

PRESS model curriculum framework - syllabus

Course credits and length:

The PRESS course (min. 3 ETCS) comprises a minimum of 14 sessions of two hours each with additional individual and project work by the students.

Course philosophy:

The PRESS model curriculum introduces science student teachers to internationally and nationally relevant concepts, regulations, and policies for sustainability and education for sustainable development (ESD). The curriculum aims to develop scientifically-based sustainability awareness among future science teachers at various educational levels. The aim is to equip the future teachers with knowledge and skills to teach sustainability issues in science classes. The curriculum emphasizes the development of teaching methods that engage students in using their knowledge in real-world situations. The aim is to develop knowledge to both be able to teach about sustainability issues in science class as well as to develop sustainability action with school students in the student teachers' later profession as science teachers. Aside from theoretical input on the international current state-of-the-art in ESD, the PRESS model curriculum includes specific sessions focusing on national curricula, regulations, policies, and examples for the cases of Georgia, Israel, and Indonesia.

The PRESS model curriculum combines presentations with active student engagement through searches, discussions, project work, or student presentations as elements of a guided student-active teaching and learning scenario. For each session, a model approach is under development based on a PowerPoint presentation with information, illustrative materials, and tasks to be conducted during the session and/or as homework assignments.

Specific PRESS features, aside from the general information on sustainability and ESD, are foci on critical scientific media literacy and sustainability representations in social media, networking of schools with non-formal educational partners (e.g. museums, science centers, regional environmental sites, NGOs, or SMEs), and project-based and product/action-oriented learning.

The input and interactive phases in the first eight sessions cumulate in small student projects where student teachers in small groups and in cooperation with schools and non-formal educational partners develop small presentations, activities, or actions to promote sustainability awareness and/or sustainability as such. These projects are presented in the final two weeks of the course to the university public or within the partner schools and are reflected on their educational potential to promote sustainability, particularly in ESD.

Course structure:

The PRESS consortium has agreed upon the following structure for the PRESS model curriculum that is currently in the piloting phase.

Sessions 1 and 2 lay the foundation for the concepts of sustainability and ESD. The PRESS partners in each partner country jointly structure Session 3 on the local/national specifics of sustainability policies and ESD in their countries (with help and guidance from program country partners).

Session 4 reflects on the role of modern (social) media in the debates around sustainability and within the session, student teachers design their own short teaching sequences using social media. Sessions 5 and 6, using various examples, model scenarios for the successful implementation of ESD along international perspectives and national specifics. Session 7 introduces student teachers to project-

based learning and the possibilities for learning when collaborating with informal and non-formal partners. Session 8 is explicitly dedicated to the formation of networks, for example with non-formal partners and SMEs.

In the final third of the course (Sessions 9-13), students are introduced to and then work on their own ESD projects, which they finally present. Session 14 is dedicated to reflecting on the student teachers' projects, the learning process, and the learning effects.

Course structure overview:

Session	Topic	Planning Responsibility
1	Introduction to sustainability and modern concepts of sustainable development	Uni Bremen
2	Theories and foundations of education for sustainable development (ESD)	Uni Bremen
3	National regulations, and policies for ESD in partner countries	Partner country members
4	The role of critical scientific media literacy for ESD	Uni Bremen
5	Best practices of ESD from an international perspective	Uni Bremen
6	Best practices of ESD in partner countries	Partner country members
7	Project-based learning and innovative structures for ESD with informal and non-formal partners	Uni Helsinki
8	Networks, networking, and school partnerships as part of school development	Uni Klagenfurt
9	Introduction and planning for students' PRESS projects	Partner country members
10	<i>Students guided project work</i>	Partner country members
11	<i>Students guided project work</i>	Partner country members
12	<i>Students guided project work</i>	Partner country members
13	Public presentation of students' PRESS projects	Partner country members
14	Reflection on students' PRESS projects and the course	Uni Klagenfurt

Detailed description of content and learning objectives

Session 1	<i>Sustainability and contemporary concepts of sustainable development</i>
<p>General aim of the session: The students learn about theoretical concepts of sustainability and their historical development. They reflect their own understanding and any affective associations with the concept of sustainability. The students search for national policies of sustainable development that are framed by international and scientific concepts, such as the United Nations' Sustainable Development Goals or the Stockholm Resilience Centre's concept of planetary boundaries.</p>	
<p>Content overview</p>	<ul style="list-style-type: none"> • Definitions of sustainability and sustainable development • Concepts and models of sustainable development <ul style="list-style-type: none"> • The dimensions of sustainability • The Sustainable Development Goals (SDGs) • The concept of planetary boundaries • The Anthropocene • Critical raw materials • National policies for sustainable development
<p>Process skills</p>	<ul style="list-style-type: none"> • The students learn how web-based tools can be used to reflect about own understanding and associations, e.g. use of word cloud making by mentimeter.com. • The students learn how to identify national educational policy documents relevant for their later profession as teachers. • The students learn how to develop shared understanding by using web-based tools, e.g. using Padlet technology via padlet.com.
<p>Literature provided to students</p>	<ul style="list-style-type: none"> • Zowada, C., Niebert, K. & Eilks, I. (2022). Perspectives on education for sustainability in chemistry teaching. <i>Quimica Nova na Escola</i>, 44(2), 222–228.
<p>Web resources</p>	<ul style="list-style-type: none"> • https://sdgs.un.org/goals • https://www.stockholmresilience.org/research/planetary-boundaries.html • https://education.nationalgeographic.org/resource/anthropocene • https://single-market-economy.ec.europa.eu/sectors/raw-materials/areas-specific-interest/critical-raw-materials_en

