WiSE Widening Interdisciplinary Sustainability Education

Ecology, Decision-Making, and Environmental Education. Overview discipline approach - report 3

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Introduction

Since the very beginning, environmental education (EE) has tended to be oriented toward motivating people to participate in solving environmental problems and issues. According to the Tbilisi Declaration (1977), the purpose of EE should be to raise people's awareness of the economic, social, political, and ecological interdependence of things, and to "*emphasize the complexity of environmental problems…to develop critical thinking and problem-solving skills*" (Tbilisi Declaration, 1977). To achieve this goal in a democratic society, people should obtain certain knowledge, skills, and attitudes (later reframed as "competence") that would allow them to face these environmental problems on both the individual and the collective levels.

The aim of this report is to provide a basic overview of relevant educational approaches for teachers interested in including environmental or sustainability issues in their curricula. Although the main focus of the report is an educational one, the report is a result of the cooperation of a diverse team of scholars from different disciplines across the natural and social sciences. During their discussions, there was opportunity to tackle the issues of capitalism, governance and decision making processes. The report combines a literature review with examples from the personal experience of the authors, and it provides both international and national (country-specific) perspectives on the main topic. The report also reflects the different needs of the various types of the learning environment: while some of the described approaches are more suitable for secondary school or university students (i.e., case-based methodology, simulation games), others may be more suitable for elementary students (issue investigation models) or even for primary school students (drama education models). The pedagogical approaches can be used as a form of inspiration for already existing EE curricula as well as a form of fulfillment of sustainability pillars in the courses that were not focusing on this topic.

In the contemporary world of global challenges and uncertainty, teaching environmental and sustainability issues[1] is a crucial imperative for all teachers as well as non-formal educators. We hope that this report will help them to find the best way how to integrate this area into their teaching.

[1] In the report, we differentiate between "problems" (=situations in which something that we value is at risk) and "issues" (=situations in which different opinions exist on how to solve a problem). In the EE context, both perspectives may be used while describing different content (what problems exist and should be solved vs. what the possible solutions are and how they are based on the attitudes and values of the different stakeholders).

Information-assimilation approaches

While the early approaches emphasized the role of providing problem-relevant knowledge, it soon became clear that knowledge itself does not motivate people toward pro-environmental behavior (Hungerford & Volk, 1990). The original assumption typical for the EE programs of the 1970's, called the K-A-B theory (see image 1), has not been proven, and the EE programs based on it have not demonstrated their effectiveness for increasing the pro-environmental behavior of their participants (Hungerford & Volk, 1990).

Image 1 The K-A-B theory

However, instructional strategies based on the K-A-B theory are still very frequent in the EE field as many programs transmit a huge amount of problem-relevant knowledge to their students. Although this approach may be considered very time-efficient, it is clear that it opens serious areas of concern. Problem-oriented knowledge may have ephemeral importance only. Without further elaboration, the received information can be easily misinterpreted, which may lead to the creation of persistent misconceptions. Furthermore, as has been already discussed, new knowledge itself does not motivate people to practice responsible behavior and it does not develop the students' competence. Because of this, K-A-B-based instructional strategies should be used with care and, in most situations, they should be avoided.

Since the 1980's, several instructional approaches have been launched which aim to increase people's motivation to participate in decision-making processes related to solving the emerging local and global environmental problems. Some of these approaches will be presented in the following chapters.

Issue investigation models

Two particularly influential models were developed by the team led by H.R. Hungerford in the 1980s. These models, called "Issue Investigation and Action Training Model (IIAT)" and "Extended Case Study

Model (ECM)," were based on a synthesis of an in-depth literature review of the factors shaping human behavior and the on-going process of evaluation of newly developed models. On the basis of the literature review, Hungerford and Volk (1990) designed a theory called "Responsible Environmental Behavior" (REB), identifying a set of variables whose interplay was supposed to shape human behavior (see Image 2). The theory listed other important variables in addition to knowledge, especially affective variables and skills, and it discriminated among different types of knowledge (ecological knowledge, issue oriented knowledge, action knowledge).

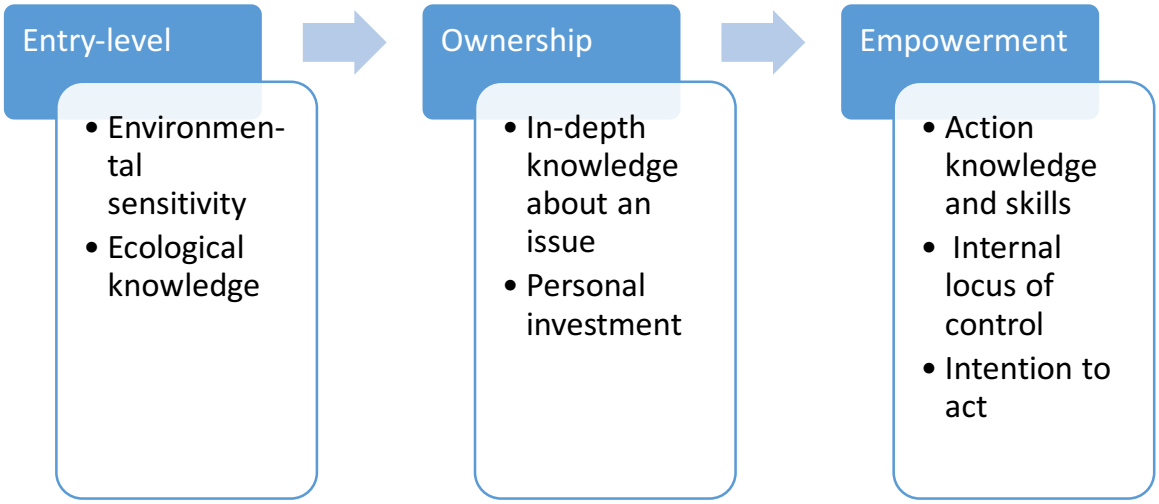

Image 2 Responsible Environmental Behavior theory

The main importance of the theory was not in its impact on conservation psychology (as it has been partially replaced by other behavioral models in the following decades) but in its benefit for EE practice. The significance of emotions, attitudes, skills, and action-oriented beliefs expressed by the model resonated in instructional models that were more finely elaborated and more effective than the former K-A-B-oriented EE programs.

