECV); president of the Society of Archaeometry Applied to Cultural Heritage (SAPaC); and head scientist of the Institute of History's Laboratory of Heritage Conservation. Main research lines: Archaeometry of ceramic materials and glass, preventive conservation on museum collections and other Heritage Science conservation issues, and innovative didactic projects on Heritage conservation for implementation among students of different primary and secondary grades.

Cristina Gil is PhD in Geology (2002 Complutense University, Madrid, Spain). Head of the Laboratory for Quality Control and Head of the Technological and Scientific Department (National Glass Center Foundation, La Granja, Spain, 1997–2013). Current position from 2014: Lecturer at the Department for Didactic of Social and Experimental Sciences and Mathematics. Main research lines: relationships between Science, Technology, and Society; development of the scientific thought, Heritage conservation, formative evaluation in high education, and STEAM (didactic model based on Science, Technology, Engineering, Mathematics and Arts).

Fernando Agua is MSc in Chemistry (1991, Alcalá de Henares University, Spain). Staff member of the Spanish National Research Council (CSIC) since 1992 at, first, the Institute of Nanoscience and Materials Science of Aragón (INMA, Zaragoza) and, then, the Institute of Ceramic and Glass (ICV, Madrid). Current position from 2007: Senior Specialized Higher Technician at the Institute of History (IH, Madrid) of the Spanish National Research Council (CSIC) and head technician of the Institute of History's Laboratory of Heritage Conservation. Main research lines: Archaeometry of historical materials and development of preventive and curative conservation strategies for Cultural Heritage materials.

Alejandro Pinilla is graduated in Archaeology and MA in Archaeology of the Mediterranean in Classical Antiquity (2021 Complutense University, Madrid, Spain). JAE-Intro scholarship (2020–21) at the Institute of History (IH, Madrid) of the Spanish National Research Council (CSIC). Current position from 2021: contracted Research Assistant (Youth Guarantee) from the Regional Government of Madrid at the Institute of History (IH, Madrid). Main research lines: Formation focused on Archaeometry of historical materials and development of preventive and curative conservation strategies for Cultural Heritage materials.

Fátima Quijada is higher technician in Laboratory of Analysis and Quality Control (2019, IES Zaidín-Vergeles, Granada, Spain). Current position from 2021: contracted Laboratory Technician (Youth Guarantee) from the Regional Government of Madrid at the Institute of History's (IH, Madrid) Laboratory of Heritage Conservation. Main research lines: Formation focused on Archaeometry of historical materials and development of preventive and curative conservation strategies for Cultural Heritage materials.

María Ángeles Villegas is PhD in Chemistry (1987 Autónoma University, Madrid, Spain) and PhD in Arts (2016 Granada University, Spain). Staff member of the Spanish National Research Council (CSIC) at, first, the Institute of Ceramic and Glass (ICV, Madrid, 1990–2001) and, then, the National Center for Metallurgical Research (CENIM, Madrid, 2001–2007). Current Position from 2007: Research professor at the Institute of History (IH, Madrid) of the Spanish National Research Council (CSIC) and head of the research team Material Culture and Heritage (CERVITRUM). She is also president of the Art, Archaeometry, and Heritage Section of the Spanish Ceramic and Glass Society (SECV) and winner of the 2015 Placa de Honor Prize granted by the Spanish Association of Scientists (AEC). Main research lines: materials archaeometry, conservation strategies, environmental sensors technology, analytical characterization of Heritage items, and innovative didactic projects on Heritage conservation for implementation among students of different primary and secondary grades.

Problematizing STEM Integration from an Epistemological and Identity Perspective

13

Digna Couso, Carme Grimalt-Álvaro, and Cristina Simarro

Abstract

STEM education is a global trend, although there is not a convergence regarding the aims, methods and theories behind different meanings given. Within this amalgam of perspectives, the vision of STEM education as an inherently interdisciplinary or integrated framework is usually the most favored. This tacit understanding can lead STEM educational proposals to fail in the acknowledgement of what view of STEM education they hold and diminish the potential behind diversity of approaches. In this chapter we discuss how, regardless of the educational approach, we need to develop and promote both an epistemic understanding of what is STEM and students' identity growth from an equitable and inclusive perspective so that STEM education can successfully achieve its educational aims. To this end, we argue how both an epistemological and identity perspective offer interesting arguments to address important questions within STEM education, such as the supposedly inherent integrative character of STEM education or the existence of a single privileged model of STEM integration. In consequence, we claim for a more critical standpoint in STEM education emphasizing the richness introduced by an idiosyncratic focus regarding both disciplines and people, offering an initial definition of STEM competence that can help to guide STEM education proposals.

