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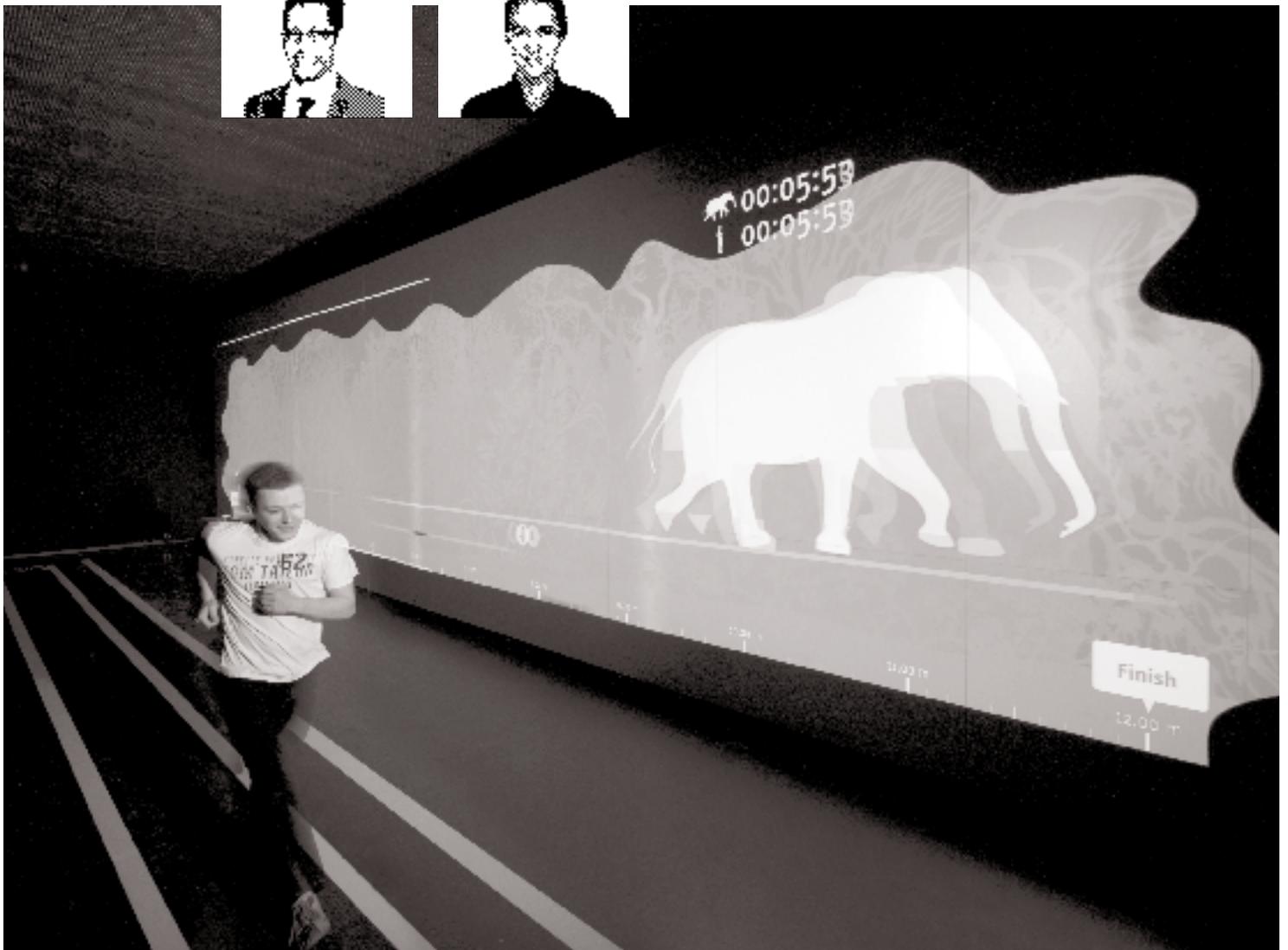
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Actively learning about species leads to a better understanding of interconnections in natural systems. Here at Dynamikum Science Centre, Pirmasens (Germany).