Both the models developed by Hungerford's team have been proven to be highly effective in changing the participants' understanding, skills, attitudes, and behavior (Hungerford & Volk, 1981; Ramsey, 1993; Culen, 1994; Hsu, 2004; Volk & Cheak, 2005; Marcinkowski, 2001; 2004), and so they have been applied in many countries.

These models use a 4-step sequence of activities that range from an initial teacher-oriented focus to a very open student-oriented project (see Image 3).

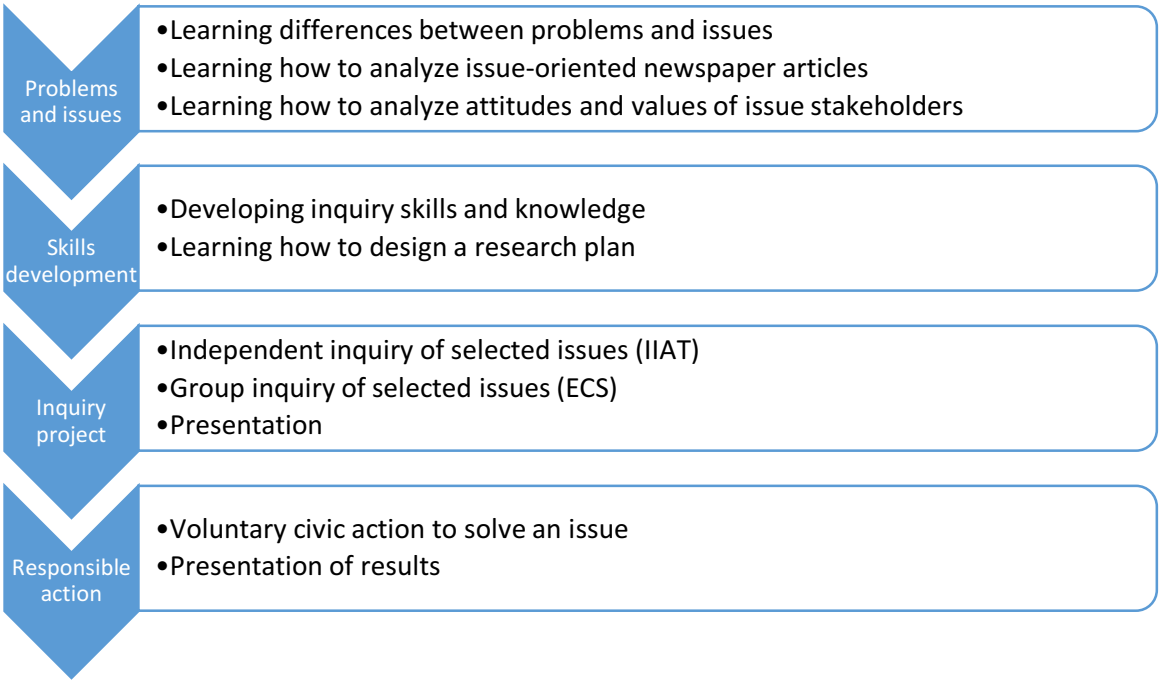

Image 3 Issue Investigation models

An important aspect of both these models (that differ mainly in the third step of the sequence in regards to the level of the students' independence in the inquiry process) is that they provide experience with dealing with a real issue, preferably an issue from the students' local environment and community. The students may feel that the issues they are investigating (they may choose what to investigate in the IIAT model) are part of their familiar world and, because of this, they could become attached to them and motivated to take a responsible action. In the last step, the students usually choose an action connected with a direct or an indirect effort to influence some relevant decision-making processes, e.g. they present their findings (e.g., a public opinion survey about the issue) to the municipality, participate in public hearings, or present their arguments in public.

Although both the models may be considered as needing a slight update, they still present a viable approach. In the Czech Republic, the ECS model was applied for the Forest in School program (7th grade) conducted by the educational organization Tereza. Although this experience revealed the limitations connected with applying the model in a different educational environment (the lack of teacher skills, time constrains, etc.), the evaluated program was successful in influencing the locus of control[2] of the participating students (so that more students believed they were capable of altering

[2] Locus of control expresses „the degree to which people believe that they have control over the outcome of events in their lives, as opposed to external forces beyond their control." (Wikipedia)

the state of their local environment at the end of the program than before) (Cincera & Simonova, in press).

Action competence and critical place-based education models

In the early 1990's, the issue investigation models were critically assessed by a group of scholars from Nordic countries (Jensen & Schnack, 1997; Mogensen & Schnack, 2010; Breiting & Mogensen, 1999). According to these critics, EE (as represented by the issue investigation models) tended to be too strongly behavioristic, with an emphasis on individual behavior and direct action, while it was indirect, collective action and less strictly formulated action competence that were seen as needed for the society at the end of the 20th century. According to Jensen and Schnack (1997), action competence consists of components such as knowledge/insight, commitment, vision, and action experiences. Therefore, the approaches that were recommended highlighted the meaning of the participants' reflected experience and of the emancipatory (participative) approach based on the students' choices and decisions about shaping their programs.

In comparison with IIET and ECS, the teachers do not dominate even in the initial steps of the action competence models. Rather than transmitting knowledge, they should play the role of facilitators developing the students' interpersonal competence (including cooperation, communication, or decision-making) and providing the students with the opportunity to solve issues of their own choice. Learning should occur as a result of the students' action and reflection, in a repeated 4-step sequence based on the experiential learning theory as formulated by Kurt Lewin and David Kolb (1984) (see Image 4).