Keywords

STEM education · Epistemology · Identity · STEM competence · Interdisciplinarity · STEM integration

D. Couso (✉) · C. Simarro
Department of Mathematics and Science Education, Faculty of Education, Universitat Autònoma de Barcelona, Barcelona, Spain
e-mail: digna.couso@uab.cat

C. Grimalt-Álvaro
Universitat Rovira I Virgili, Tarragona, Spain

D. Ortega-Sánchez (ed.), *Controversial Issues and Social Problems for an Integrated Disciplinary Teaching*, Integrated Science 8,
https://doi.org/10.1007/978-3-031-08697-7_13

Why Do We Need an Epistemic and Identity Perspective in STEM Education?

There is little discussion on the fact that STEM education is a global trend and "all things STEM" are in fashion. The STEMmania, which M. Sanders described in 2009 [1] is still here, fueled by political, social, economic and/or pedagogical forces around the globe. The acronym has reached not only teachers and educators but also students and parents through a diversity of programs, initiatives, and resources both in and out-of-school. The living proof of a global effort in STEM education is the enormous number of different logos and infographics that can be found in any internet search engine if you look for images related to STEM education, even for different languages and countries.

Despite the existence of a global trend towards designing and investing in STEM education, there is not a convergence regarding the aims, methods and theories behind different meanings given to it [2]. This diversity of views is not inherently problematic: STEM education as a field is richly diverse and different contexts require different STEM education. However, it is worrying that this need for diversity of approaches is not actually acknowledged. In addition, quite often the initiatives, resources and even research pieces on STEM education do not start with a clear positioning on what view of STEM education they actually hold. This is particularly important regarding the goal of any STEM education initiative or resource: *what for* is perhaps the most crucial question to bear in mind in STEM education.

According to the influential publication on k-12 STEM [3], there are three major goals for STEM education. These goals are related to the promotion of aspirations towards STEM studies and careers from an equity perspective, the increase in numbers and diversity of the STEM workforce and, more importantly, the development of STEM literacy in all students, independently of their future career choices. Certainly, most STEM education initiatives and resources try to serve one or more of these goals in different ways by applying different approaches and methods (STEM PBL, I-STEM, STEAM, STREAM…) and using different conceptualizations of STEM education (integrated STEM, transdisciplinary STEM…). However, addressing these ambitious goals is a matter of radically transforming the field of science, engineering and/or mathematics education, rather than superficially modifying it. Therefore, quite often, what is needed to fulfill the goals of sound STEM education is not explicit enough.

From our perspective, these three goals of STEM education entail two important needs that refer to epistemic and cognitive aspects of STEM, but also to affective ones. On the one hand, there is the need to develop students' STEM competence so that they become productive, informed and empowered citizens [4] with the potential to become STEM-related professionals. This implies an epistemic understanding of what is STEM and the mastery of how it is done rather than the mere use of STEM concepts and tools. In other words, what the literature has discussed as a focus-on-practices vs focus-on-products approach [5]. On the other hand, there

is also the need to develop students' identities from an equitable and inclusive perspective so that every student can reconcile who they are with how they consider STEM people is. This implies not only to share a diverse, non-stereotyped model of STEM people, but to act on the affective variables such as self-efficacy, capacity, interest or aspirations, that can guarantee that each student can see themself as a feasible and capable STEM person at their own desired level [6].

To be fulfilled, these two needs require interlinking any epistemological reflection on STEM education with an identity framework for STEM education in such a way that both dimensions of STEM knowledge and competence and STEM feeling and being are mutually supported. However, considering explicitly and coherently both the need to develop an epistemically sound STEM competence and the need to engage adequately diverse STEM identities is undisputedly demanding. From our viewpoint, this is mostly because any interlink with an identity framework implies challenging widespread notions of STEM education, which usually assume an important degree of universality.

An example of this challenge is the vision of STEM education as an inherently interdisciplinary or integrated framework, in which integration among all disciplines is proposed for all students. Hence, the association of STEM education with different ideas of interdisciplinarity or integration is a quite exciting trend in recent STEM education. This trend is referred to as STEM integration, integrated STEM, or even I-STEM. Whatever the language and integrative framework used, the idea behind these I-STEM proposals is to put the integration of different STEM areas to the forefront [7], usually referring to Engineering or Technology as the integrators [8], but without a consistent approach [7]. Despite the many attempts to conceptualize an integrated STEM framework that have emerged in the recent literature [9] and current efforts to review the research in the field [10], we agree with Sgro et al. [11] that integrated STEM is still "whatever someone decides it means". In practice, claims for integrated STEM could be focused on context or content integration, use of authentic problems, assimilation of STEM practices, development of twenty-first century skills or giving centrality to engineering design or technology, among others [9].

