Learning and Teaching for a Sustainable Future

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Abstract

Education and continuous learning are one of the keys for sustainable development. A sustainable development not only calls for transformative research, but also for new transformative education that disseminates the values and principles that are the basis of sustainable development. "Schools@University for Sustainability + Climate Protection" is an educational format at Freie Universität Berlin (FUB) that has taken up the call for education for sustainable development (ESD) in 2005 by creating an innovative inter and transdisciplinary program. In this framework, young students and their teachers are invited to FUB twice a year to gain in-depth knowledge on sustainability issues, learn critical thinking skills and be empowered to effect changes within their everyday world and in society at large. The educational format Schools@University has played a pioneering role and its accomplishments have been recognized with prizes from the UN Decade of ESD three times. This chapter reflects the experiences and key challenges of the project's ten year history, the goals, didactic approach as well as topics and methods of the educational format. Moreover, it explains how the Environmental Policy Research Centre (FFU) has met the challenge of developing this innovative approach with Schools@University and how its messages and activities have become a role model, encouraging other universities to adopt these exemplary ideas.

Keywords

Education for sustainable development (ESD) · Transformative education · Outreach · Children´s university

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1 Introduction

A secure, climate-friendly energy supply, protection of biodiversity and the provision of life's basic requirements to all are some of the key global challenges of our time. To deal with them requires critical examination of our way of doing business, as well as consumption and lifestyle practices in Western industrialized countries. Climate change and the nuclear catastrophe in Fukushima have made it clear that these problems cannot be solved without fundamental political and social change. Such a transformation calls for a broad societal awareness of these problems and the magnitude of change required. Sustainability is the one idea that links all of these global problems and connects them to mechanisms of change (Fig. 1).

How can such change take place? In its 2011 report on "the new societal contract for a great transformation", the German Advisory Council of Global Change (WBGU 2011a, b) described the importance of education that contributes to sustainable transformation by promoting societal participation. The report singled out universities' special role in promoting education for sustainable development by better orienting science and policy to the societal goals of the great transformation.

The UN Decade for Education for Sustainable Development (ESD) that ended in 2014 and the follow up of the Global Action Plan ESD (UNESCO Roadmap 2015) seeks to promote important skills necessary to actively contribute to social, economic and environmental change. It teaches students how to work together, resolve conflicts, identify problems and express independent judgement to solve complex problems and shape their world (de Haan 2009, Wiek et al. 2011). The FFU believes the transfer of such skills should be facilitated by civil society, too. That's why the Environmental Policy Research Center (FFU) has taken up the UNESCOs call for education for sustainable development by developing an innovative program that brings young students and their teachers to FUB two weeks a year to gain in-depth knowledge on key issues of sustainability, learn critical thinking skills and become empowered to make change within their everyday world and in society at large (UNESCO Roadmap 2015). By bringing elementary school students to FUB to learn about critical issues relevant to sustainability and climate change, Schools@University[1] intends to educate the younger and next generations to be a key part of the great transformation.

This chapter presents the project "Schools@University" at Freie Universität Berlin's Environmental Policy Research Center (FFU). It looks at the history and structure of the project and presents it as an example to follow for other universities. Among the many merits of the project are its impact on young students aged 10–13 years, their increased knowledge about the environment, sustainability issues and climate change, and the teachers' involvement in trainings and the project itself. Evaluation and surveys are used to show the project's value and the beneficiaries' opinions.

[1]The German title is "SchülerUni Nachhaltigkeit + Klimaschutz".

Fig. 1 Logo of Schools@University (Copyright: Schools@University, Environmental Policy Research Centre)

2 Expanding the Dialog

How do you turn wind, cow dung and tooth paste into energy? What do mobile phones and roast beef have to do with climate change? Can we have a real effect on the climate? How can we make the world fairer for everyone by changing our daily consumption? These and other issues regarding sustainable development are the subjects FFU focuses on at Schools@University (Fig. 2).

