

TIMSS 2023 Environmental Attitudes and Behaviors Framework





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Overview

Multiple international cooperation frameworks (e.g., Sustainable Development Goals [SDG], Paris Agreement) call for global measures to respond to climate change and support sustainable development.¹ Because of the increasing urgency of these issues, the TIMSS 2023 Student Questionnaires will measure fourth and eighth grade students' attitudes toward the natural environment, as well as their enactment of environmentally responsible behaviors. Home, school, and classroom contexts contributing to these behaviors will also be represented in the Home, School, and Teacher Questionnaires. These internationally comparable data will support research on children's environmental attitudes, behaviors, and education across countries.

This special framework serves as a supplement to the *TIMSS 2023 Context Questionnaire Framework* and provides information specific to these environmental topics. Because these topics were incorporated into the context questionnaires later in the TIMSS 2023 development cycle (see *The Development Process* below), they were not included in the original *TIMSS 2023 Context Questionnaire Framework*. Readers interested in general information about the TIMSS 2023 context questionnaires are encouraged to consult that specific publication.²

Historically, TIMSS has measured fourth and eighth grade students' environmental knowledge as part of the science assessment. Topics related to human impact on the environment and natural resources have been included in the TIMSS science assessment for many cycles. Measurement of students' knowledge about the natural environment and environmental issues was formalized in TIMSS 2019 with the creation of the TIMSS 2019 Environmental Awareness Scales. Post hoc identification of items from the TIMSS 2019 science assessment measuring environmental awareness allowed for the construction of these cognitive scales, which provide a measure of environmental awareness for fourth and eighth grade students.³ TIMSS 2023 builds on this foundation, incorporating items measuring noncognitive constructs related to environmentalism and sustainability, including students' attitudes and behaviors, parents' behaviors, school policies, and teaching practices.

The TIMSS 2023 Environmental Attitudes and Behaviors Framework outlines the information related to environmental attitudes and behaviors to be collected in the TIMSS 2023 Context Questionnaires with brief rationales and selected references. It begins with a discussion of the importance of this information, as well as an overview of the development process for these questionnaire items. The remainder of the framework is organized around topics included in each of



the questionnaires, beginning with the Student Questionnaire. The framework then discusses items in the Home, School, and Teacher Questionnaires.

Why Measure Environmental Attitudes and Behaviors?

The environmental crisis facing humanity is not only scientific in nature, but also social and political.⁴ This reality is increasingly acknowledged in recent frameworks of environmental sustainability competence.⁵ Addressing environmental challenges requires more than establishing scientific facts; research shows that knowledge alone does not lead to behavioral change and that changes in attitudes and ways of thinking about the natural environment are needed to bring about changes in individuals' behavior.⁶ To make informed and environmentally responsible decisions, students need to develop both environmental knowledge and environmentally responsible attitudes or values.⁷

Attitude is not the sole determinant of behavior; however, there is evidence that good measures of attitudes can predict behavior.^{8,9} Research also suggests that the relationship between attitudes and behavior is stronger when an attitude is informed by behavior-relevant information.¹⁰ Within the realm of environ-mental issues, some evidence shows that attitudes and norms are predictors of environmentally responsible behavior.^{11,12}

Education is increasingly seen as one of the most powerful means for developing environmentally responsible behavior. Therefore, integrating education for sustainable development in schools is receiving greater attention across many countries.^{13, 14, 15} Education for sustainable development requires teaching practices that promote and cultivate positive changes in students' environmental knowledge, attitudes, and behaviors.¹⁶

By incorporating these questionnaire items, and continuing refinement of the TIMSS 2019 Environmental Awareness Scales, TIMSS 2023 aims to measure key characteristics (i.e., knowledge, attitudes, and behaviors) that can support inferences about the degree to which fourth and eighth grade students around the world are prepared to face environmental challenges.