Although integrating disciplines is inherently an epistemological problem (a problem of disciplinary boundary crossing and new knowledge creation), discussions in the field have usually used only pedagogical frameworks. As such, the focus has been more on "how to" do I-STEM rather than what philosophically and epistemically "means" to do I-STEM. It is only recently that the nature of STEM has received an explicit focus [12], and much more developments in this area are needed. The same happens regarding the affective dimension in STEM: even though what it is understood by I-STEM, particularly what disciplines to integrate and the approach to integrate them, have evidenced important implications for which students can be truly engaged [6], the descriptions of I-STEM rarely consider explicitly the identity perspective.

For these reasons, in this paper we want to discuss these two perspectives, the epistemological and the identity ones, in relation to mainstream STEM education and particularly regarding integrated STEM. The purpose is twofold. On the one

hand, to show how both perspectives offer interesting arguments to address important questions within STEM education, such as the supposedly inherent integrative character of STEM education or the existence of a single privileged model of STEM integration, for instance, around engineering construction. On the other hand, to claim for a more critical standpoint in STEM education that emphasizes the richness introduced by an idiosyncratic focus on both disciplines and people. As such, we will use epistemic and identity-based arguments to justify the importance of a STEM education that embraces Diversity with capital D: capitalizing on the different and more socially just ways of seeing the world introduced by different disciplines and by different people. In essence, our proposal for STEM education differentiates itself from a uniform, quasi-universal, one-size-fits-all approach, urging caution towards the problems associated with certain ideas of integrated STEM education that neglect the role of single disciplines and its differential meaning to different people.

An Epistemological Lens Applied to STEM Education

Epistemic Challenges of an Integrated STEM Education

Multidisciplinary, interdisciplinary, transdisciplinary, or meta-disciplinary approaches to STEM education are indistinctly presented by STEM education scholars as the way for improving STEM education [13, 14], being the trans-disciplinary approach the most acclaimed one. However, the precise nature of this integration, how should it be done and what its main benefits are do not often get addressed, with difficulties in the literature to propose "*an unequivocal endorsement of integrated approaches to STEM education"* [15]. In this context, challenges to the integrative STEM approach have been found mostly related to two educational factors: the need to deepen students' learning, and the need to guarantee a balanced impact regarding the learning of different STEM areas [16]. According to research, the learning of in-depth STEM knowledge is an obstacle for many integrated STEM curricula [17].

As a strategy to tackle these challenges, many current definitions of integrative STEM education focus on engineering problems as the approach to facilitate STEM areas integration. In this sense, some authors claim that a design, construction, or engineering challenge should be the one that triggers the STEM classroom activity [1, 18]. Justification for this view is the idea that engineering problem solving could be a systematic approach to solve challenges in the STEM field [19] and, consequently, the knowledge and practices of the different areas are at the service of an engineering objective. From this perspective, authors state that STEM education "*purposefully situates scientific inquiry and the application of mathematics in the context of technological design/problem solving*" [1]. Therefore, this mainstream integrative approach causes an imbalance among the development of students' practices/skills.

Moreover, research points to teachers' difficulties in tackling integration in STEM education due to several reasons, but mainly due to difficulties in the mutual understanding and collaboration among teachers from different STEM areas [20] and, more importantly, limited interdisciplinary understandings [21]. Hence, research has highlighted teachers' limited backgrounds in terms of disciplinary practices, the nature of reasoning in disciplines other than their own, as well as relations among STEM areas [22]. These difficulties can be a source of tensions, especially in secondary and college education.

In our opinion, the problems we have outlined here are related to STEM integration based on the idea of a STEM literacy or competence that goes easily beyond each of the scientific, engineering, and mathematical literacies and competences. However, this perspective of a sort of global competence area [4], if not well addressed, could result in an amalgam of the different well-researched scientific, engineering, or mathematical literacies that has not yet been developed or tested [23]. This is because the conceptualization of STEM as a meta-discipline [14], which unites the normally separated areas to create new knowledge, forces us to establish connections to bridge the gap between disciplines that are closely related but fundamentally different in nature. While we acknowledge that in real-world contexts STEM problems are tackled in an integrative way and that, in fact, STEM areas share important commonalities that allow this integrative approach (such as the crosscutting concepts [24]), we highlight the fact that STEM disciplinary practices are also epistemologically different, and that there are educational benefits associated with this differentiation. For these reasons, we advocate for including an explicit epistemological perspective in STEM education, whether it is integrative or not, for improving STEM education.