With Schools@University, FFU expanded its outreach activities because research in 2005 showed that despite the political importance of climate change, schools have given little attention to the whole issue. FFU didn't want to accept these knowledge gaps and decided to build bridges between the research institute, schools and the community. Since 2008, FFU has been inviting 5th and 6th grade classes and their teachers regularly to programs and training always in spring and autumn.

By opening the green campus of FUB, FFU creates a fascinating "out of school learning place" where kids and teachers can gain practical knowledge about sustainable development and solutions on climate protection. With a one-week

Fig. 2 Establishing a dialogue between school children and experts at university (Copyright: Schools@University)

program consisting of roughly 80 hands-on workshops and lectures, FFU addresses and discusses the social, economic, environmental and cultural aspects of sustainable development in relation to the lives of young students and together we develop solutions for everyday life.

The core concept of the project is to build bridges between the university as a research institution, schools as a place of learning and stakeholders and experts with different backgrounds from civil society. The goal is to help children gain in-depth knowledge on sustainability issues, learn critical thinking skills and get empowered to affect changes within their everyday world.

After a first pilot in 2006, Schools@University was established at Freie Universität Berlin in 2008 and has proven to be an accepted and highly recommended learning environment for "Learning and Teaching Sustainability". Regular high attendance rates and excellent evaluation results document the educational relevance of this format. Social innovation in close cooperation with politics, schools, administration and economy can work—this is the conclusion after ten years with a pilot and 14 program cycles and 14 teacher trainings run by FFU. Since 2008 FFU already reached 20,000 young students and 2500 teachers.

The characteristics of Schools@University at a glance:

- Focus on the key topics of sustainable development
- Two one-week programs a year (in spring and autumn)
- One week programs with 80 interactive and hands-on workshops each
- Target groups: 5th and 6th grade students and their teachers
- Two teacher trainings a year
- Learning with a "Head, Heart and Hands" approach
- Inter and transdisciplinary approach
- Different venues on campus
- Lectures and trainers from different backgrounds
- Reaches 2600 students and 140 teachers a year.

3 Building Bridges Between Academia and Community

At the outset of the project a set of hypotheses were taken into consideration:

Children and teenagers are future decision makers and consumers—in other words, potential catalysts for change. They play a key role in implementing sustainable development. Critical analysis of relevant questions and solution designs are crucial elements of school education (UNESCO Roadmap 2015). This requires practical examples and, particularly for young people, models to learn from and emulate, at present and in the future. Schools are important learning places for the personal and educational development of adolescents. They can transfer sustainable thinking and acting and can empower children as catalysts for change. ESD, however is rarely practiced in German and European schools. This makes sharing

proven and applicable knowledge with schools—as the FFU does—the more valuable. The first hypothesis is that the programs and trainings of Schools@University increase teachers' and students' knowledge about sustainability and climate protection. The second hypothesis is that due to the knowledge and practice gaps in schools the programs of Schools@University are key part of the transformation towards sustainable systems. The third hypothesis is, that proven long-term learning environments need to be integrated and institutionalized in the structure of Universities to unfold their transformative potential. The programs educate young students and provide an opportunity for universities to contribute to the sustainable development of their communities and support the necessary change toward sustainable structures. Furthermore they are a viable means to attract the next generation of motivated students:

4 A Ten Years Practical Experience of ESD

The project has a ten year history. Here is an overview of the different project phases:

4.1 2005–2006: The Early Beginning as a Pilot

The FFU initiated the first topic focused "Schoolchildren's University for Climate and Energy" as a pilot project on the 20th anniversary of the Chernobyl nuclear disaster. It was derived from the popular European model of children's universities. Basically, the pilot drew inspiration from the popular term "Children's Universities",[2] a widespread public outreach activity for children aged 7–14 year olds which has become common in many European universities. In 2005, the FFU re-interpreted this idea into an innovative topic focused format: A low barrier tool focusing on 5th and 6th grade classes from all education backgrounds and accessible for schools from all twelve districts of Berlin. The program took place in 2006 as a lecture series. 2600 students participated and their teachers gave very positive feedback.