The Development Process

Development of the TIMSS 2023 environmental attitudes and behaviors items proceeded according to a slightly different process and timeline than other items in the TIMSS 2023 Context Questionnaires. Staff at the TIMSS & PIRLS International Study Center began identifying potential topics of interest related to environmentalism and sustainability in May 2022. Subsequently, a special expert group was formed to finalize these constructs and draft items for each of the TIMSS 2023 context questionnaires. The TIMSS 2023 Questionnaire Item Review Committee (QIRC) reviewed these items at the third QIRC meeting in August 2022. National Research Coordinators (NRCs) also reviewed the items prior to TIMSS 2023 data collection.



Student Attitudes and Behaviors Students' Environmental Attitudes

To measure students' environmental attitudes, TIMSS 2023 draws from the two-dimensional Model of Ecological Values, which is based on the Theory of Ecological Attitude.^{17,18,19} Scales developed from this model have been used in populations of young children and adolescents, as well as different national contexts.^{20,21,22,23} Such scales provided a foundation for the TIMSS 2023 items.

The Theory of Ecological Attitude posits two broader dimensions of environmental attitudes: preservation and utilization. Preservation reflects an individual's endorsement of conservation and protection of nature, while utilization reflects an individual's endorsement of human use of natural resources and the environment. Students whose attitudes are aligned with preservation are likely to enjoy spending time in nature and care about the protection of natural areas. Students whose attitudes are aligned with utilization are likely to believe that nature exists for human benefit and have confidence that science and technology will inevitably solve environmental problems. Although originally proposed as orthogonal (i.e., uncorrelated and independent),²⁴ independent replications of the two dimensions in other research have observed a negative correlation between preservation and utilization.^{25,26}

Items measuring the preservation dimension are included in the TIMSS 2023 Student Questionnaire for both fourth and eighth grade students. Items measuring the utilization dimension are included only in the TIMSS 2023 Student Questionnaire for eighth grade students. Students indicate the extent to which they agree or disagree with statements reflecting preservation (fourth and eighth grade) and utilization (eighth grade).

Students' Environmentally Responsible Behaviors

An individual's ability to practice environmentally responsible behaviors is influenced not only by attitudes and knowledge, but also by the opportunities and circumstances of their contexts.^{27, 28} Measuring environmentally responsible behavior can be even more complicated for children internationally. Children tend to have limited agency in making decisions and their ability to exercise control likely varies across countries, cultures, and households.²⁹

Because of these complications, TIMSS 2023 Student Questionnaire items measuring students' environmentally responsible behaviors reflect relatively simple practices that are accessible to students across a variety of contexts, such as reusing things or telling friends when they engage in behaviors that harm the natural environment. Students are asked to indicate how often they engage in these behaviors.





Home Contexts Parenting Practices

Environmental attitudes can be shaped by socialization processes. Parents are the primary socialization agents for their children, and so play a substantial role in the formation of their children's environmental attitudes.³⁰ There is evidence that parental concern for the environment and parental behaviors predict children's environmental attitudes and behaviors.^{31,32} Parents can engage in direct pathways of socialization to transmit their environmental attitudes and behaviors to their children, including talking to their children about environmental issues or showing them how to practice environmentally responsible behavior.³³

TIMSS 2023 gathers information about these direct pathways of socialization in the Home Questionnaire. Parents of fourth grade students are asked to indicate how often they engage in various activities with their child.

School Contexts School Policies and Practices

Schools are formative environments which can have a significant influence on shaping children's and adolescents' environmental attitudes and behaviors.^{34,35,36,37} A shared vision and a schoolwide approach to sustainability education can give a clear direction to teachers and encourage collaboration for integrating sustainability in educational processes.^{38, 39, 40} The demands of current environmental challenges also put greater pressure on education systems to teach young people how to take action to protect the environment.⁴¹ School practices can serve as models of sustainable behavior for students as they provide examples of applying sustainability principles in everyday life. Therefore, integrating sustainability principles in schools' everyday practices is an effective way to promote environmentally sustainable attitudes and behaviors in students.^{42,43} However, schools' enactment of sustainability education is also predicated on the availability of knowledgeable teachers with relevant skills. Although teachers may receive some training in this area during their initial teacher preparation, inservice training and school-based support for teachers' professional development in sustainability education is regarded as one of the most powerful mechanisms for transforming teaching and learning for sustainability in schools.⁴⁴ Effective school-based education for sustainable development is also locally relevant and connected with community development.^{45,46} Schools that promote environmental sustainability in their communities deliver localized instruction that is closely tied to students' everyday experiences and model environmental behavior through community action.^{47,48}