Developing an Epistemology for STEM

An epistemological lens that allows to identify the idiosyncratic aspects of each of the STEM areas in terms of their nature and value systems, realizing the similarities and the differences among them, could guide how we face the challenges of STEM integration. By reflecting on the idiosyncratic epistemic features of the different STEM areas, some problems that STEM education research has identified in relation to STEM integration (such as restricted in-depth knowledge, the unbalanced presence of STEM areas or the limited interdisciplinary understanding of teachers) could be more easily problematized, detected, and better equipped for a quality integrative STEM education. Particularly, we argue that developing an epistemological lens can have two major benefits for STEM education, which are described as follows.

On one hand, including an epistemological lens in STEM education would help to develop epistemic knowledge and competence, which are in fact learning objectives of STEM education. Including epistemic knowledge and competence has been agreed internationally in the new PISA framework (OECD's Program for International Student Assessment), and it has been explicitly introduced in most

curricula internationally, including the Next Generation Science Standards (NGSS) in the United States. From this perspective, one cannot be considered competent in science, engineering, and mathematics if they do not know what science, engineering or mathematics are about.

On the other hand, the inclusion of an epistemological perspective in STEM education would help to clarify the specific practices, that is, specific ways of doing, talking, thinking, valuing and being [25] of each STEM area. There is global recognition that a disciplinary competence refers not only to the conceptual knowledge and body of practices of that discipline, but also to the epistemic objectives and values underpinning those practices [5, 26–28]. Hence, the relevance given to the inclusion of practices in STEM education will be enhanced and enriched by including this epistemological lens, often neglected.

In a first attempt to reflect these epistemic underpinnings, we propose a set of STEM practices (for science, engineering and mathematics) based on existing proposals [5, 26–28] nuanced by an epistemic perspective. Recognizing the relationship between STEM areas, the nine disciplinary practices have been written in a similar way, led by a core practice encapsulating the aim of each discipline [25] (Table 13.1).

Drawing from our proposal, we argue that in STEM education recognizing the existence of differences among STEM areas, not only regarding their core ideas or practices but also regarding its aims and cultures [30], will not only bring richness to the spectrum of competences able to be developed in STEM classrooms, but also to allow a greater diversity of proposals be more appealing for more diverse people. However, engaging and consolidating diversity adequately in STEM entails further approaches that consider affective aspects. To this end, it is also necessary to integrate an identity lens to STEM education.

An Identity Lens Applied to STEM Education

Controversies Defining STEM Identities

Another important part of the literature related to STEM education has focused on understanding how students can feel that STEM education is "for themselves", especially regarding those students who struggle more because they are from minoritized groups. A promising way to study young people's relationships with STEM is by using the paradigm of identity. Although "STEM identity" has been used in the literature, there is not a clear definition of it [31]. Most research studies characterize students' STEM identity as a conglomerate of students' relationships with any of the different STEM areas: a "*socially based identity grounded in the extent to which individuals see themselves and are accepted as a member of a STEM area or field*" [32], but the term STEM identity has been also used interchangeably with science identity [33]. Few studies have suggested the existence of a "general" STEM identity characterized as how students view themselves as

Table 13.1 Proposal for the idiosincratic scientific, engineering, and mathematical practices to be developed in STEM education

Scientific practices Adaptation of NRC [24]	**Engineering practices** Adaptation of Simarro and Couso [29]	*Mathematical practices* Adaptation of NCTM [27] and Niss [28]
Aim: Developing and using useful scientific models to predict, describe, and explain phenomena	*Aim: Identifying and/or developing multiple solutions and select the optimal one*	*Aim: Developing and using mathematical tools, strategies, and concepts to address problems*
Familiarizing with the phenomena and formulating research questions	Defining and delimiting engineering problems	Identifying mathematical concepts to generate problems in diverse situations and contexts
Developing hypotheses and making predictions of scientific phenomena	Developing and using prototypes and simulations	Formulating questions, conjectures, affirmations, or hypotheses
Planning and carrying out scientific research to collect data on the phenomena	Planning and carrying out tests to collect data on the solution	Planning problem solving and carrying it out
Analyzing and interpreting data to improve descriptions and explanations of the phenomena	Analyzing and interpreting data to identify points for improvement	Checking and validating mathematical solutions to problems
Using mathematical reasoning, computational thinking and appropriate technologies when scientifically inquiring, modeling, and arguing	Using mathematical reasoning, computational thinking, scientific models, and available technologies when creating engineering solutions	Using scientific models and technological objects, analog or digital, to adjust and solve mathematical problems
Constructing sufficiently precise descriptions and explanations of phenomena	Materializing adequate solutions	Constructing useful mathematical knowledge in different contexts and situations
Engaging in argument from scientific evidence	Engaging in argument from test results	Arguing using diverse representations, making deductions, and justifying results in the process of solving problems
Obtaining, evaluating, and communicating scientific information	Obtaining, evaluating, and communicating engineering information	Obtaining, evaluating, and communicating mathematical information

Aim of each STEM discipline is emphasized in italics

STEM people, their interest in STEM topics, and their perceived recognition as STEM people from relevant others [34]. These deep discrepancies in how STEM identity is conceptualized led us to question if a general or interdisciplinary STEM identity could actually be developed when students participated in STEM educational activities or not.