4.2 2008–2011: From Pilot to European-Wide Educational ESD Format

4.2.1 The European SAUCE Project

The positive response to the pilot program in Berlin inspired the FFU to bring the idea to a wider audience. Thanks to the European program "Intelligent Energy Europe", the Schoolchildren's University model was carried out successfully by

[2]For more information about the European Children's Universities visit: www.eucu.net.

seven European partner universities in Berlin, London, Vienna, Roskilde, Aalborg, Riga, and Twente[3] as SAUCE (Acronym for: Schools@University for Climate + Energy), which was supported by the European Commission from 2008 to 2011. FFU was the coordinator of the EU project. Following the idea of the pilot, each university opened their campus as an extra-curricular out of school learning place for teachers and young students. This facilitated a transfer of knowledge and competencies, deepened the understanding of environmental and climate topics and opened new paths for universities' public outreach Piening, Watts (2011).

All universities chose an interdisciplinary and participatory approach for teaching the young students. Each partner university created their own country-specific version of the format. In three years, a viable ESD education format for a total of 19,000 students was created. 35,000 workshop places were offered and 1250 teachers participated in the accompanying teacher trainings. An intensive, continuous exchange of experiences between all six universities was crucial for this success.[4]

4.3 2011–2015 Transformation with Schools@University in Berlin

Based on the European SAUCE experience, FFU has continued with the format with a modified name in Berlin: Schools@University for Sustainability + Climate Protection. Eight additional one-week programs and eight teacher trainings were offered at Freie Universität from 2011–2015. This was promoted and propelled by the 2011 Climate Protection Agreement between Freie Universität Berlin and Berlin's Government. Freie Universität was Berlin's first university to become a partner of Berlin's climate protection plans, meaning the University needs to lower its CO_2 emissions and its energy use by 10 % compared to 2010. Schools@University's relevance for the energy transition and its positive feedback from target groups ensured the formalized continuation of the format.[5]

[3]London Metropolitan University (UK), University of Latvia (Latvia), Aalborg University (Denmark), Roskilde University (Denmark), University of Twente (Netherlands), Vienna University of Technology (Austria)..

[4]The results of the European SAUCE project are available on the project website: www.schools-at-university.eu/index.html and results are published in the SAUCE published report: http://www.schools-at-university.eu/files/sauce_publishable_rep.pdf; The SAUCE handbook summarizes the most important results and gives interested universities tips and hints about putting on SAUCE programs at their own universities. http://www.schools-at-university.eu/files/sauce_handbook_e.pdf; The SAUCE Resources Guide presents a selection of the SAUCE workshops and lectures held at the SAUCE partner universities>: http://www.schools-at-university.eu/files/sauce_reader_en.pdf.

[5]In addition, Schools@University was supported from 2011–2014 by Berlin's Senate for Education, Youth and Science, by Berlin's climate protection partners, Berliner Stadtreinigungsbetriebe(BSR), GASAG and the Embassy of the United States of America.

4.4 2015–2020 Sustaining the Educational Format in Cooperation with the Climate Protection Partners of Berlin

In 2015 Freie Universität Berlin, Berlin's Government and the climate protection partners of the Berlin Government Berliner Wasserbetriebe, Berliner Stadtreinigungsbetriebe (BSR) and the GASAG signed bilateral cooperation contracts with FFU with the common educational goal to support the ESD format Schools@University for another 5 years. Thanks to the support of these partners, ten program cycles and ten accompanying teacher trainings will run at Freie Universität starting in 2016.

5 Education as Key for Change

The idea for Schools@University is based on the ESD concept, which draws from the guidelines for sustainable development. UNESCO defines the basics of ESD as follows: "ESD promotes sustainable thinking and acting for children, teenagers and adults. It enables people to make decisions for the future, understanding how their own actions will affect future generations and other regions of the world".