The TIMSS 2023 School Questionnaire gathers information on schools' emphasis on environmental sustainability for both the fourth and eighth grades. Principals are asked to indicate to what extent the school engages in various activities to promote environmental sustainability, such as reviewing school practices and promoting relevant teacher professional development.





Classroom Contexts Teaching Practices

Research provides evidence that teaching methods influence the effectiveness of sustainability instruction.^{49,50} Students who experience more active and interactive teaching methods (e.g., classroom discussions, research projects, hands-on activities, excursions in nature, outdoor environmental programs) demonstrate higher awareness about environmental issues, more positive environmental attitudes, and more frequent environmentally responsible behavior.^{51,52,53,54} Modelling behavior in the classroom can also be an effective tool for cultivating environmentally responsible lifestyles among students.⁵⁵

The TIMSS 2023 Teacher Questionnaire gathers information about the methods science teachers use to teach about sustainability, as well as the extent to which science teachers encourage environmentally responsible behavior among students. This information is collected from both fourth and eighth grade science teachers.

Teachers' Attitudes and Competence

Teachers' personal attitudes shape classroom contexts for students. Research indicates that teachers' motivation and acknowledgement of the role of education in promoting sustainability is an important factor in the effectiveness of sustainability education,^{56,57,58} as is appropriate training for integrating environmentalism and sustainability into science education.^{59,60}

The TIMSS 2023 Teacher Questionnaire asks fourth and eighth grade science teachers to indicate the extent to which they agree that education about environmentalism and sustainability should be a priority for schools, as well as their participation in and need for professional development for integrating these topics into their teaching.