"STEM Identity" as an Umbrella of Different S/T/E/M Identities

We approach the characterization of STEM identity from self-identification, as a key process where "*people, using the reflexive aspect of the self, name themselves regarding positional designations or labels*" [35], such as for example a scientist or a student. When they do so, they invoke socially shared meanings and expectations regarding how a scientist or a student behaves, which becomes internalized as the parts of the self that are called identities [35]. Research has shown that students can self-identify with STEM "as a whole", suggesting the existence of a conscious, explicit "sense of STEM identity" for 12- to 16-year-old students. However, even though students' self-identification expressed something about how students relate to the STEM area "as a whole", interpreting the different ways in which a student can positively or negatively identify themselves as STEM people—and even the interpretation of the meaning of STEM—remains unclear.

The integration of complementary and informative constructs when characterizing students' identity (for example, interest, competence, self-efficacy, and aspirations toward the different STEM areas) allows for a more in-depth interpretation of how students relate to STEM and, especially, which meaning they might be attributing to the term STEM. Hence, although we agree that a general "STEM perception" can exist and act as an umbrella, we argue that it is a complex and indeterminate entity, which leads us to question the existence of an actual and defined STEM identity as a whole construct, at least from our current social and historical moment. It does not seem to be a clearly shared social meaning of what a STEM person would be and do, but rather, only defined meanings related to the individual STEM areas (e.g., prototypes of what a science or engineering person is and does) or specific subjects and professions within the individual STEM areas (e.g., prototypes of what a physicist, a computer engineer, or a health professional is and does). In sum, the idea that "general" STEM identity, or identifying with STEM "as a whole", is problematic and not considering the different ways in which students identify with STEM has important implications for education.

Deepening into Students' Possible STEM Identity

As an example of how these STEM identities can be characterized, we opted to explore how students both relate to STEM as a unified construct and how they relate to each of the individual STEM areas (Science, Technology, Engineering and Mathematics). In particular, we wanted to know how students' self-identification with STEM related to students' interest, competence, self-efficacy, and aspirations toward the different STEM areas, as all these constructs have been highlighted in the literature to be deeply related to identity formation [31]. We argue that, by doing this, we could begin to better understand if the term STEM seems to have a single meaning or entails different and complementary meanings for different young people.

To answer these questions, we collected data through a questionnaire from 12- to 16-year-old students from different high schools in and around Barcelona (Catalonia, Spain) in 2019, as explained in our previous works [6]. The analysis of student' responses generated six clusters: C1 (234 students, 23% of the sample), C2 (158 students, 16%), C3 (359 students, 36%), C4 (73 students, 7%), C5 (137 students, 14%) and C6 (43 students, 4%), represented in Fig. 13.1. Although overall, more than half of participating students in the study (56%) expressed explicitly a very positive or fairly positive identification with STEM "as a whole", self-identification with STEM among students in C1 and C2 was overwhelmingly positive. For this reason, we interpreted and classified the two first clusters as a group of students with positive self-identification with STEM. This result was of particular interest because, although self-identification was not used to build the clusters, but rather as a target construct, how students in each cluster self-identified as STEM people reinforced the connection between a possible sense of STEM identity and participants' reported interest, competence, self-efficacy, and aspirations.

When analyzing students' answers in the two clusters displaying positive self-identification as STEM people, we found strong differences. While C1 was overrepresented by students who self-identified as boys, C2 was overrepresented by students who self-identified as girls. Second, students' relation with different STEM areas, showed by their interest, competence, self-efficacy, and aspirations, not only was different, but complementary. Therefore, we observed two notably different ways of how students self-identified as STEM people: students who self-identified as STEM people were inclined either toward the areas of technology and engineering (C1), or toward science (C2), with mathematics appearing to play a secondary and instrumental role for both groups of students [6].