Hence, the question is how to offer participatory education formats to convey complex inter-connections and key issues of sustainable development to Berlin's students. Which methods can promote sustainable thinking and acting? Who is best qualified to teach the students?

FFU is dealing with these challenges and has established an open dialogue between academia, schools, politics and the civil society to develop the concept for Schools@University based on the ESD didactic. Following you will find an explanation of the educational format.

6 Didactic Approach of Schools@University

"Learning for a sustainable future" is the slogan of Schools@University. Focusing on a holistic ESD approach and on the key topics of sustainable development distinguishes this educational format from other types of "Children's Universities".

Although content and methods of the format have been modified during the last years in order to meet the needs of the target groups and the results of evaluations the following specifics are characteristic for the didactic approach:

- Interactive and cross-disciplined workshops
- Age-appropriate teaching based on real-life experience
- Participation with a wide range of interactive methods

Fig. 3 Protecting the environment with recycled paper: Hands-on experiment (Copyright: Schools@University)

- Workshop trainers and experts from academic an non-academic backgrounds
- Learning on six different authentic venues on campus (Fig. 3).

With these didactic specifics, FFU transforms the lecture halls, seminar rooms, the weather station and the Botanical Garden into labs where students experiment with renewable energy or discuss about sustainable architecture and future cities. Experience has shown that children are very curious to discover the authentic sites of FUB, which are usually a "place for adults".

6.1 Age-Appropriate Teaching Based on Real-Life Experience

Schools@University's workshops deal with omnipresent key issues of sustainable development by referencing students' everyday environment, their lifestyle and their consumption patterns. Students learn to critically analyze their choice of clothing, transportation, holiday, hobbies, electrical appliances etc. Intriguing questions like how to bring wind or sun inside a socket or how energy can be unjust stimulate discussions.

These are the key topics of the workshops and lectures:

- Climate change, transition of energy, energy efficiency and savings
- Consumption and lifestyle patterns, product design
- Mobility and transportation
- Architecture, building, future cities
- Nutrition and agriculture
- Maintenance of biodiversity, resource protection

All workshops and lectures intend to convey a sense of empowerment and engagement with the natural and social world in order to discuss complex issues with fun. All components are designed in an interdisciplinary and participatory manner. For example, climate change is discussed with an eye to its social, economic, ecological and cultural aspects. Practitioners present climate change as a solvable challenge and emphasize its potential for creating jobs in the field of renewable energies.

6.2 Building up an Educational ESD Network: Imparting Critical ESD Skills

A multidisciplinary team of experts is continuously optimizing content and methods of Schools@University together with FFU, resulting in high quality workshops and diversity in topics and methods. Among the experts are renowned scientists, technical experts, artists, photographers, directors, members of environmental NGOs and businesses, peers and students. Over the years, a regional ESD network of about 30 institutions and 60 individual stakeholders has been established under the umbrella of Schools@University.

6.3 Learning with Students and Peers

Having students teach some of the workshops has proven to be particularly successful. Children enjoy these peer interactions at the same level and assess them very positively, as do their teachers. Existing workshop modules are adapted and new designs are explored in a collaborative process to match the format of Schools@University. "Sharing and networking knowledge" is the motto of Schools@University's expert network.[6]

6.4 Learning Sustainability with Head, Heart and Hands[7]

Another characteristic of Schools@University is its diversity of its methods. In order to reach out to students on an emotional level, the format links all senses to theoretical knowledge, thus enabling students to understand and act out topics on a deeper level (Sipos et al. 2008). Story-writing, experimenting and handcrafting are only a few examples of the many engaging methods engaged to encourage children and teenagers to search for practical everyday solutions by themselves (Fig. 4).

The following participatory methods and techniques have proven to be particularly popular[8]:

[6]Schools@University's network with portraits of all stakeholders can be found at: http://www.fu-berlin.de/sites/schueleruni/netzwerk/partner_faq/index.html.