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References

- ¹ United Nations. (2021). *The Sustainable Development Goals Report 2021*. Retrieved from <u>https://unstats.un.org/sdgs/report/2021/</u>
- ² Reynolds, K. A., Mullis, I. V. S., & Martin, M. O. (2021). TIMSS 2023 Context Questionnaire Framework. In I.V.S. Mullis, M. O. Martin, & M. von Davier (Eds.), *TIMSS 2023 Assessment Frameworks*. Retrieved from https://timssandpirls.bc.edu/timss2023/frameworks/chapter-3.html
- ³ Yin, L., & Foy, P. (2020). Constructing the TIMSS 2019 environmental awareness scales. In M. O. Martin, M. von Davier, & I. V. S. Mullis (Eds.), *Methods and Procedures: TIMSS 2019 Technical Report*. Retrieved from <u>https://timssandpirls.bc.edu/timss2019/methods/chapter-18.html</u>
- ⁴ Vare, P., & Scott, W. (2007). Learning for a Change: Exploring the Relationship Between Education and Sustainable Development. *Journal of Education for Sustainable Development*, 1(2), 191–198. <u>https://doi.org/10.1177/097340820700100209</u>
- ⁵ European Commission, Joint Research Centre. (2022). GreenComp, the European sustainability competence framework. Retrieved from <u>https://data.europa.eu/doi/10.2760/13286</u>
- ⁶ Vare, P., & Scott, W. (2007). Learning for a Change: Exploring the Relationship Between Education and Sustainable Development. *Journal of Education for Sustainable Development*, 1(2), 191–198. https://doi.org/10.1177/097340820700100209
- ⁷ Uitto, A., Boeve-de Pauw, J., & Saloranta, S. (2015). Participatory school experiences as facilitators for adolescents' ecological behavior. *Journal of Environmental Psychology*, 43, 55–65. <u>https://doi.org/10.1016/j.jenvp.2015.05.007</u>
- ⁸ Ajzen, I., & Fishbein, M. (1977). Attitude-behavior relations: A theoretical analysis and review of empirical research. *Psychological Bulletin*, 84(5), 888–918. <u>https://doi.org/10.1037/0033-2909.84.5.888</u>
- ⁹ Glasman, L. R., & Albarracín, D. (2006). Forming attitudes that predict future behavior: A meta-analysis of the attitude-behavior relation. *Psychological Bulletin*, 132(5), 778–822. <u>https://doi.org/10.1037/0033-2909.132.5.778</u>
- ¹⁰ Glasman, L. R., & Albarracín, D. (2006). Forming attitudes that predict future behavior: A meta-analysis of the attitude-behavior relation. *Psychological Bulletin*, 132(5), 778–822. <u>https://doi.org/10.1037/0033-2909.132.5.778</u>
- ¹¹ Bamberg, S., & Möser, G. (2007). Twenty years after Hines, Hungerford, and Tomera: A new meta-analysis of psycho-social determinants of pro-environmental behaviour. *Journal of Environmental Psychology*, 27(1), 14–25. <u>https://doi.org/10.1016/j.jenvp.2006.12.002</u>
- ¹² Uitto, A., Boeve-de Pauw, J., & Saloranta, S. (2015). Participatory school experiences as facilitators for adolescents' ecological behavior. *Journal of Environmental Psychology*, 43, 55–65. <u>https://doi.org/10.1016/j.jenvp.2015.05.007</u>
- ¹³ Higgs, A. L., & McMillan, V. M. (2006). Teaching Through Modeling: Four Schools' Experiences in Sustainability Education. *The Journal of Environmental Education*, 38(1), 39–53. <u>https://doi.org/10.3200/JOEE.38.1.39-53</u>
- ¹⁴ Uitto, A., Boeve-de Pauw, J., & Saloranta, S. (2015). Participatory school experiences as facilitators for adolescents' ecological behavior. *Journal of Environmental Psychology*, 43, 55–65. <u>https://doi.org/10.1016/j.jenvp.2015.05.007</u>
- ¹⁵ UNESCO. (2014). Shaping the future we want: UN Decade of Education for Sustainable Development.
- ¹⁶ UNESCO. (2014). Shaping the future we want: UN Decade of Education for Sustainable Development.
- ¹⁷ Bogner, F. X. & Wiseman, M. (1999). Toward measuring adolescent environmental perception. *European Psychologist*, 4(3), 139-151. <u>https://doi.org/10.1027//1016-9040.4.3.139</u>
- ¹⁸ Wiseman, M., & Bogner, F. X. (2003). A higher-order model of ecological values and its relationship to personality. *Personality and Individual Differences*, 34(5), 783–794. <u>https://doi.org/10.1016/S0191-8869(02)00071-5</u>