Session 2	Theories and foundations of education for sustainable development (ESD)
General aim of the session: The students learn about theoretical concepts of education for sustainable development (ESD) and their political framing in the UN Agendas 21 and 2030. They see different definitions and models how learning is targeted on ESD. At the end, the students learn about a curriculum model for socio-scientific issues based science education that is feasible for ESD.	
Content overview	<ul style="list-style-type: none"> • Policies and definitions of ESD • Concepts and models of ESD <ul style="list-style-type: none"> • Shaping competencies • Key competencies • Dynamic model of ESD competencies for teaching • Different strategies to do ESD in science teaching • A curriculum model for ESD teaching
Process skills	<ul style="list-style-type: none"> • The students learn how to identify national educational policy documents relevant for ESD. • The students reflect international policies for ESD towards their own national and regional conditions. • The students learn how to develop shared understanding by using web-based tools, e.g. using Padlet technology via padlet.com.
Literature provided to students	<ul style="list-style-type: none"> • Burmeister, M., Rauch, F., & Eilks, I. (2012). Education for Sustainable Development (ESD) and secondary chemistry education. <i>Chemistry Education Research and Practice</i>, 13 (2), 59-68. • Eilks, I., Rauch, F., Ralle, B., & Hofstein, A. (2013). How to balance the chemistry curriculum between science and society. In I. Eilks & A. Hofstein (eds.), <i>Teaching chemistry – A studybook</i> (pp. 1-36). Rotterdam: Sense. • Sjöström, J., Rauch, F., & Eilks, I. (2015). Chemistry education for sustainability. In I. Eilks & A. Hofstein (eds.), <i>Relevant chemistry education - From theory to practice</i> (pp. 163-184). Rotterdam: Sense.
Web resources	<ul style="list-style-type: none"> • https://www.unesco.org/en/sustainable-development/education • https://www.unesco.org/en/education-sustainable-development/need-know • https://www.oecd.org/education/education-policy-outlook-4cf5b585-en.htm • https://education.ec.europa.eu/focus-topics/green-education/learning-for-the-green-transition • https://www.globaleslernen.de/sites/default/files/files/pages/curriculum_framework_education_for_sustainable_development_barrierefrei.pdf

Session 3a	National regulations, and policies for ESD in Georgia
General aim of the session: The students learn about the national regulations and policies in Georgia. They search for the national documents, analyze them and conduct discussions.	
Content overview	<ul style="list-style-type: none"> • Decree of the Government of Georgia on Sustainable Development Goals • National documents for promoting environmental education and education for sustainable development • Environmental education in Georgia
Process skills	<ul style="list-style-type: none"> • The students learn how to identify national educational policy documents relevant for ESD. • The students reflect on national policy and compare with international policies for ESD
Literature provided to students	<p>Literature in Georgian language:</p> <ul style="list-style-type: none"> • <i>National Strategy and Action Plan of Georgia for the years 2020-2024.</i> Environmental and Education Center, 2020 • <i>Sectoral characteristics of education of primary level teacher.</i> National Centre for Educational Quality Enhancement
Web resources	<ul style="list-style-type: none"> • https://www.eiec.gov.ge/Ge/EducationalResources • https://www.cenn.org/ka/%e1%83%9e%e1%83%a3%e1%83%91%e1%83%9a%e1%83%98%e1%83%99%e1%83%90%e1%83%aa%e1%83%98-%e1%83%94%e1%83%91%e1%83%98/ • https://www.undp.org/ka/georgia/publications/shavi-zghvis-skivri

Session 3b.1	National regulations, and policies for ESD in Israel – Hebrew sector
<p>General aim of the session: The student teachers are challenged to construct knowledge, tools, and skills required for ESD according to the Israeli interpretation of the term, with special attention to the concept of energy. In Israel, Education for Sustainability operates in the formal education system as part of Division A of Sciences in the Pedagogical Secretariat of the Ministry of Education. It is a broad concept that views the environmental challenges we are experiencing as an opportunity to raise a generation that will create a more considerate society. This view invites students to construct knowledge, tools, and skills that encourage active citizenship, critical thinking, and social solidarity.</p>	
<p>Content overview</p>	<ul style="list-style-type: none"> • Moto of ESD in Israel: "Sustainability is an optimistic democratic worldview, which places human dignity and freedom at the center with a deep understanding that humankind is part of the web of life that nourishes and sustains all creatures on the planet." • Scientific knowledge is the basis of activism and socio-ecological action. • Acquiring "ecological literacy" fosters systemic thinking and understanding of the interrelationships between the ecosystems that sustain us. • The scientific knowledge about sustainability is interdisciplinary and embraces biology, chemistry, physics, geography, geology, and more. • The scientific infrastructure allows a mental and practical leap to the following concepts, in the form of technological inventions and social activism in the field of sustainability, to expand on the teaching of scientific knowledge in each field. • ESD aims to foster science-based awareness of how to address questions such as: What is a better environment from an environmental, economic, health, and social point of view? How can humans contribute to making a better environment? What is the meaning of "environmental responsibility," "environmental