[7]Sipos et al. (2008).

[8]A list of all past workshops with short descriptions can be found here: www.fu-berlin.de/sites/schueleruni/programm/programmbausteine/index.html.

Fig. 4 Two students practicing a stop-motion film about the topic "Water is life" (Copyright: Schools@University)

- Scientific experiments with renewable energies
- Energy tours of the campus
- Tours of the weather tower, the canteen
- or the Botanical Garden
- Art and theater workshops
- Stop Motion Film labs
- Creative writing classes
- Simulations and role plays
- Science slams
- Design thinking workshops
- Breakfast, quizzes and games
- Taste discovery games
- Bike-powered cinema

6.5 Integrating Art and Culture to Re-Design the Future

Creative engagement with topics of sustainable development is especially important to FFU. Topics such as future cities, energy transition and other complex issues are taught in close cooperation with artists, authors, stage directors, and actors without any fixed expectations or outcomes. These artistic workshops usually last for four hours (Fig. 5).

Fig. 5 Using dried plants and flowers to make paint (Copyright: Schools@University)

Other employed methods include art, photography, design thinking,[9] performances and creative writing. These creative workshops make up the highlights of Schools@University. The FFU´s experience shows that cultural education can open up the mind for thinking and discovering. A dialogue between students and artists is established, stimulating self-reflexive actions and aesthetic interpretations of the issue at hand.

6.6 Target Groups: Young Students and Teachers

Schools@University is aimed at both students and teachers. Teachers are encouraged to apply their newly learned methods and ideas of the cross-sectoral topic sustainability and climate protection to their classes in a holistic ESD approach. Considering the gaps in environmental education at schools, FFU focuses on educating teachers. Teachers as crucial disseminators need support. Therefore, since 2009 FFU have been offering with the format Schools@University accompanying four hours teacher trainings.[10] Teachers are equipped with insights into the topics and relevant methods and competencies. Experienced local stakeholders present successful methods, teaching units and material. ESD background knowledge and insights into current scientific debates are also part of the teacher trainings (Figs. 6 and 7).

[9]Design Thinking is an innovative method to describe, design and solve problems. It draws from the idea that innovation can only bring about viable solutions in multi-disciplinary groups. (http://www.hpi.uni-potsdam.de/d_school/designthinking.html).

[10]Teacher trainings are carried out in cooperation with the Senate for Education, Youth and Science and the project "Zukunft gestaltet Schule, Bildung für nachhaltige Entwicklung". Participating trainers receive state-approved statements of participation.

Fig. 6 A school class with their teachers and Schools@University staff (Copyright: Schools@University)

Fig. 7 Workshop during teachers training (Copyright: Schools@University)

Methods like "World Café"inspire the teachers to train other teachers. This constructive exchange of ideas results in an authentic dialogue called "teachers train the teacher". Project ideas, strategies and concepts can be discussed. New inspirations for teaching modules are also presented among colleagues with the support of Schools@University.

Schools@University focuses on students aged 10–13 years who are already able to process and abstract complex ESD topics. Some of the students may have started to think about going to university and a certain curiosity exists. Experience shows that this target group is especially interested in socio-ecological issues and causes and consequences of climate change. Other popular topics include biodiversity conservation and preservation of natural livelihood.

In addition, students of this age group are already able to develop solution strategies in role plays and group works. Simulated games of energy, climate and biodiversity politics are very popular. Young students enjoy taking different roles in simulated international conferences or meetings. Political science students of FUB acts as instructors for the "ministers", "farmers" and "lobbyists".