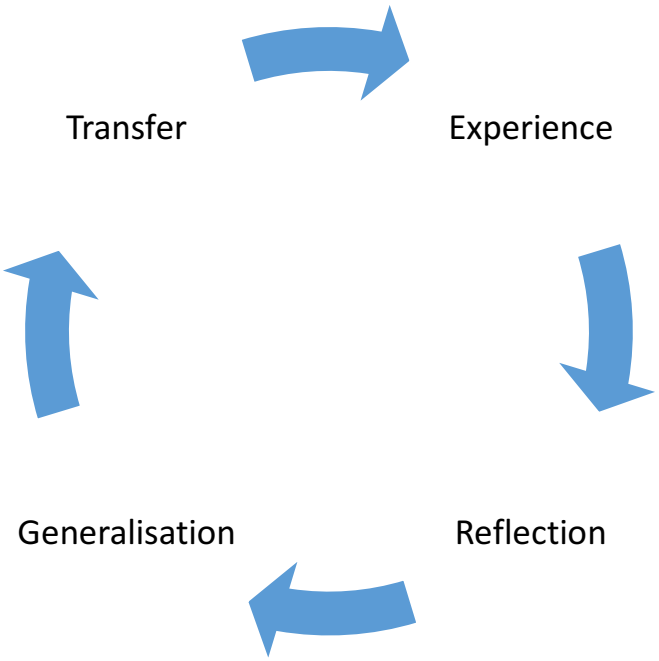

Image 4 The Experiential Learning cycle

Although such a critical-thinking approach is still rare in the Czech Republic (it seems to be more common in Sweden and some other European countries), a few examples have been recently mentioned in Cincera et al. (2016). For instance, after participating in a discussion-based lesson on the palm oil issue, elementary school pupils decided to investigate which of their favorite biscuits contain palm oil. After this, they wrote a letter to the producer (which was the Czech branch of an international company) with a complaint and a request to alter the practice.

These recommendations resonated with many approaches that have been used world-wide and that are relevant for the field of EE as well as for Education for Sustainable Development (ESD), a new, popular concept since the early 1990s. Another popular approach, also known in the Czech Republic, is place-based education (PBE), which highlights the idea of linking the school curricula with the local environment and community (Sobel, 2005; Smith, 2007). Given the scope of this quite broad field encompassing a variety of particular approaches, David Gruenewald (2008) called for "the critical PBE". The critical PBE was supposed to be oriented toward teaching students to critically reflect on the problems and issues in their community, to identify how these problems and issues are rooted in hidden power structures, and to be actively engaged in solving the issues by direct or indirect actions. In this approach, schools should become an agent of change. They should develop the students'

citizenship competence rather than just transmitting knowledge or preparing the students for the demands of the global market.

Unfortunately, this kind of practice is still new in the Czech Republic, and these kinds of school activities are often met with misunderstanding or animosity from the implicated municipal bodies. As a result, teachers tend to "choose" non-controversial issues for their students, issues that are often based on "greening" the waste areas, increasing safety on the roads near their schools, etc. (Cincera et al., 2016). For many schools, it seems to be safer to engage in various game or discussion-based scenarios rather than to deal with real-life issues. As this approach may also have its merits, it will be analyzed in the next chapter.

Game and discussion-based approaches

Although it is the instructional strategies based on actual participation in real-life problems that seem to have the highest impact on students' competence, far too often this approach is not manageable for teachers. Limited time, lack of experience, or the complex nature of global problems may increase the need for alternative, less demanding approaches. Sound, even if probably less powerful, strategies are based on providing indirect experience with the investigated issues through discussion activities, text analysis, and various role-playing or simulation games.

In the context of EE, these types of activities have been frequently used since the very foundation of the field in the 1970s. While in this field there are many overlapping approaches that provide students with indirect experience with EE/ESD-relevant issues, just a few of them will be described in more detail here.

Case-based methodology

A case-based methodology stands for a socio-constructivist perspective in which the teacher is a mediator and students work in groups and learn from their peers. First applied in 1870, in a Law School in the United States of America (Harvard Graduate School of Business Administration), where a newly appointed Dean, Christopher Langdell, began teaching by referring to real cases, broke away decades of teaching through lectures and transmissive approaches to teaching. The success and effectiveness of this new approach was due to the quality of the materials provided and the commitment of the institution in gaining expertise in the new teaching method.

The use of real-life cases (actual or historical) allows students to develop more complex levels of cognitive learning, which will lead to the development of analytical skills and evaluation and

application competences. Is has also been proven that case based methodology can also promote critical thinking and enhance decision making capabilities.

This teaching methodology requires that students have a prior knowledge of the subject, in order to facilitate the reflection and resolution of real cases, in opposition to other teaching methodologies which don't require previous experience or understanding of the subject under study (e.g. problem-based learning) (Williams, 2005). So, a case-based teaching methodology is based on the idea that new knowledge is built upon previous knowledge, by adding experience to it (Harrington & Garrison, 1992), thus closing the gap between the complex reality and the theoretical principles taught in the classroom. By providing a real-life context, the students tend to put themselves into the role of the actors in the case, which will facilitate student's engagement in the activity and in the learning process. It is also often mentioned by students that this methodology promotes and develops interpersonal skills by enabling active discussion and interaction between students (Williams, 2005).

Drama education

Other approaches introduce EE/ESD-relevant issues through playing roles in a kind of educational drama. The idea of merging the roles of the audience with those of the actors in a co-created, critically engaged play may be traced back to the works of Paulo Freire (2005) and Augusto Boal who organized the so called "theatre of the oppressed". In this kind of a "street show", the public, usually the members of the low-class society living in poor suburbs of developing countries, were depicted in various situations reflecting the existing social oppression and the associated dilemmas. After seeing the negative consequences of one of the possible choices in such a dilemma, the audience was invited to take the role of actors and solve the issue in another way, with a positive result. This concept highlighted the importance of empowerment as a precondition of future responsible behavior.