	<p>citizenship," "activism" and "social justice" in the context of sustainability?</p> <ul style="list-style-type: none"> • ESD is an educational and social challenge that combines political and economic challenges. It involves fostering together environmental responsibility and social justice based on scientific knowledge and new technologies. • In ESD, scientific knowledge, social consciousness, and comprehensive thinking are the basis for developing students' understanding of the need to take action regarding environmental issues. • In ESD, students are expected to understand the complex effects on the planet and be able to determine what behavior is desirable.
Process skills	<p>The teacher-students will be able to:</p> <ul style="list-style-type: none"> • Unpack the motto of ESD in Israel • Differentiate between scientific knowledge-based arguments and none scientific ones as the basis of activism and socio-ecological action • Differentiate between systemic and non-systemic thinking • Describe methods for characterizing locally as well as globally a good environment from various perspectives; How to evaluate humans' contribution to a better environment; An "environmental responsibility," "environmental citizenship," "activism," and "social justice" in the context of sustainability. <ul style="list-style-type: none"> ○ justice" in the context of sustainability.
Literature provided to students	<ul style="list-style-type: none"> • Redman, A., Wiek, A., & Barth, M. (2021). Current practice of assessing students' sustainability competencies: A review of tools. <i>Sustainability Science</i>, 16, 117-135. • Casasso A, Capodaglio P, Simonetto F, Sethi R. (2019). Environmental and Economic Benefits from the Phase-out of Residential Oil Heating: A Study from the Aosta Valley Region (Italy). <i>Sustainability</i>. 11(13), 3633. • Leal Filho, W., Raath, S., Lazzarini, B., Vargas, V. R., de Souza, L., Anholon, R., ... & Orlovic Lovren, V. (2018). The role of transformation in learning and education for sustainability. <i>Journal of Cleaner Production</i>, 199, 286-295. • Leicht, A., Heiss, J., & Byun, W. J. (2018). <i>Issues and trends in education for sustainable development</i>. UNESCO Publishing. https://unesdoc.unesco.org/ark:/48223/pf0000261445 • Wals, A. E., & Jickling, B. (2002). "Sustainability" in higher education: From doublethink and newspeak to critical thinking and meaningful learning. <i>International Journal of Sustainability in Higher Education</i>, 3(3), 221-232.
Web resources	<ul style="list-style-type: none"> • https://pop.education.gov.il/sustainability-education/ • https://docs.google.com/viewer?url=https%3A%2F%2Ffs.knesset.gov.il%2Fglobaldocs%2FMMM%2Fc70d63ce-bc19-eb11-8109-00155d0aee38%2F2_c70d63ce-bc19-eb11-8109-00155d0aee38_11_17644.pdf • https://www.gov.il/BlobFolder/guide/enviromental_education_system/he/education_sustainability_education_live_together.pdf • https://www.reshet-yeruka.net/

Session 3b.2	National regulations, and policies for ESD in Israel – Arab sector
General aim of the session: Students will get to know what ESD entails and its meaning in the context of global sustainability goals, and will also learn about the specific policies and regulations governing ESD in Israel, and will learn about the roles and responsibilities of various government bodies, such as the Ministry of Education, in the promotion and implementation of ESD, as well as what are the challenges facing the implementation of ESD in Israel .	
Content overview	<ul style="list-style-type: none"> • An overview of the national policy framework governing ESD, highlighting specific laws and government guidelines that support sustainability education. • A discussion of the challenges facing the implementation of this policy and future developments or potential reforms aimed at increasing ESD in Israel. • Detailing the roles and responsibilities of various government bodies, such as the Ministry of Education and the Ministry of Environmental Protection, in implementing ESD. • A discussion of the challenges facing the implementation of this policy and future developments or potential reforms aimed at increasing ESD in Israel.
Process skills	<ul style="list-style-type: none"> • Skills in design and conceptual integration exist in the curriculum across different educational levels. • Able to create and use assessment tools that effectively measure students' understanding and engagement in ESD topics. • Expertise in using effective teaching methods that enable interactive and interdisciplinary learning experiences focused on sustainability. • Skills in fostering collaborative learning environments that encourage student participation and critical thinking on sustainability issues.
Literature provided to students	<ul style="list-style-type: none"> • Implementation of the Sustainable Goals Development National Review, Israel 2019 • Man, nature, SDG, and what's next (in Hebrew) • Holst, J., Brock, A., Singer-Brodowski, M., & de Haan, G. (2020). Monitoring progress of change: Implementation of Education for Sustainable Development (ESD) within documents of the German education system. <i>Sustainability</i>, 12(10), 4306. • Waltner, E. M., Scharenberg, K., Hörsch, C., & Rieß, W. (2020). What teachers think and know about education for sustainable development and how they implement it in class. <i>Sustainability</i>, 12(4), 1690.
Web resources	<ul style="list-style-type: none"> • https://www.esd-env.com/ • https://www.teva.org.il/