Students are encouraged to change their perspective and to think about potential issues for discussion. Depending on their individual roles, they later take their respective stand in the simulation, thus getting a good impression of the difficulties and opportunities connected to societal and political processes regarding climate change and biodiversity conservation. 11-year old Zora reports: "It is really difficult to convince everybody and to find my own opinion. I think it's impossible to meet everyone's expectations."[11]

7 Facts and Figures—Evaluation Results

Schools@University formats and the accompanying teacher trainings are booked out regularly. Each year, about 2600 students visit campus and ca. 140 teachers attend the teacher trainings. In 2008, Schools@University offered 40 workshops per week, a number which has now risen to 80. Since 2009, a total of 20,000 students in 14 program cycles participated in 750 individual events. 860 teachers and disseminators attended the teacher trainings. All program cycles are evaluated and each single event receives feedback from two to three students and their teachers.

FFU forwards the feedback to participating experts in order to customize and improve future workshops. Content, methods and administrative procedures are improved continually. About 80 % of the feedback forms, an impressively high number, are returned and provide a good overview. Feedback is positive throughout. Good to very good grades are given, judging the topic selection, methods, experts, atmosphere on campus and overall organization.

According to the feedback forms of 2014 and 2015, teachers especially valued the diversity of key issues and the different perspectives cast upon them by experts from various backgrounds. They also praised the participatory methods. On average, 65 % of teachers assessed the quality of content and methods as well as the overall intention of the education format with very good grades, and 30 % of them gave good grades.

[11]Source: Interviews with students, in: Kiek Mal - Die Berliner Kinder- und Familienzeitung (2013): Mit Schuhkartons das Klima verstehen, 1-2/2013, 17.

A female teacher who repeatedly attended Schools@University workshops with her 5th-graders summed up her experience: "Once again, I am thrilled and inspired by the offer. We cannot teach this wealth of ideas with so many different methods and material at school. I now feel confident to apply the Schools@University ideas to my science classes. The students have seen real life examples and can relate better to topics like renewable energies because they had so much fun in the workshops."[12]

The evaluation of the teacher trainings was very positive as well. Organization, implementation, structure, content, supervision, and atmosphere were praised. 40 % of teachers rated the taught methods and content modules as "very good" and 50 % as "good".

These results show that the format meets the needs and interests of teachers as well as students. Teachers emphasize that they are more motivated to integrated Schools@University's topics into their lessons. The network of experts, regional education stakeholders and other teachers is considered to be very valuable to exchange ideas and experiences.

8 Conclusion: Example to Follow

The reported experience from Freie Universität of Berlin shows that the ESD format of Schools@University represents for the involved parties a valuable and rewarding endeavor. Its achievements in education policy and for meeting all standards of ESD have been acknowledged by three awards of the UN Decade and Schools@University has advanced from pilot to role model for ESD. The realization and continuity of Schools@University still depends on effective management, positive evaluation and constant improvement of the workshops´ design, successful fund-raising, a continuous and reliable support from the FUB and the Berlin Government, an efficient regional partner.

network, and—most of all—the passionate involvement of individual scientists. Needless to say, the prerequisite for a sustainable impact of this approach is to consolidate the project's structural, financial and human resources requirements. The major challenge for future work will be to convince Politics and University to institutionalize this exemplary educational format in the structure of FUB.

The evaluation results are very positive and the attendance and acceptance of the programs is high; a qualitative empirical scientific survey is still to come. Depending on the availability of additional financing, a thorough reflection will follow and we will examine the limits and risks of this exemplary, practical approach. A qualitative empirical survey about the real learning effects and outcomes of the programs and trainings is planned. To operationalize the real learning outcomes and effects on motivation, skills and competencies by the target groups we plan an interview based survey.

[12]Interview from „Kraftwerk im Klassenzimmer", in: Campus.leben, Freie Universität Berlin (02.04.2012); http://www.fu-berlin.de/campusleben/lernen-und-lehren/2012/120402_schueleruni/.

A further challenge—after implementing the theoretical idea of ESD in a concrete practical long-term experience—is to derive lessons for future policy. These should provide useful feedback loops also to the theoretical groundwork of our approach, and deliver new food for thought for testing the hypothesis that young students by addressing and better understanding the complex connections between humans and environment and by "practising" sustainability in everyday life feel less overwhelmed by the multiple global crisis.

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