Despite the on-going discussion about from what age exactly the students are mature enough to accept the emotional burden connected with global problems, there are some approaches focused on presenting global issues even to primary school pupils. Among them, the Global Storylines may be seen as one of the most interesting ones. The method is based on merging EE/ESD and drama education discourses. Students are encouraged to play a character in a partially pre-designed play presenting a selected issue (e.g., immigration, the exhaustion of the natural sources, water scarcity etc.) (McNaughton, 2004, 2006, 2012). They start to be emotionally engaged and are asked to solve dilemmas postulated by the teacher through the play's script.

This approach has proved to be effective mainly in increasing the pupils' issue awareness and their empathy toward marginalized and oppressed groups (e.g., the indigenous people living in a destroyed tropical forest). It has also had some positive impact on the pupils' interpersonal competence (communication and cooperation skills) (McNaughton, 2004, 2006, 2012, 2014; Vaďurová & Slepičková, 2015).

Global education and system thinking education

Another approach based on providing an indirect experience with EE/ESD problems is global education (GE), which was founded in the early 1980s. In this approach, the issues are presented by various types of discussion techniques and educational games, e.g. role-playing, simulation games, etc. (Greig, Pike & Selby, 1987; Pike & Selby, 1994). In GE, awareness of the issues and competence development occupy a central position, while the other variables defined by REB are rarely used. This approach may be related to Freire's concept of "consciousness" as the precondition for critical reflection and for challenging the existing forms of social oppression (2005). Another connection may be found with the Mezirow (2001) concept of transformative learning, or with the Meadows and Sweeney (2010) concept of systems thinking education. All of these approaches highlight the idea of a radical change in the students' understanding of the social reality (mental models, mental paradigms, frames of reference) caused by their exposure to an emotional experience and to a different perspective (see image 5). This experience may be mediated with the help of various games: playing a different role may provide a new perspective and challenge the way the participants interpret the investigated phenomenon.

Such a theory may be well illustrated by the example of the Fish Banks, a famous simulation game developed by D. Meadows (1999). The activity is intended to explain the tragedy of the commons systemic archetype by G. Hardin (1998) and, more broadly, the concept of mental models presented by the Iceberg model (see Image 5) (Sweeney & Meadows, 2010).

The Iceberg model represents the overlying assumption of the systems thinking educational approach. According to this model, educational games help students to realize that the individual events occurring in the game (and representing similar events in real life) are often part of a larger pattern. This pattern may be generated by the (often unexamined) organizational structure applied for solving the situation. The organizational structure itself is a result of (often unexamined) mental models, the way we think and assess social phenomena. Through an initiating experience and a follow-up reflection, the organizational structure and mental models are discovered and the students may assess the models' relevance for their future decision-making.

In the game, the participants play the roles of small independent companies responsible for fishing in a shared sea area. In the frequently used game scenario, students often do not realize that fish, while being a renewable source, may be exhausted by overreaching the number of fishing boats beyond the carrying capacity of the ecosystem (a mental model). Because of this lack of awareness, the participants unnecessarily compete with the other companies and gradually increase the number of boats in their fleet (an organizational structure) before they detect the first signs of collapse (an event, a pattern). This experience, often emotionally loaded, is assumed to challenge the participants' mental models and, as a result, it should lead them to adopt a different organizational structure in similar real-life situations.

How the "Fish banks" simulation game was reflected by its participants and university teachers:

"It was funny and involving game. All game players (including my team) were so focused on their own business, that only in the very end all noticed that the competitive game is leading to a dead end for us." Katarzyna Iwinska, (Collegium Civitas, Poland)

"My team had a responsible attitude toward natural resources. We were very careful with our decisions and we were trying to limit the volume of fishing when we had a guess that the bay became depleted. We were bewildered with the bold decisions of other teams. In the end our approach didn't save the bay as we were only one among many." Magdalena Kraszewska, (Collegium Civitas, Poland)

"To me, the Fishbank Game is not just an important lesson in the Tragedy of the Commons Archetype, it also points to the inadequacy of the three pillars metaphor of sustainability. In the Fishbank Game we focused on economic sustainability without knowing anything about the resource base. This tells me that the three-layer cake metaphor is a better model for understanding sustainability. The three-layer cake model is consistent with the system thinking competence that we aim to develop. While on the subject of archetypal traps, I think that we could use some of the material in Donella Meadows "System Thinking" for teachers notes and or further reading. Her book includes a chapter on system traps and how to spring them, and a chapter on levers for change in complex systems. The core competencies we aim to achieve reflect a paradigm shift in education about sustainability. This mirrors some of the paradigm shift currently happening in fields like economics and ecosystem management. People do not change paradigms easily because of their values and cognitive frames." Michael Jones (Swedish Biodiversity Centre, Uppsala)