Session 3c	National regulations, and policies for ESD in Indonesia
<p>General aim of the session: The students learn about the national regulations and policies governing Education for Sustainable Development (ESD) in Indonesia, including their implementation strategies, key stakeholders involved, and the impact on educational practices and sustainable development goals</p>	
<p>Content overview</p>	<p>National ESD Policies:</p> <ul style="list-style-type: none"> • Overview of Indonesia’s national policies on ESD. • Key regulations and legislative frameworks supporting ESD. <p>Governmental and Institutional Roles:</p> <ul style="list-style-type: none"> • Roles of the Ministry of Education and Culture, Ministry of Environment and Forestry, and other relevant bodies. • Coordination between different governmental and non-governmental organizations. <p>Implementation Strategies:</p> <ul style="list-style-type: none"> • Strategies for integrating ESD into the national curriculum. • Examples of successful ESD initiatives and programs in Indonesia. <p>Challenges and Opportunities:</p> <ul style="list-style-type: none"> • Common challenges in implementing ESD policies. • Opportunities for enhancing ESD through policy and practice.
<p>Process skills</p>	<ul style="list-style-type: none"> • The students analyze the framework and key components of ESD policies in Indonesia. • The students identify the roles of various governmental and non-governmental organizations in promoting ESD. • The students evaluate the effectiveness of these policies in achieving sustainable development goals. • The students reflect and discuss the challenges and opportunities in implementing ESD at different educational levels.
<p>Literature provided to students</p>	<ul style="list-style-type: none"> • Berglund, T.; Gericke, N.; Chang Rundgren, S.-N. (2014). The implementation of education for sustainable development in Sweden: Investigating the sustainability consciousness among upper secondary students. <i>Research in Science and Technology Education</i>, 32, 318–339. • Didham, R. J., & Ofei-Manu, P. (2012). <i>Education for Sustainable Development Country Status Reports: An Evaluation of National Implementation During the UN Decade of Education for Sustainable Development (2005-2014) in East and Southeast Asia</i>. Kanagawa, Institute for Global Environmental Strategies. • Didham, R. J., & Ofei-Manu, P. (2012). <i>Monitoring & Evaluation of Education for Sustainable Development - A framework of the main factors and important leverage points in the implementation of education for sustainable development in the Asia-Pacific region</i>. United Nations University Institute of Advanced Studies (UNU-IAS). Kanagawa, Institute for Global Environmental Strategies (IGES). • Eames, C., Barker, M., Wilson-Hill, F., & Law, B. (2010). <i>Investigating the relationship between whole-school approaches to education for sustainability and student learning</i>. A summary. New Zealand Council for Educational Research.

Web resources	<ul style="list-style-type: none">• https://www.ecoschools.global/how-does-it-work.• https://www.forestschoollassociation.org/what-is-forestschool/• https://www.unesco.org/en/articles/indonesia-support-esd-2030-through-national-workshop-country-initiatives• https://www.adb.org/publications/reviews-national-policies-education-indonesia-rising-challenge• https://www.oecd-ilibrary.org/education/education-in-indonesia_9789264230750-en
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Session 4	<i>The role of critical scientific media literacy for ESD</i>
General aim of the session: The students learn about the role of modern media in the sustainability debate and the potential that dealing with (modern) media can have for ESD. They reflect on the often one-sided depiction of sustainability especially on social media. Good practice examples for teaching interventions that combine ESD and scientific media literacy are provided. Students are the encouraged to create their own teaching scenarios.	
Content overview	<ul style="list-style-type: none"> • Definitions of media literacy and scientific media literacy • Aspects of relevance of media for ESD • State of the research on science and the media, the influence of media on young people, teachers' perceptions on science and the media • Inoculation theory • Relevant aspects when creating teaching environments with a focus on (modern) media
Process skills	<ul style="list-style-type: none"> • The students learn how a hashtag-based search on social media can reveal current ESD debated • The students learn how to create teaching materials using social-media-based designs • The students learn how to develop shared understanding by using web-based tools, e.g. Mentimeter
Literature provided to students	<ul style="list-style-type: none"> • Belova, N., Heckenthaler, A., Tietjen, J. M., & Zowada, C. (2023). Chemistry-Based Information in Social Media – from Media Literacy Goals Towards Curricular Innovations. In Y. Dori, C. Ngai, & G. Szteinberg (eds.), <i>The Digital Learning and Teaching in Chemistry</i> (pp. 93-107). RSC. • Belova, N., & Krause, M. (2023). Inoculating students against science-based manipulation strategies in social media: debunking the concept of 'water with conductivity extract'. <i>Chemistry Education Research and Practice</i>, 24, 192-202.
Web resources	<ul style="list-style-type: none"> • https://unesdoc.unesco.org/ark:/48223/pf0000377068