- ¹⁹ Bogner, F. X. & Wiseman, M. (2006). Adolescents' attitudes towards nature and environment: Quantifying the 2-MEV model. *Environmentalist*, 26, 247-254. <u>https://doi.org/10.1007/s10669-006-8660-9</u>
- ²⁰ Johnson, B., & Manoli, C. C. (2008). Using Bogner and Wiseman's Model of Ecological Values to measure the impact of an earth education programme on children's environmental perceptions. *Environmental Education Research*, 14(2), 115–127. https://doi.org/10.1080/13504620801951673
- ²¹ Johnson, B., & Manoli, C. C. (2010). The 2-MEV Scale in the United States: A Measure of Children's Environmental Attitudes Based on the Theory of Ecological Attitude. *The Journal of Environmental Education*, 42(2), 84–97. <u>https://doi.org/10.1080/00958964.2010.503716</u>
- ²² Schönfelder, M. L., & Bogner, F. X. (2020). Between Science Education and Environmental Education: How Science Motivation Relates to Environmental Values. *Sustainability*, 12(5), 1968. <u>https://doi.org/10.3390/su12051968</u>
- ²³ Thorn, C., & Bogner, F. X. (2018). How Environmental Values Predict Acquisition of Different Cognitive Knowledge Types with Regard to Forest Conservation. *Sustainability*, 10(7), 2188. <u>https://doi.org/10.3390/su10072188</u>
- ²⁴ Wiseman, M., & Bogner, F. X. (2003). A higher-order model of ecological values and its relationship to personality. *Personality and Individual Differences*, 34(5), 783–794. <u>https://doi.org/10.1016/S0191-8869(02)00071-5</u>
- ²⁵ Milfont, T. L., & Duckitt, J. (2004). The structure of environmental attitudes: A first- and second-order confirmatory factor analysis. *Journal of Environmental Psychology*, 24, 289-303. <u>https://doi.org/10.1016/j.jenvp.2004.09.001</u>
- ²⁶ Milfont, T. L., Duckitt, J., & Wagner, C. (2010). The higher order structure of environmental attitudes: A crosscultural examination. *Interamerican Journal of Psychology*, 44(2), 263–273. <u>https://doi.org/10.1016/j.jenvp.2004.09.001</u>
- ²⁷ Kollmuss, A., & Agyeman, J. (2002b). Mind the Gap: Why do people act environmentally and what are the barriers to pro-environmental behavior? *Environmental Education Research*, 8(3), 239–260. <u>https://doi.org/10.1080/13504620220145401</u>
- ²⁸ Ajzen, I. (1991). The theory of planned behavior. Organizational Behavior and Human Decision Processes, 50(2), 179–211. <u>https://doi.org/10.1016/0749-5978(91)90020-T</u>
- ²⁹ Uitto, A., Boeve-de Pauw, J., & Saloranta, S. (2015). Participatory school experiences as facilitators for adolescents' ecological behavior. *Journal of Environmental Psychology*, 43, 55–65. <u>https://doi.org/10.1016/j.jenvp.2015.05.007</u>
- ³⁰ Leppänen, J. M., Haahla, A. E., Lensu, A. M., & Kuitunen, M. T. (2012). Parent-Child Similarity in Environmental Attitudes: A Pairwise Comparison. *The Journal of Environmental Education*, 43(3), 162–176. <u>https://doi.org/10.1080/00958964.2011.634449</u>
- ³¹ Grønhøj, A., & Thøgersen, J. (2009). Like father, like son? Intergenerational transmission of values, attitudes, and behaviours in the environmental domain. *Journal of Environmental Psychology*, 29(4), 414–421. <u>https://doi.org/10.1016/j.jenvp.2009.05.002</u>
- ³² Meeusen, C. (2014). The Intergenerational Transmission of Environmental Concern: The Influence of Parents and Communication Patterns Within the Family. *The Journal of Environmental Education*, 45(2), 77–90. <u>https://doi.org/10.1080/00958964.2013.846290</u>
- ³³ Grusec, J. E., & Davidov, M. (2010). Integrating Different Perspectives on Socialization Theory and Research: A Domain-Specific Approach. *Child Development*, 81(3), 687–709. <u>https://doi.org/10.1111/j.1467-8624.2010.01426.x</u>
- ³⁴ Higgs, A. L., & McMillan, V. M. (2006). Teaching Through Modeling: Four Schools' Experiences in Sustainability Education. *The Journal of Environmental Education*, 38(1), 39–53. <u>https://doi.org/10.3200/JOEE.38.1.39-53</u>