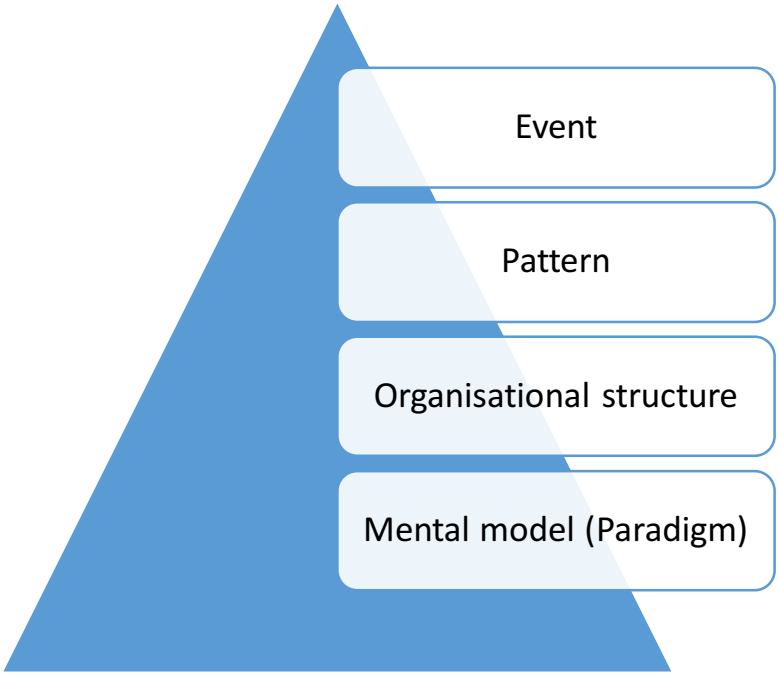

Image 5 The Iceberg model

Another learning model drives the simulation game The Forest, which is based on a reworking and extending of an earlier activity proposed by Pike and Selby (1994). The game is supposed to be used as part of a short educational program consisting of an initial discussion, the game itself, and a reflection and a follow-up on the students' investigation of the issue of deforestation (see Image 6).

The starting activity (a discussion game called The Hipbone game) is intended to give the students an opportunity to reflect on their initial concepts connected with deforestation and, in a broader sense, with the systemic interconnectedness in the world. The simulation game provides the participants with an indirect experience of the process of deforestation. This process is emotionally loaded and perceived from different perspectives. The debriefing session follows the logic of the experiential learning cycle (see Image 4) in which the experience is first reflected as a story (what has happened from their perspective), then further analyzed (what is similar and different in the real world), and finally it is transferred to the students' follow-up investigation (in two consequent weeks, the students independently investigate the area of their concern, defined in the previous step of the program).

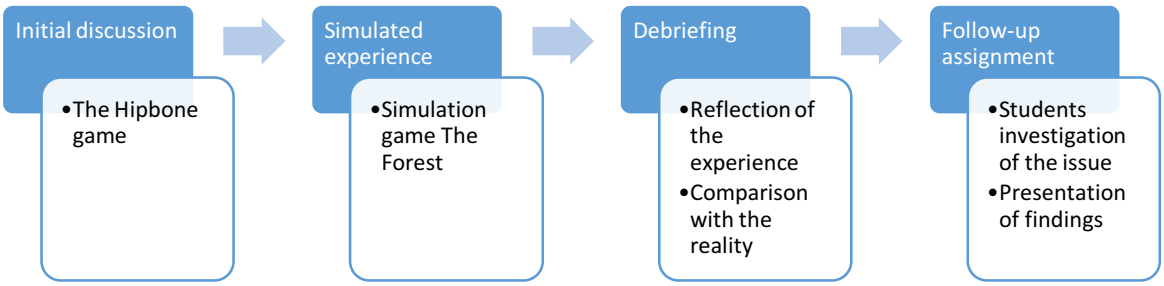

Image 6 Process model of The Forest simulation game

How the Forest simulation game was reflected by its participants and university teachers:

"At the beginning of the game everybody was motivated showing interest and enthusiasm in trying to effectively perform their roles, become aware of their resources and difficulties and therefore set objectives suited to their possibilities. In the first round, players were able to identify the differences and inequalities at work, recognize the role of other stakeholders, communicate and interact with different social groups and cultures, thus to comprehend, to some degree, sociocultural and economic relations and their importance. With the completion of the first round, when the first candles were extinguished/put out, players started to realize the consequences of their decisions, so negotiations became their prime target. In the consecutive phases, players reflected and employed strategies to find points in common with one's own stand and reach agreements through careful planning and listening the other person's version. Players were pressured by time and changing situations which stimulated them to recognize their own successes and failures, think logically, integrate into their vision, to varying degrees (re: roles), environmental ethics, equality and diverse human values and, finally, find alternative routes to achieve their objectives…"

"The game motivated players to perform it with interest and diligence; therefore, the game was played with interest, care, speed and promptness. The players became aware of their resources and difficulties and thus they were able to set objectives suited to their possibilities; therefore, they were able to recognize their own successes and failures. Given the complex, dynamic, contradictory situation, players were able to identify the differences and inequalities at work and to communicate and interact with different social groups and cultures. The connections between different SHs enabled players to comprehend, to some degree, sociocultural and economic relations and their importance.

Adaptability was also necessary for the game. They were pressured by time, disagreements, opposition, etc. which did not stop them from setting (new) objectives as well as from finding alternative routes to achieve their objectives. They were also stimulated by the challenge of changing situations and tried to monitor their progress. Furthermore, the game promoted a reflective, critical attitude, strengthened (some of) the players' (depending on the roles) capacity to think logically, using reason as an instrument of dialogue as well as to integrate into their vision a diversity of knowledge, beliefs and values, and include ethics as an issue.

Additionally, interpersonal communication was developed in the framework of the game. The players were able to establish good dialogue relations with others and produce collaboration as a product of interactions. The players were able to improve interpersonal communication, conflict management and the exercise of leadership in small groups.

Negotiation was central to the game. The players were able to learn and master simple tactics such as listening to the other person's version and finding points in common with one's own stand. They also addressed conflictive situations, reflected and employed strategies to reach agreements. Finally, they were able to handle confrontations through conflict negotiation or engaging mediation.
Moreover, the game seems to have contributed in developing values such as respect for human dignity, solidarity, global justice, etc. to all the players." (Alex Koutsouris and Alexandra Smyrniotopoulou, Agricultural University of Athens)

"During the simulation "Tropical Forest" I was astonished how easily we get into so called „capitalist game" of thinking about particular profits here and now, it saddened me when he lesson was so realistic: it occurred that even with very good governance in the end those who are big and rich have a great power. This experience made me pessimistic about the future of the world… and turned into thinking how to empower students through active learning. Are we going to show students „what the world is" or shall we also try to make them more active and powerful? This is a challenge of sustainable teaching and teaching sustainability" (Katarzyna Iwinska, Collegium Civitas)

"The Forest simulation game was notable for the richness of the social and political dimensions of SD where many stakeholders compete for access to the same resource, and multiple ways in which stakeholders derived their livelihood from the forest. Once again though, our knowledge of rate of change to the forest was inadequate for us to plan ahead and devise better ways of managing the forest for the benefit of all. The Forest simulation is a sophisticated game with the potential to create lesson plans around each of the core competencies by running the simulation in different forms, for

example a version that is focused on vision (anticipatory competence) and leadership (interpersonal competence).” Michael Jones (Swedish Biodiversity Centre, Uppsala)

“When playing and learning in a game like the rain forest simulation game or Fish banks, one very important part is that the end result will be debriefed in a way that a feeling of hopelessness is avoided.”