Session 5	Best practices of ESD from an international perspective
<p>General aim of the session: The students learn about the role of local contexts for ESD and the importance of dealing with ESD aspects on an individual country level. Based on cases from all over the world, they reflect on the potential of different ideological and philosophical orientations (western imperatives vs. indigenisation, decolonisation etc.).</p>	
<p>Content overview</p>	<ul style="list-style-type: none"> • Examples for sustainability issues in different regions of the world based on the project and partner countries of PRESS (e.g. lobster larvae smuggling in Indonesia, desalination in Israel or sustainable fashion in Finland) • Summary of current review publications on international perspectives on ESD • Presentation of three cases (Thailand, Germany, South Africa)
<p>Process skills</p>	<ul style="list-style-type: none"> • The students learn how to develop shared understanding by using web-based tools, e.g. Mentimeter • The students learn how to use common databases to search for ESD examples
<p>Literature provided to students</p>	<ul style="list-style-type: none"> • Doxsee, K. M. (2015). Collaborative Development of a High School Green Chemistry Curriculum in Thailand. In V. G. Zuin & L. Mammino (eds.), <i>Worldwide Trends in Green Chemistry Education</i> (pp. 61-75). RSC. • Linkwitz, M., & Eilks, I. (2022). An Action Research Teacher's Journey while Integrating Green Chemistry into the High School Chemistry Curriculum. <i>Sustainability</i>, 14(17), 10621. • Dzerefos, C. (2020). Reviewing education for sustainable development practices in South African eco-schools. <i>Environmental Education Research</i>, 26(11), 1621-1635.
<p>Web resources</p>	<ul style="list-style-type: none"> • Databases such as ERIC, Google Scholar or Web of Science can be used

Session 6a	Best practices of ESD in Georgia
General aim of the session: The students learn about the Georgian best practices. These practices can help foster a culture of sustainability and equip students with the knowledge, skills, and attitudes necessary to address environmental challenges.	
Content overview	<ul style="list-style-type: none"> • Cultural Context and Local Relevance • Green Schools Project (Some schools in Georgia have adopted sustainable practices in their operations. This includes waste reduction programs, energy-saving measures, and the use of renewable energy sources. Schools also engage students in maintaining school gardens and participating in recycling programs) • Community and School Partnerships • Public Awareness Campaigns • CABOL project
Process skills	<ul style="list-style-type: none"> • The students learn how to identify best practices of ESD in Georgia • The students reflect on best practice examples • The students learn how to use multimedia and technology to search for ESD examples
Literature provided to students	<ul style="list-style-type: none"> • Sekhniasvili, M. (2024) Let's think and talk about the environment, Journal "Matsavlebeli", 02.24 • Ratiani, M. (2019) Sustainable development goals - from theory to practice, Ilia State University publishing house
Web resources	<ul style="list-style-type: none"> • https://greenschool.ge/eng/ • https://www.kgt.ge/en/post/eco-schools-program-in-georgia

Session 6b.1	Best practices of ESD in Israel – Hebrew sector
General aim of the session:	
Content overview	This course's main goal is to raise teachers-students' awareness of the role of the fundamental values of Science in considerations related to sustainability issues with a special focus on energy. Rather than stating one correct view of the subject, the course aims at providing the students with tools to weigh and compare between different sustainable solutions quantitatively and means to convey these tools to their future students. Examples will mainly focus on phenomena related to energy.
Process skills	<p>Curriculum Integration:</p> <ul style="list-style-type: none"> • Interdisciplinary Teaching: Merging 21st-century skills (Communication, Collaboration, Critical Thinking and Problem Solving) with traditional subjects to enrich the curriculum. • Active Methodologies: Employing strategies like "constructive alignment" and "backward design" to align learning outcomes with teaching activities. • Assessment Methods: Knowledge of various assessment tools for critical thinking and adopting frameworks like the VALUE rubrics and the ATC21S project. <p>Constructivist Approaches:</p> <ul style="list-style-type: none"> • Social Constructivism, Student-Centered Learning <p>Technology Integration:</p> <ul style="list-style-type: none"> • ICT Literacy: Using technology effectively to enhance the learning process. • Tech-Enhanced Learning: Utilizing modern tools and applications to create interactive, engaging, and personalized learning environments.