We argue that each of these two groups of students (C1 and C2) might be giving a different meaning to STEM, based on their preferences toward STEM areas, raising questions about the existence of a single and unified meaning of STEM

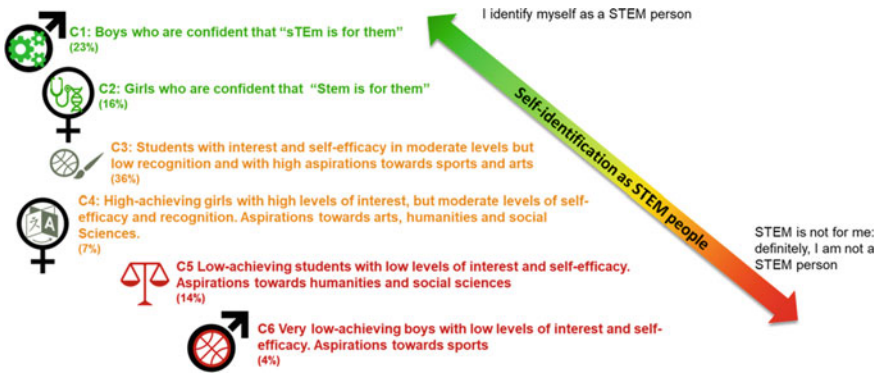


Fig. 13.1 Conceptual representation of the six clusters based on students' self-identification as STEM people

towards which students can position themselves. The contribution of our results is also showing that we can portray a more complex profile to interpret gender and other personal differences in how students negotiate their allegedly STEM identities, especially regarding their interests, capacities, self-efficacy, and aspirations towards particular STEM areas. Hence, it is reasonable to think that these different identities would benefit from diversity in STEM educational approaches. In other words, promoting a unified STEM education, or narrowing STEM practices to one main STEM area, without explicitly and equally considering the myriad of practices and their epistemological singularities, not only can contribute to maintain these identified inequalities and other existing ones, but widen them.

How to Include Both an Epistemic and an Identity Lens in STEM Education?

In the previous sections, we have argued separately the importance of including both an epistemological and an identity perspective in STEM education. Our arguments challenge views of STEM as a transdisciplinary or meta-disciplinary field and fuel the debate about how to address STEM integration in STEM education. However, it is necessary to go a step further in the effort to link the epistemic dimension with the affective one in the context of STEM education for all, taking both dimensions into account at the same time and with the same emphasis if the goals of STEM education are actually to be pursued. In essence, what the previous arguments are showing is that in STEM, as in any other human action, there is no possibility of epistemic and cognitive engagement without emotional engagement. Ignoring this may reinforce and widen inequalities in education and reduce the potential of STEM education for the preparation of all citizens and diverse professionals that take care of their communities and the planet in a knowledgeable, reflective, and critical way.

One possible way of doing so is guiding STEM education by a definition of STEM competence that not only addresses "what of STEM" needs to be mastered and for what, but how STEM is felt differently and why. To truthfully focus the main goals of STEM education we need a definition of STEM competence that is based on the acquisition of mastery regarding the epistemically diverse STEM ideas and practices, but also on the display of diverse STEM identities that reflect a critical but non-stereotyped view of the field. We consider it difficult to make such a definition, but for the purpose of initiating dialogue and a co-creation process in the field, we consider necessary to offer a starting point. As such, and inspired by previous definitions of STEM competence [36], our own definition of STEM competence from an epistemological perspective published in Catalan [37], and including an explicit identity approach, we define STEM competence as being able to *identify, apply and reflect upon the way we think, do and talk in Science, Engineering and Mathematics (in a more or less integrated fashion) to understand, decide and act on complex problems and to build creative solutions, using the*

appropriate technologies and collaborating with others in a critical, reflective and value-driven way, through the enactment of the own agency and the authoring of the contribution of diverse people to minimize the inequalities in the STEM field. Having this (or other better defined STEM competence) in mind, we can ask ourselves if our STEM education interventions do help students to have a critical stance, act with their knowledge of but also about science, engineering or mathematics, or include the values of sustainability or social justice, among others. Despite not all interventions could do all, throughout all the STEM education of a singular student, they should be able to develop this competence progressively. As such, a definition of STEM competence from an epistemological and identity lens can guide our actions as STEM education researchers, trainers, and teachers.

Finally, with this paper we want to emphasize the idea that STEM is not universal: nor in the practices, nor in the knowledge, not epistemologically, not regarding the identities of those who do, like and/or support STEM. STEM is a culturally diverse field, and more diversity should be embraced in STEM education. From our viewpoint, then, any integrative approach to STEM should consider this diversity standpoint and explore different ways of integrating STEM areas and disciplines, in addition to combining STEM integration with none STEM integration. As such, instead of looking for a one-size-fits-all model for STEM integration, we could focus more on what epistemic challenges and identity problems are raised by each particular model of STEM integration, and how to compensate or reflect openly with students on them. For instance, equating I-STEM with interventions only guided by engineering and focused on the creation of technological solutions offers an impoverished view of STEM areas and STEM people, engaging mostly a gendered, particular profile of students. This does not mean that we cannot do this sort of STEM project, but not all I-STEM should look like that: we could offer alternative STEM school interventions guided by mathematics or science, or even projects where students can choose the disciplinary focus, they will use to address them.