Peter Aspengren (SLU, Sweden)

While numerous educational materials with EE-relevant games or discussion-based activities have been published, they have rarely been the target of rigorous evaluation. In contrast to the issue-investigation or action-competence models, they are usually considered to be part of a longer program and their particular effect is usually not analyzed. In the case of The Forest program, the effect of the simulation game cannot be separated from the effect of the full program as the initial discussion could help with framing the experience and the follow-up investigation might be crucial for the students' deeper elaboration of the issue. Since the program was aimed to develop the students' issue awareness and their systems thinking competence, we could see, on the basis of the students' reflection, that such a development likely occurred as the students were able to reflect on the role of new stakeholders in the issue (“*Many groups with different preferences, background…”, “also local timber industry plays its role”)* and they became aware of new layers of the social and ecological mechanisms of deforestation (*“the reason is not only desire for new plantations of palm trees but also planting soya beans…”, “government plans building new infrastructure for establishing security of local citizens…”, “timber companies must have gains and be compatible in global market”*).

While the evaluation research of the issue-oriented programs may be sometimes difficult or beyond the capacity of the teachers involved, a simple quality assessment may provide useful information for analyzing the relevance of such programs for issue-oriented curricula.

Quality assessment criteria for issue-oriented EE programs and educational materials

The application of quality criteria is one of the approaches discussed in assessing EE/ESD programs. As some scholars assume, not only the outcomes, but also the process matters, and the process is often shaped by qualities that are hard to measure (Mogensen & Schnack, 2010). As a result, various sets of quality assessment criteria exist in the fields of both EE/ESD. While some of the sets are relevant to specific programs only (e.g., the quality criteria for the Eco-school program), others are designed for

a wide range of programs (Reid, Nikel, & Scott, 2006; Breiting, Mayer, & Mogensen, 2005; Mogensen & Mayer, 2005).

The Real World Learning Model (2015) is an example of a recently published set of quality criteria relevant for outdoor environmental education programs. The model recommends assessing six quality criteria, including ecological concepts, transfer, experience, competence development, values, and overlying frames. While some of the quality criteria are not new, the concept of values and frames, first expressed in this model, provides an interesting perspective which is particularly relevant for issue-oriented EE/ESD programs.

"The universal values model is valuable as is the material about frames from the Real World Learning website. Based on my experience as an SD practitioner, understanding values and frames is a fundamental part of resolving conflict. Understanding how people develop, use and change their values and frames is extraordinarily complex and is an endless process that proceeds slowly throughout life."
Michael Jones (Swedish Biodiversity Centre, Uppsala)

The values and frames categories are based on the theory of universal values expressed by Schwartz (1992, 1994, 2006, 2012). According to Schwartz, there are universal categories of values all over the world (see Image 7). The categories influence each other, and so by supporting some of them (e.g., by expressing them as the "message" of an EE/ESD program), we support also the values in the neighboring categories but weaken the values in the opposite categories at the same time. As some of the values (self-direction, universalism, benevolence) support one's willingness toward altruistic behavior and others (power, achievement) rather toward egoistic behavior, this theory offers a broad scope of application in all the aspects of environmental education and communication (Blackmore et al., 2013). Considering this, it may be important to be careful about what messages EE/ESD programs communicate. As an example, when a program directly or indirectly communicates the fear of global problems, it may consequently highlight the values of security, and as a result, support calling for power and tradition, while weakening the opposite values of self-direction and universalism. Thus it may, paradoxically, support the participants' tendency toward egoistic behavior and weaken their motivation toward responsible environmental behavior.