	<ul style="list-style-type: none"> • Model Application: Understanding and applying a model to enhance teaching practices. <p>Personalization and Co-Design:</p> <ul style="list-style-type: none"> • Involving students in the design of the curriculum and learning activities to make learning more relevant and engaging. • Creating flexible and personalized learning experiences tailored to individual student needs. • Developing beyond subject knowledge to include technological, pedagogical, and disciplinary elements. <p>Reflective and Feedback-Oriented Learning:</p> <ul style="list-style-type: none"> • Feedback Mechanisms: Providing clear and precise feedback, enabling students to learn from their mistakes and improve continuously. • Reflective Practice: Encouraging students to reflect on their learning experiences to foster deeper understanding and self-improvement.
<p>Literature provided to students</p>	<p>Curriculum Integration</p> <ul style="list-style-type: none"> • Langbeheim, E., Lehavi, Y., & Merzel, A., (2023). Physics in K-12 integrated science curricula. In M. F. Tasar & P. R. L. Heron (eds.), <i>International Handbook of Physics Education Research</i>. • Lehavi, Y., & Eylon, B. S. (2018). Integrating Science Education Research and History and Philosophy of Science in Developing an Energy Curriculum. In M. Matthews (ed.), <i>History, Philosophy and Science Teaching</i> (pp. 235-260). Springer. <p>Teacher-Teacher Curiosity-Driven Discourse</p> <ul style="list-style-type: none"> • Lehavi, Y., Merzel, A., Segal, R., & Jutkowitz, R. (2021). Introducing pedagogical content awareness to model growth in the context of teachers' peer mentoring. <i>Proceedings of the 2021 AERA Annual Meeting. 2021 AERA Annual Meeting</i>. • Lehavi, Y., Merzel, A., Segal, R., Baram, A., & Eylon, B.-S. (2019). Using Self-video-based Discourse in Training Physics Teachers. In E. McLoughlin & P. van Kampen (Eds.), <i>Concepts, Strategies and Models to Enhance Physics Teaching and Learning</i> (pp. 159–169). Springer . • Segal, R., Merzel, A., Lehavi, Y. (2023). Improving the Professional Awareness of Mathematics Teachers and Teacher Instructors Using Video-Based Curiosity-Driven Discourse – A Case Study. <i>International Journal of Science and Mathematics Education</i>, 22, 1083-1106. • Segal, R., Lehavi, Y., Merzel, A., Baram, A., & Eylon, B. S. (2018). Using self-video-based conversation in training mathematics teacher instructors. Accepted to Research Report. In <i>Proceedings of the 42nd Conference of the International Group for the Psychology of Mathematics Education</i>, 4, 139-146. <p>Teaching energy as a crosscutting concept</p> <ul style="list-style-type: none"> • Abramovitch, S., & Fortus, D. (2023). Conceptualization of Energy by Practicing Scientists: Do Researchers from Different Disciplines Grasp Energy as a Crosscutting Concept?. <i>Education Sciences</i>, 13(12), 1179. • Etkina, E., Owen, J., Planinsic, G., & Seeley, L. (2023). How Crosscutting Is the Energy Concept within Physics Teaching and Learning. <i>Education Sciences</i>, 13(9), 857. • Lehavi, Y., Yosovich, A., & Barak, S. (2016). Bringing joule back to school. <i>School Science Review</i>, 97(361), 9-14.

	<ul style="list-style-type: none"> • Nordine, J. C., & Lee, O. (2023). On the nature and utility of crosscutting concepts. <i>Education Sciences</i>, 13(7), 640. • Nordine, J., Fortus, D., Lehavi, Y., Neumann, K., & Krajcik, J. (2018). Modeling energy transfers between systems to support energy knowledge in use. <i>Studies in Science Education</i>, 54(2), 177-206.
Web resources	<ul style="list-style-type: none"> • https://pop.education.gov.il/sustainability-education/sustainability-education-programs/ • https://madan.education/review-daily/330/

Session 6b.2	Best practices of ESD in Israel – Arab sector
<p>General aim of the session: Students will learn how ESD is integrated across different subjects to provide students with a holistic understanding of sustainability issues, how local communities can be involved in the educational process, and how to adapt ESD content to reflect Israel's cultural, historical, and social contexts. In addition, comprehensive training can be provided to teachers on how to provide ESD effectively, and how to encourage student-led initiatives and projects that promote sustainability.</p>	
<p>Content overview</p>	<ul style="list-style-type: none"> • Applying ESD across different subjects to give students a comprehensive understanding of sustainability. • Adapting ESD to the environmental challenges and the unique cultural context of Israel. • Collaboration with local entities to provide students with practical experiences. • Encouraging student-led projects to encourage active participation and responsibility for sustainability.
<p>Process skills</p>	<ul style="list-style-type: none"> • Skills in encouraging students to analyze, question, and apply sustainability concepts in real-world contexts. • Skills in combination exist across different subjects to provide a comprehensive education. • Can use interactive and participatory teaching methods that involve students deeply in sustainability issues. • Skills in facilitating collaborative learning that promotes teamwork in sustainability projects. • Ability to guide students in identifying, investigating, and solving environmental challenges.
<p>Literature provided to students</p>	<ul style="list-style-type: none"> • Gan, D. (2021). Perspectives on environmental education, citizenship, and assessment: A case study of elementary school teachers and principals in Israel. <i>Educational Policy Analysis Archives</i>, 29(127). • Zuzovsky, R. (2021). Failing the test or the failure of the test: The case of environmental education in Israel. <i>Educational Policy Analysis Archives</i>, 29(123). • Zaradez, N., Sela-Sheffy, R., & Tal, T. (2020). The identity work of environmental education teachers in Israel. <i>Environmental Educational Research</i>, 26(6), 812-829. • Tal, T. (2020). Green schools in Israel: Multiple rationales and multiple action plans. <i>Green schools globally: Stories of impact on educational for sustainable development</i>, 227-244.
<p>Web resources</p>	<ul style="list-style-type: none"> • https://www.gov.il/he/departments/topics/sustainability_and_economy/govil-landing-page • https://www.teva.org.il/ • https://www.esd-env.com/