- ³⁵ Uitto, A., Boeve-de Pauw, J., & Saloranta, S. (2015). Participatory school experiences as facilitators for adolescents' ecological behavior. *Journal of Environmental Psychology*, 43, 55–65. <u>https://doi.org/10.1016/j.jenvp.2015.05.007</u>
- ³⁶ UNESCO (2014). *Shaping the future we want: UN Decade of Education for Sustainable Development.*
- ³⁷ Jucker, R., & Mathar, R. (2015). Introduction: From a Single Project to a Systemic Approach to Sustainability—An Overview of Developments in Europe. In R. Jucker & R. Mathar (Eds.), Schooling for Sustainable Development in Europe: Concepts, Policies and Educational Experiences at the End of the UN Decade of Education for Sustainable Development (pp. 3–14). Springer International Publishing. <u>https://doi.org/10.1007/978-3-319-09549-3_1</u>
- ³⁸ Breiting, S., Mayer, M., & Mogensen, F. (2005). *Quality Criteria for ESD-Schools*. Austrian Federal Ministry of Education, Science and Culture.
- ³⁹ Higgs, A. L., & McMillan, V. M. (2006). Teaching Through Modeling: Four Schools' Experiences in Sustainability Education. *The Journal of Environmental Education*, 38(1), 39–53. <u>https://doi.org/10.3200/JOEE.38.1.39-53</u>
- ⁴⁰ Mathar, R. (2015). A Whole School Approach to Sustainable Development: Elements of Education for Sustainable Development and Students' Competencies for Sustainable Development. In R. Jucker & R. Mathar (Eds.), Schooling for Sustainable Development in Europe: Concepts, Policies and Educational Experiences at the End of the UN Decade of Education for Sustainable Development (pp. 15–30). Springer International Publishing. https://doi.org/10.1007/978-3-319-09549-3_2
- ⁴¹ Breiting, S., Mayer, M., & Mogensen, F. (2005). *Quality Criteria for ESD-Schools*. Austrian Federal Ministry of Education, Science and Culture.
- ⁴² Higgs, A. L., & McMillan, V. M. (2006). Teaching Through Modeling: Four Schools' Experiences in Sustainability Education. *The Journal of Environmental Education*, 38(1), 39–53. <u>https://doi.org/10.3200/JOEE.38.1.39-53</u>
- ⁴³ Mathar, R. (2015). A Whole School Approach to Sustainable Development: Elements of Education for Sustainable Development and Students' Competencies for Sustainable Development. In R. Jucker & R. Mathar (Eds.), Schooling for Sustainable Development in Europe: Concepts, Policies and Educational Experiences at the End of the UN Decade of Education for Sustainable Development (pp. 15–30). Springer International Publishing. https://doi.org/10.1007/978-3-319-09549-3_2
- ⁴⁴ Redman, E., Wiek, A., & Redman, A. (2018). Continuing Professional Development in Sustainability Education for K-12 Teachers: Principles, Programme, Applications, Outlook. *Journal of Education for Sustainable Development*, 12(1), 59–80. <u>https://doi.org/10.1177/2455133318777182</u>
- ⁴⁵ Mathar, R. (2015). A Whole School Approach to Sustainable Development: Elements of Education for Sustainable Development and Students' Competencies for Sustainable Development. In R. Jucker & R. Mathar (Eds.), *Schooling for Sustainable Development in Europe: Concepts, Policies and Educational Experiences at the End of the* UN Decade of Education for Sustainable Development (pp. 15–30). Springer International Publishing. https://doi.org/10.1007/978-3-319-09549-3_2
- ⁴⁶ Mathar, R. (2015). Project Variety and Established Structures: Development and Actual Practice of ESD in Germany. In R. Jucker & R. Mathar (Eds.), *Schooling for Sustainable Development in Europe: Concepts, Policies and Educational Experiences at the End of the UN Decade of Education for Sustainable Development* (pp. 123–134). Springer International Publishing. <u>https://doi.org/10.1007/978-3-319-09549-3_8</u>
- ⁴⁷ Green, M., & Somerville, M. (2015). Sustainability education: Researching practice in primary schools. *Environmental Education Research*, 21(6), 832–845. <u>https://doi.org/10.1080/13504622.2014.923382</u>
- ⁴⁸ UNESCO. (2014). Shaping the future we want: UN Decade of Education for Sustainable Development.
- ⁴⁹ Jelle Boeve-de Pauw et al., "The Effectiveness of Education for Sustainable Development," *Sustainability* 7, no. 11 (2015): 15693–717, <u>https://doi.org/10.3390/su71115693</u>