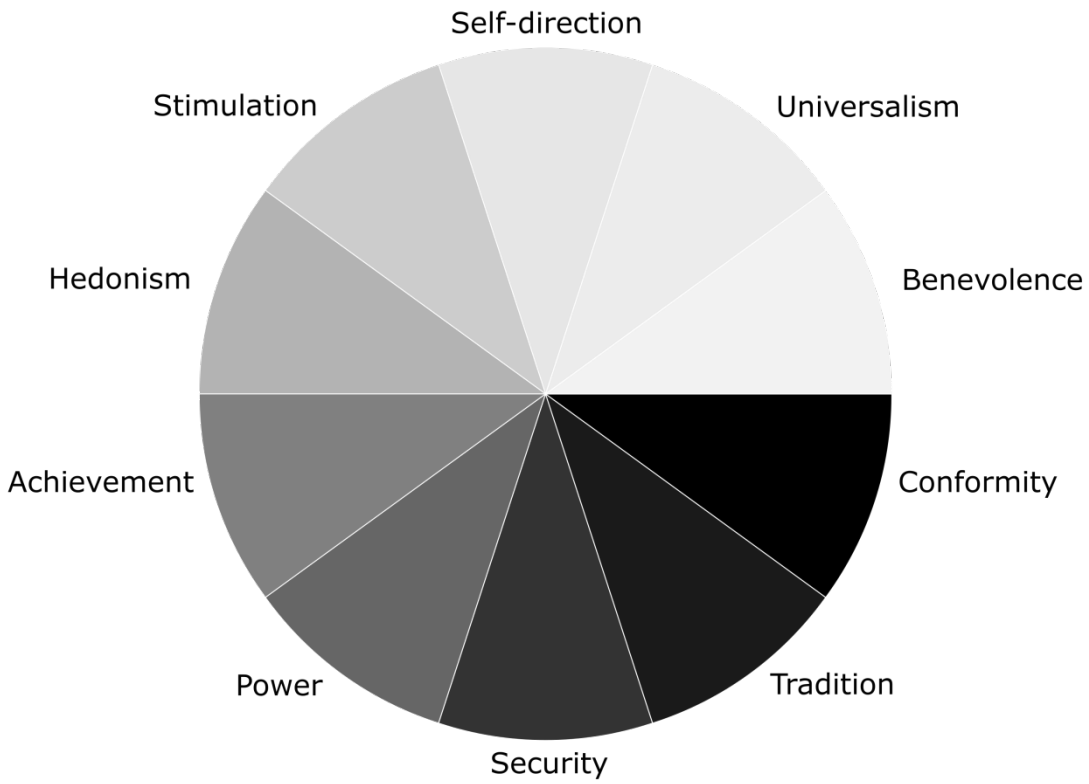

Image 7 The Schwartz theory of universal values (Schwartz, 1994)

The Guidelines for Excellence EE Materials formulated by the North American Association for Environmental Education (NAAEE, 2004) offer an example of such a universal set of quality criteria. The Guidelines provide six broad categories of quality, which are further divided into 2-7 specific quality criteria:

- fairness and accuracy
    - factual accuracy
    - balanced presentation of differing viewpoints and theories
    - openness to inquiry
    - reflection of diversity
- depth
    - awareness
    - focus on concepts
    - concepts in context
    - attention to different scales

- emphasis on skills building
    - critical and creative thinking
    - applying skills to issues
    - action skills
- action orientation
    - sense of personal stake and responsibility
    - self-efficacy
- instructional soundness
    - learner-centered instruction
    - different ways of learning
    - connection to learners' everyday life
    - expanded learning environment
    - interdisciplinarity
    - goals and objectives
    - appropriateness for a specific setting
    - assessment
- usability
    - clarity and logic
    - easy to use
    - long-lived
    - adaptable
    - accompanied by instruction and support
    - make substantiated claim
    - fit with national, state, or local requirements.

While many quality criteria may be taken into consideration when assessing EE/ESD-issues relevant programs, some of them seem to be crucial. A strong program should have a sound "program theory", i.e. there should be a reasonable chance that the program may achieve its intended goals through the planned sequence of activities (Rossi, Lipsey & Freeman, 2004; McLaughlin & Jordan, 2004, W.K. Kellog Foundation, 2004). The program theory could be visually expressed by the logic model (see Image 8):

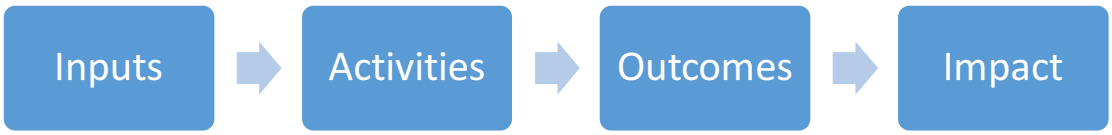

Image 8 Logic model

On the basis of a well-articulated program theory, it is possible to assess if the intended goals can be achieved. For example, when the "outcomes" (i.e., goals or aims in the educational context) of a program are "to develop students' decision-making skills", the associated activities should likely provide students with an opportunity to solve a dilemma within which one or (preferably) more decisions must be made. These decisions should be quite difficult but manageable, and the students should have a chance to reflect on the decision-making mechanisms (e.g., consent, voting, expert decision) they applied. When such an activity is missing, the students are asked to solve an unsolvable dilemma, or there is no time for reflection, achieving the intended goal is unlikely.

The case focused on the organic farming issue developed as the part of the WISE project aims to develop students' decision making abilities and collaborating skills. Nevertheless, when the role-playing debate on organic case first was tested to the Greek students, these goals were not clearly stated at the beginning of the exercise, consequently none group was willing to reach an agreement on the reasons why organic farming is worth subsidizing. The second time the exercise took place, groups were more open to negotiations and mutual understanding of each other's position.

Another aspect of the instructional soundness of a program is how the program activities are sequenced. While this topic exceeds the scope of this report, a sound sequence should respect the group's dynamics (Johnson & Johnson, 2006), the students' initial level of understanding of an issue, and it should use appropriate learning models designed according to some of the existing theories of learning (Braus & Wood, 1993, Fosnot, 2005, Jacobson, McDuff & Monroe, 2006, McCarthy, 2010). For examples of learning models, see images 3 and 4, or image 6 for an example of an already prepared flow of activities based on a combination of the constructivist and experiential learning models.

Generally, most learning models prefer starting a program with some kind of discussion or with an experiential activity, rather than with transmitting information, while new knowledge is generated through the whole process (e.g., through the experience, reflection, and application stage). Most

models also seek the right balance between abstract and concrete learning, experience and information transmission, theory and application. When resorting to case-based learning the teaching process starts with the presentation of real cases (current or even historical) and in group work promote reflection and the development of competencies such as critical thinking and self-directed learning. Still, no learning model can be seen as the only valid one, and teachers have the opportunity to find the way of sequencing the activities that works best for their particular group and goals.

For example, the case focused on organic farming developed as the part of the WISE project consists of three stages (see Image 9):

Image 9 Activities flow in the case about organic farming

In the case of organic farming exercise the flow of activities comprises of the following stages (see Image 9): At the first stage, students are presented by a comprehensive lecture in organic farming, proposed in order for the students to acquire the basic information on organic farming principles, certification, labelling, and financial support. Afterwards, students are divided into groups, and background information and support material are distributed and further sources indicated. In the second stage students participate in their own research, group meetings and preparation (within two weeks' interval). Finally, they participate in a role playing exercise: group presentation in the class, discussions among and within groups, concluding statements/positions and joint decision making (based on their mutual agreement).