Whatever the disciplines leading or involved in a particular STEM educational intervention, we could do so in a way that our students, all of them and each of them, feel welcomed and capable enough. This could be done by explicitly introducing an equity perspective that focus on underrepresented people, indigenous knowledge, and decolonizing practices, among others. But also, by using the research-based didactic and pedagogical tools we have developed in Mathematics, Science and Engineering education research, such as relevant contextualization, formative assessment, dialogic interaction, adequate scaffolding, and so on. It is by doing high quality, evidence-based, and equity-driven STEM education that we will improve the field of STEM education. In essence, the epistemological and identity perspective to STEM education speaks about high-quality STEM education for all.

Acknowledgements This work was funded by the Spanish Government (grant number EDU2015-66643-C2-1-P) and carried out within the ACELEC research group, acknowledged by the Catalan Government (grant number 2017SGR1399).

References

1. Sanders M (2009) STEM, STEMEducation, STEMmania. Technol Teach:20–27
2. Ortiz-Revilla J, Greca IM, Arriassecq I (2022) A theoretical framework for integrated STEM education. Sci Educ 31:383–404. https://doi.org/10.1007/s11191-021-00242-x
3. National Research Council (2011) Successful K-12 STEM education: identifying effective approaches in science, technology, engineering and mathematics. The National Academies Press, Washington, DC
4. Surr W, Loney E, Goldston C, Rasmussen J, Anderson K (2016) From career pipeline to STEM literacy for all. Exploring evolving notions of STEM. Washington, DC
5. Duschl RA, Grandy R (2013) Two views about explicitly teaching nature of science. Sci Educ 22:2109–2139. https://doi.org/10.1007/s11191-012-9539-4
6. Grimalt-Álvaro C, Couso D, Boixadera-Planas E, Godec S (2022) "I see myself as a STEM person": exploring high school students' self-identification with STEM. J Res Sci Teach 59:720–745. https://doi.org/10.1002/tea.21742
7. Moore TJ, Johnston AC, Glancy AW (2020) STEM Integration. In: Johnson CC, Mohr-Schroeder MJ, Moore TJ, English LD (eds) Handbook of research on STEM education. Routledge, New York, pp 3–16
8. Johnston AC, Akarsu M, Moore TJ, Guzey SS (2019) Engineering as the integrator: a case study of one middle school science teacher's talk. J Eng Educ 108:418–440. https://doi.org/10.1002/jee.20286
9. Roehrig GH, Dare EA, Ellis JA, Ring-Whalen E (2021) Beyond the basics: a detailed conceptual framework of integrated STEM. Discip Interdiscip Sci Educ Res 3:11. https://doi.org/10.1186/s43031-021-00041-y
10. Johnson CC, Mohr-Schroeder MJ, Moore TJ, English LD (2020) Handbook of research on STEM education. Routledge
11. Sgro CM, Bobowski T, Oliveira AW (2020) Current praxis and conceptualization of STEM education: a call for greater clarity in integrated curriculum development. In: Contemporary trends and issues in science education, pp 185–210
12. Erduran S (2020) Nature of "STEM"? Sci Educ 29:781–784. https://doi.org/10.1007/s11191-020-00150-6
13. Vasquez JA (2015) STEM-beyond the acronym. Educ Leadersh 72:10–15
14. Kennedy TJ, Odell MRL (2014) Engaging students in STEM education. Sci Educ Int 25:246–258
15. Honey MA, Pearson G, Schweingruber H (2014) STEM integration in K-12 education: status, prospects, and an agenda for research. National Academy Press
16. English LD (2016) STEM education K-12: perspectives on integration. Int J STEM Educ 3:1–8. https://doi.org/10.1186/s40594-016-0036-1
17. Chalmers C, Carter M, Cooper T, Nason R (2017) Implementing "big ideas" to advance the teaching and learning of science, technology, engineering, and mathematics (STEM). Int J Sci Math Educ 15:25–43. https://doi.org/10.1007/s10763-017-9799-1
18. Guzey SS, Moore TJ, Harwell M (2016) Building up STEM: an analysis of teacher-developed engineering design-based STEM integration curricular materials. J Pre-College Eng Educ Res 6:2. https://doi.org/10.7771/2157-9288.1129
19. Kelley TR, Knowles JG (2016) A conceptual framework for integrated STEM education. Int J STEM Educ 3:1–11. https://doi.org/10.1186/s40594-016-0046-z
20. Zubrowski B (2002) Integrating science into design technology projects: using a standard model in the design process. J Technol Educ 13:48–67. https://doi.org/10.21061/jte.v13i2.a.4
21. Ryu M, Mentzer N, Knobloch N (2019) Preservice teachers' experiences of STEM integration: challenges and implications for integrated STEM teacher preparation. Int J Technol Des Educ 29:493–512. https://doi.org/10.1007/s10798-018-9440-9