- ⁵⁰ Breiting, S., & Mayer, M. (2015). Quality Criteria for ESD Schools: Engaging Whole Schools in Education for Sustainable Development. In R. Jucker & R. Mathar (Eds.), Schooling for Sustainable Development in Europe: Concepts, Policies and Educational Experiences at the End of the UN Decade of Education for Sustainable Development (pp. 31–46). Springer International Publishing. https://doi.org/10.1007/978-3-319-09549-3_3
- ⁵¹ Boeve-de Pauw, J., Gericke, N., Olsson, D., & Berglund, T. (2015). The Effectiveness of Education for Sustainable Development. Sustainability, 7(11), 15693–15717. <u>https://doi.org/10.3390/su71115693</u>
- ⁵² Johnson, B., & Manoli, C. (2020). Earth Education. Oxford Research Encyclopedia of Education. <u>https://doi.org/10.1093/acrefore/9780190264093.013.684</u>
- ⁵³ Krnel, D., & Naglic, S. (2009). Environmental Literacy Comparison between ECO-Schools and Ordinary Schools in Slovenia. *Science Education International*, 20, 5–24.
- ⁵⁴ Uitto, A., Boeve-de Pauw, J., & Saloranta, S. (2015). Participatory school experiences as facilitators for adolescents' ecological behavior. *Journal of Environmental Psychology*, 43, 55–65. <u>https://doi.org/10.1016/j.jenvp.2015.05.007</u>
- ⁵⁵ Higgs, A. L., & McMillan, V. M. (2006). Teaching Through Modeling: Four Schools' Experiences in Sustainability Education. *The Journal of Environmental Education*, 38(1), 39–53. <u>https://doi.org/10.3200/JOEE.38.1.39-53</u>
- ⁵⁶ Bertschy, F., Künzli, C., & Lehmann, M. (2013). Teachers' Competencies for the Implementation of Educational Offers in the Field of Education for Sustainable Development. *Sustainability*, 5(12), 5067–5080. <u>https://doi.org/10.3390/su5125067</u>
- ⁵⁷ Varela-Losada, M., Pérez-Rodríguez, U., Lorenzo-Rial, M., Vega-Marcote, P., & Reid, A. (2021). Dealing with global environmental change: The design and validation of the GEC attitude scale. *Environmental Education Research*, 27(1), 110–131. <u>https://doi.org/10.1080/13504622.2020.1822990</u>
- ⁵⁸ Réti, M., Horváth, D., Czippán, K., & Varga, A. (2015). The Challenge of Mainstreaming ESD in Hungary. In R. Jucker & R. Mathar (Eds.), Schooling for Sustainable Development in Europe: Concepts, Policies and Educational Experiences at the End of the UN Decade of Education for Sustainable Development (pp. 201–219). Springer International Publishing. <u>https://doi.org/10.1007/978-3-319-09549-3_12</u>
- ⁵⁹ Vega-Marcote, P., & Reid, A. (2021). Dealing with global environmental change: The design and validation of the GEC attitude scale. *Environmental Education Research*, 27(1), 110–131. https://doi.org/10.1080/13504622.2020.1822990
- ⁶⁰ Espinet, M., Junyent, M., Amat, A., & Castelltort, A. (2015). Moving Schools Towards ESD in Catalonia, Spain: The Tensions of a Change. In R. Jucker & R. Mathar (Eds.), *Schooling for Sustainable Development in Europe: Concepts, Policies and Educational Experiences at the End of the UN Decade of Education for Sustainable Development* (pp. 177–199). Springer International Publishing. <u>https://doi.org/10.1007/978-3-319-09549-3_11</u>







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