Session 6c	Best practices of ESD in Indonesia
<p>General aim of the session: The students learn to identify, analyze, evaluate the best practices of Education for Sustainable Development (ESD) in Indonesia, demonstrating an understanding of successful initiatives and their impact on promoting sustainability within educational settings and communities</p>	
<p>Content overview</p>	<p>Successful ESD Initiatives:</p> <ul style="list-style-type: none"> • Case studies of successful ESD programs in Indonesian schools and communities. • Examples of projects that have effectively integrated ESD into the curriculum. <p>Implementation Strategies:</p> <ul style="list-style-type: none"> • Methods for incorporating ESD into various educational levels and subjects. • Pedagogical approaches and teaching methods that support ESD. <p>Stakeholder Involvement:</p> <ul style="list-style-type: none"> • Role of educators, students, parents, and community members in promoting ESD. • Strategies for effective stakeholder engagement and collaboration. <p>Challenges and Solutions:</p> <ul style="list-style-type: none"> • Common challenges faced in implementing ESD. • Innovative solutions and best practices to overcome these challenges.
<p>Process skills</p>	<ul style="list-style-type: none"> • The students identify key examples of successful ESD initiatives in Indonesia. • The students analyze the factors contributing to the success of these initiatives. • The students evaluate the impact of best practices on educational outcomes and sustainable development goals.
<p>Literature provided to students</p>	<ul style="list-style-type: none"> • Primasti, G.S. (2021, October). Design and Development of Green Behavior Introduction Activities: Implementation of the ESD Program in Elementary Schools. <i>Jurnal Spektrum Analisis Kebijakan Pendidikan</i>, 10 (3), 80-100. • Mulyadiprana, A., dkk. (2022). Rancang Bangun Kegiatan Pengenalan Green Behavior: Penerapan Program ESD di Sekolah Dasar. <i>Edukatif : Jurnal Ilmu Pendidikan</i>, 4 Nomor 2 Tahun 2022 Halm 2370 – 2377. • Supriatna, N., dkk. (2018, November). Implementation Education for sustainable development (ESD). <i>Primaria Educationem Journal</i>, 1 (2). • Riyanto, A, dkk (2023, January). Potensi Implementasi STEAM Berorientasi ESD dalam Pembelajaran Zat dan Perubahannya. <i>Jurnal Penelitian Pembelajaran Fisika</i>, 15 (1), 88-94. • Zidny, R., & Eilks, I. (2022). Learning about pesticide use adapted from ethnoscience as a contribution to green and sustainable chemistry education. <i>Education Sciences</i>, 12(4), 227. • Zidny, R., Solfarina, S., Aisyah, R. S. S., & Eilks, I. (2021). Exploring indigenous science to identify contents and contexts for science

	<p>learning in order to promote education for sustainable development. <i>Education Sciences</i>, 11(3), 114.</p> <ul style="list-style-type: none"> • Zidny, R., & Eilks, I. (2020). Integrating perspectives from indigenous knowledge and Western science in secondary and higher chemistry learning to contribute to sustainability education. <i>Sustainable Chemistry and Pharmacy</i>, 16, 100229.
Web resources	<ul style="list-style-type: none"> • https://link.springer.com/chapter/10.1007/978-981-99-8711-5_9 • https://www.unesco.org/en/articles/indonesia-support-esd-2030-through-national-workshop-country-initiatives • https://www.unicef.org/indonesia/reports/compendium-of-good-practices • https://www.oecd.org/publications/education-in-indonesia-9789264230750-en.htm • https://link.springer.com/chapter/10.1007/978-981-15-3859-9_14

Session 7	Project-based learning and innovative structures for ESD with informal and non-formal partners
<p>General aim of the session: The aim of this session is to explore how project-based learning (PBL) can be integrated in ESD through partnerships with informal and non-formal educational entities. Students will learn about the impact learning environment can have on an individual's learning and the criteria for collaboration with informal and non-formal partners to enhance learning outcomes and promote sustainable practices. Examples of projects in ESD with informal and nonformal partners are shared to give students concrete ideas to incorporate to their own projects and teaching in future.</p>	
Content overview	<ul style="list-style-type: none"> • Definitions of a learning environment and formal, non-formal and informal learning • Discussion on students' experiences with different learning environments • The criteria for collaboration with non-formal and informal partners, including study visits as a form of collaboration • Examples on non-formal and informal learning environments, study visits and PBL with various partners • Brainstorming and discussing about possible local non-/informal partners and benefits of collaboration
Process skills	<ul style="list-style-type: none"> • The students understand how to integrate non-/informal learning opportunities into their teaching. • The students learn to identify potential non-/informal partners relevant for ESD.
Literature provided to students	<ul style="list-style-type: none"> • Tolppanen, S., Vartiainen, J., Ikävalko, V.-M., & Aksela, M. (2015). Relevance of Non-Formal Education in Science Education. In I. Eilks & A. Hofstein (Eds.), <i>Relevant Chemistry Education: From Theory to Practice</i> (pp. 335–354). Sense. • Eshach, H. (2007). Bridging In-school and Out-of-school Learning: Formal, Non-Formal, and Informal Education. <i>Journal of Science Education and Technology</i>, 16(2), 171–190. • Haatainen, O. & Aksela, M. (2021). Project-Based Learning in Science Education: Active Teachers' Perceptions and Practices. <i>LUMAT</i>, 9(1), 149–173. • Markula, A, & Aksela, M. (2022). The key characteristics of project-based learning: how teachers implement projects in K-12 science education. <i>Disciplinary and Interdisciplinary Science Education Research</i>, 4:2
Web resources	<ul style="list-style-type: none"> • https://www.bu.edu/ctl/guides/project-based-learning/ • https://teachingcommons.stanford.edu/resources/learning/learning-activities/project-based-learning • https://www.edutopia.org/blog/pbl-through-a-makers-lens-patrick-waters • https://www.pblworks.org/what-is-pbl • https://er.educause.edu/articles/2015/1/using-design-thinking-in-higher-education • https://start.luma.fi/en/ • https://start.luma.fi/en/materials/