22. Guzey SS, Ring-Whalen EA (2018) Negotiating science and engineering: an exploratory case study of a reform-minded science teacher. Int J Sci Educ 40:723–741. https://doi.org/10.1080/09500693.2018.1445310
23. Williams JP (2011) STEM education: proceed with caution. Des Technol Educ An Int J 16:26–35
24. National Research Council (2012) A framework for K-12 science education: practices, crosscutting concepts and core ideas. The National Academies Press, Washington, DC
25. Couso D, Simarro C (2020) STEM education through the epistemological lens. In: Johnson CC, Mohr-Schroeder MJ, Moore TJ, English LD (eds) Handbook of research on STEM education. Routledge, New York, pp 17–28
26. Osborne JF (2014) Teaching scientific practices: meeting the challenge of change. J Sci Teacher Educ 25:177–196. https://doi.org/10.1007/s10972-014-9384-1
27. NCTM (2020) Principles and standards for school mathematics overview. Reston, VA
28. Niss M (2011) The Danish KOM project and possible consequences for teacher education. Cuad Investig Y Form En Educ Matemática:13–24
29. Simarro C, Couso D (2021) Engineering practices as a framework for STEM education: a proposal based on epistemic nuances. Int J STEM Educ 8:53. https://doi.org/10.1186/s40594-021-00310-2
30. Erduran S, Dagher ZR (2014) Reconceptualizing the nature of science for science education. Springer, Netherlands, Dordrecht
31. Grimalt-Álvaro C, Couso D (2022) ¿Qué sabemos del posicionamiento STEM del alumnado? Una revisión sistemática de la literatura. Rev Investig Educ (in press)
32. Kim AY, Sinatra GM, Seyranian V (2018) Developing a STEM identity among young women: a social identity perspective. Rev Educ Res 88:589–625. https://doi.org/10.3102/0034654318779957
33. Singer A, Montgomery G, Schmoll S (2020) How to foster the formation of STEM identity: studying diversity in an authentic learning environment. Int J STEM Educ 7.https://doi.org/10.1186/s40594-020-00254-z
34. Cohen SM, Hazari Z, Mahadeo J, Sonnert G, Sadler PM (2021) Examining the effect of early STEM experiences as a form of STEM capital and identity capital on STEM identity: a gender study. Sci Educ:1–25.https://doi.org/10.1002/sce.21670
35. Burke PJ, Stets JE (2009) Identity theory. Oxford University Press, New York
36. Balka D (2011) Standards of mathematical practice and STEM. Stillwater, OK
37. Couso D (2017) Per a què estem a STEM? Definint l'alfabetització STEM per a tothom i amb valors. Rev Ciències Rev del Profr Ciències d'Infantil, Primària i Secundària 34:22–28

Digna Couso holds a Ph.D. in Science Education. She is a tenured lecturer at the Faculty of Education at the Universitat Autònoma de Barcelona where she teaches pre-service primary and secondary school teachers. Her research interests are focused on communities of practice in STEM education, design of teaching and learning sequences and materials, models and modeling-based inquiry in science and particularly in physics, and equity and gender balance in STEM.

Carme Grimalt-Álvaro holds a Ph.D. in Mathematics and Science Education. She is a researcher at Universitat Rovira i Virgili and a visiting scholar at Universitat Autònoma de Barcelona, where she teachers pre-service and in-service primary and secondary school teachers. Her research is centered on teaching and learning in STEM from cultural-historical perspective, the use of digital technologies, and the promotion of equity in the development of young people's identities in STEM.

Cristina Simarro holds a Ph.D. in Mathematics and Science Education. She is a freelance researcher and a high-school technology teacher. Her research focus on tinkering and other creative methodologies in STEM education, engineering practices and interdisciplinarity within STEM.

Index

D. Ortega-Sánchez (ed.), *Controversial Issues and Social Problems for an Integrated Disciplinary Teaching*, Integrated Science 8,
https://doi.org/10.1007/978-3-031-08697-7