Flow of activities in the case on mitigating food waste:

In the opening part class is provided with some facts that help to establish background to the issue of food waste - such as use of resources for agricultural production, demographic data of the world population, technological developments that allow for the increase in food production, and finally, the data about share of production that is being wasted. With this opening a ground for further work is

laid, and the extent of the subject is also demarcated. From this moment, class is divided into groups and further work is performed in groups.

In the next stage groups discuss how the problem of a food waste could be reduced through everyday consumer choices. With this exercise, participants explore and summarize experience and knowledge that exists within the group.

Then the entire class is presented with the list of possible consumer actions that mitigate the problem (prepared by teacher) and groups reflect on that list based on their previous discussion. The items from the list that were discussed in groups are acknowledged and those that were not are briefly referred to by teacher. Additional input from each group (which was not on the list) is added to the list. After this exercise, each group has similar knowledge on possible actions that can be taken to mitigate the food waste by consumers.

The next activity aims to investigate the motives and consequences of (un)sustainable consumer choices. The groups are given description of consumers, which include their food related behavior (two profiles are presented to the class but one to each group - of a sustainability oriented person - Alexander or consumption oriented person - Anna). Consumer profiles are employed because discussing behavior of others is easier for people and seem to increase the openness and frankness of the expressed opinions. Each group reads the profile and chooses a particular example of consumer behavior that mitigates a problem of food waste on individual level. A group debates the costs and benefits of this action for Anna or Alexander. Next, the implications of this particular behavior for environment, society and economy are reviewed. Via this exercise, students realize how individual actions affect the global situation.

After completing the group task with consumer profiles, groups present their outcomes to the entire class. As groups were working with different solutions to food waste problem, the outcomes vary. Based on the results students try to identify the costs and benefits of sustainable choices for individual consumers, environment, society and economy.

In the final part, students are encouraged to select one of the food related sustainable consumer actions which they would like to apply in their lives for the next two weeks. They are also invited to share the explanation why this action, and if it is going to be difficult for them (Magdalena Kraszewska, Collegium Civitas)

Discussion

As we can see, there is no one way to teach EE/ESD issues. Table 1 compares the instructional approaches discussed above.

	Knowledge transmission	Issue investigation	Action competence	Case reflection	Drama education	Role-playing and simulations
Associated discourses	Transmissive (information-assimilation) learning	Social constructivism, experiential learning, inquiry-based learning	Emancipatory approach, action competence approach Place-based education Critical education	Interactive, discussion and sharing knowledge	Global storylines Critical education Drama education	Global education System thinking education, Simulation game theory
Underlying theories	K-A-B theory	REB model	social learning theory, Experiential learning cycle (Kolb's cycle)	Social constructivism	Experiential learning cycle (Kolb's cycle) Social constructivism Cognitive dissonance	Social constructivism, experiential learning Transformative education Cognitive dissonance
Strategies	Presentation	Presentation, text analysis, investigation, community-based project	Community-based project	Text analysis, role-play, inquiry activities, oral presentation, online research, games, and others.	Role-playing	Simulation games, role-playing games, discussion activities, text analysis
Approved effect	Issue awareness and knowledge	Issue awareness and knowledge, attitudes, issue investigation	Issue awareness and knowledge, empowerment, action	Issue awareness and knowledge,	Issue awareness and knowledge, empathy,	Issue awareness and knowledge, Empathy, system

		skills, self-efficacy, locus of control, intention to act	competence, self-efficacy and locus of control, place attachment, impact on school context	Empathy, system thinking, anticipatory, and interpersonal competence	interpersonal competence	thinking, anticipatory, and interpersonal competence
Experiencing an issue	Indirectly	Indirectly and directly	Directly	Indirectly or directly	Indirectly	indirectly
Age	Secondary schools, university students	Elementary and secondary school students	Primary, elementary, secondary school and university students	Middle, Secondary schools and university students	Primary school students	Secondary school and university students, adults
Educational environment	Formal / nonformal / informal education	Formal education	Formal / nonformal education	Formal / nonformal education	Formal / nonformal education	Formal / nonformal education, training
Time requirement	Low (hours)	High (months)	High (months)	Generaly low (hours)	Medium (weeks)	Low / medium (hours / weeks)

Tabulka 1 Comparison of different approaches to teach and learn issues in the context of Environmental Education

As the various approaches often overlap with one another, it is difficult to clearly distinguish among them. For example, role-playing may be interpreted as a "strategy" in the context of the case-based methodology but also in the context of global education, or it could be even interpreted as a particular approach that provides literature focusing on simulation and role playing games without references to any other approach. Teaching EE/ESD issues may call for a broad understanding of different approaches and for the teachers' ability to flexibly switch among the discourses or instructional strategies associated with these approaches. However, some patterns seem to be emerging. While the approaches discussed here differ in their effect, one of the aspects to help determine their application could be just what the teacher wants to achieve. Even the transmissive, information-assimilation approach could be useful sometimes, especially when it is awareness that needs to be increased and when the allocated time is limited. In other cases, the educational environment (formal/nonformal/informal) and their special needs and opportunities may be what matters.

Such a variety also opens the question of how and when teachers should be trained to apply these approaches in their teaching practice. It is possible that, given the demands of the topic, in-service

rather than pre-service teacher training may bring better results in changing the teaching practice in schools. This form of training would more likely call for a kind of on-going coaching than a one-shot course. However, such an assumption still needs to be tested and confirmed.

Conclusion

Teachers interested in teaching EE/ESD-related issues may choose from a large variety of relevant educational approaches. The report provided just a brief overview of some of them. The existing approaches differ a lot in their theoretical background, instructional strategies, and other contextual aspects. Such diversity may be a source of uncertainty, but it can also open space for creatively designing the best way to be used in a particular context.

We hope that this report helps teachers to find their own way in shaping their practice in this important educational area.

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