Session 8	Networks, networking, and school partnerships as part of school development
<p>General aim of the session: This session assumes that ESD is more successful in cooperative settings. School Development supports the opening of schools to the local community and synergy effects are achieved through co-operation. The session is explicitly dedicated to the formation of networks and co-operation with non-formal partners and SMEs. The students understand the importance of co-operation and networking at school and with the environment locally, regionally and internationally. In this way, they learn about examples of networks and support systems that can inspire their own work as teachers.</p>	
Content overview	<ul style="list-style-type: none"> • Concepts of professional development, organizational development, co-operation and networking • Examples of networks and co-operation between different organizations, e.g. school networks, co-operation between schools and universities or schools and NGOs
Process skills	<ul style="list-style-type: none"> • Students learn about cooperation and networking concepts that are incorporated into their practice • Students learn how to identify cooperation and network partners in their specific contexts • Using practical examples, students reflect on the potential and challenges of cooperation and networking for learning and understanding science and sustainable development
Literature provided to students	<ul style="list-style-type: none"> • Rauch, F., Steiner, R., & Kurz, P. (2023). Professional development for education for sustainable development: the case of the university in-service course “Education for sustainable development – innovations in school and teacher education (BINE)”. <i>APeDuC Journal</i> 4 (01), 45-59. • Rauch, F., & Pfaffenwimmer, G. (2020). The Austrian ECOLOG-Schools Programme – Networking for Environmental and Sustainability Education. In A. Gough, J. Chi Kin Lee & E. Po Keung Tsang (Eds.), <i>Green Schools Globally: Stories of Impact for Sustainable Development</i> (pp. 85-102). Springer • Rauch, F., Hübner, R., Jungmeier, M., Elmenreich, W. & Gracner, M. (2021). Designing and Implementing an Interfaculty Elective “Sustainable Development” at a University: Concepts, Developments and Lessons Learned. <i>Action Research and Innovation in Science Education</i>, 4 (1), 33-36.
Web resources	<ul style="list-style-type: none"> • https://www.researchgate.net/publication/303873022_Essential_Features_of_Effective_Networks_in_Education • https://www.oekolog.at/ • https://www.ecoschools.global/

Session 9-13	Introduction and planning for students' PRESS projects
General aim of the session: Students are introduced to and then work on their own ESD projects, which they finally present.	
Content overview	<ul style="list-style-type: none"> • Theories and practices of project-based learning. • Individual content with respect to the topics students choose for their projects.
Process skills	<ul style="list-style-type: none"> • Cooperation skills in project work. • Communications skills in project work. • Project management skills. • Operation of networking with schools and out-of-school partners. • Presentation skills for presenting projects and project outcomes
Literature provided to students	<ul style="list-style-type: none"> • Eshach, H. (2007). Bridging In-school and Out-of-school Learning: Formal, Non-Formal, and Informal Education. <i>Journal of Science Education and Technology</i>, 16(2), 171–190. • Haatainen, O. & Aksela, M. (2021). Project-Based Learning in Science Education: Active Teachers' Perceptions and Practices. <i>LUMAT</i>, 9(1), 149–173.
Web resources	<ul style="list-style-type: none"> • https://www.bu.edu/ctl/guides/project-based-learning/ • https://teachingcommons.stanford.edu/resources/learning/learning-activities/project-based-learning • https://www.edutopia.org/blog/pbl-through-a-makers-lens-patrick-waters • https://www.pblworks.org/what-is-pbl • https://er.educause.edu/articles/2015/1/using-design-thinking-in-higher-education

Session 14	Reflection on students' PRESS projects and the course
General aim of the session: Students learn about action research as a method of quality assurance and quality development for ESD projects. They learn about evaluation methods for different target groups and contexts. They reflect on and adapt their own ESD projects based on feedback from colleagues and participate in the evaluation of the PRESS course through their feedback.	
Content overview	<ul style="list-style-type: none"> • Principles of action research • Action research methods • Evaluation instruments for different target groups (e.g. students, children) • Examples of ESD in action research projects • Conducting action research projects
Process skills	<ul style="list-style-type: none"> • Finding a starting point for AR in ESD projects • Identifying research questions • Choosing adequate research methods • Gathering and analysing data • Implementing the findings in practice
Literature provided to students	<ul style="list-style-type: none"> • Broström, S. (2012). Children's participation in research. <i>International Journal of Early Years Education</i>, 20(3), 257–269. • Feldman, A., Altrichter, H., Posch, P. & Somekh, B. (2018). <i>Teachers Investigate Their Work. An Introduction to Action Research across the Professions</i>. Routledge. • Rauch, F., Zehetmeier, S., & Posch, P. (2019). Educational Action Research: In O. Zuber-Skerritt, & L. Wood (eds.), <i>Action Learning and Action Research. Genres and Approaches</i> (pp. 111 - 126). Emerald. • Sevón, E., Mustola, M., Siippainen A. & Vlasov, J. (2023) Participatory research methods with young children: a systematic literature review. <i>Educational Review</i>.
Web resources	<ul style="list-style-type: none"> • https://www.carn.org.uk/ • https://www.alarassociation.org/ • https://www.tandfonline.com/journals/reac20