Engagement for a sustainable future

EDUCATION FOR SUSTAINABLE DEVELOPMENT AS A CONCEPT FOR SCIENCE CENTRES AND MUSEUMS

Currently, the world is experiencing multiple crises. Every day we hear news about financial instability, peak oil, effects of climate change and biodiversity loss. In addition, more than 2.6 billion people live in abject poverty, and the gap between rich and poor continues to increase. The concept of sustainable development offers viable approaches to tackle these global challenges.

However, sustainable development is dependent on the collective actions of citizens and these actions can only be influenced by education¹. Through education citizens will be enabled to address the complex challenges of the 21st century. As proponents of innovative education programmes, science centres and science museums can play a central part in this educational process. Thus, the Mechelen Declaration², signed by Ecsite and other international networks at the Science Center World Summit 2014, articulates the goal that science centres and museums are committed to taking “actions that have a positive global impact and that will make people everywhere more aware of the opportunities that science and technology hold for the sustainable advancement of humankind”.

There are numerous ways in which science centres and museums can contribute towards this sustainable advancement, e.g. by improving the energy efficiency of their buildings or by using recycled materials when constructing new exhibitions. But apart from these technical issues, sustainable development can be at the core of the visitor experience and the educational programmes of science centres. To further look into the connection between sustainable development and science centres, the concept of education for sustainable development has to be discussed in more detail.

[1] cf. United Nations Conference on Environment and Development (1992): *Agenda 21: programme of action for sustainable development. Rio declaration on environment and development*, Rio de Janeiro, Chapter 36.

[2] Read the whole Mechelen Declaration at:
www.scws2014.org/home/mechelen-declaration

Education for sustainable development in science centres and museums

According to the UNESCO, Education for Sustainable Development (ESD) is far more than including sustainability issues in different learning contexts, or teaching the science behind the global challenges. ESD aims at fostering the competencies and values that will lead to the transition to sustainable development³. These competencies should enable people to (i) solve complex problems which come with the global challenges, (ii) make collaborative decisions in order to shape their future and (iii) develop life styles which contribute to a sustainable development.⁴ ESD is also about values and the main value of ESD is respect: respect for other people, for the environment, for the planet.

Science plays a crucial role in reaching that sustainable future, because science

can not only provide an understanding of sustainability but also an understanding of the basic principles, values and lifestyles that are necessary to shape a sustainable future. Over the last ten years the goal of the UN Decade of Education for Sustainable Development was “to integrate the principles, values and practices of sustainable development into all aspects of education and learning”⁵. This obviously includes science centres and museums. So, what role does ESD play in science centres and museums today?

Science centres and museums occupy a unique space in informal learning and advocacy. Many science centres around the world are addressing global challenges and exploring sustainability as a relevant topic for exhibitions - but as it was argued ESD is more than that. Most science centres are still struggling with the challenge of delivering



EDUCATION FOR SUSTAINABLE DEVELOPMENT IS MORE THAN LEARNING ABOUT GLOBAL CHALLENGES AND THEIR SOLUTIONS.

Community gardening as science project with a problem solving capacity. Community Garden Project in Soweto (South Africa).

ESD, i.e. equipping visitors the necessary skills, changing their values, influencing their behaviours and life styles. So the question is: how can we achieve this? What are the specific strengths of science centres and museums and how can we use them to have a meaningful impact?

Implementing Education for sustainable development

To successfully promote competencies necessary to solve the complex future challenges, science centres and museums will not only focus on what their visitors are taught at a specific exhibit but rather on how they are learning and interacting. Out of numerous competencies which are proposed within ESD⁶, science centres are specifically suited to (i) encourage interdisciplinary thinking and imagining future scenarios, (ii) learning participatory skills to deal with and decide in complex situations as well as (iii) change behavioural patterns of visitors. These competencies can be learned by using different approaches – and every approach is not specifically linked to only one competency. Interdisciplinary and systems thinking can be

seen as a central knowledge to understand global problems and future scenarios. It can be learned by using investigative methods that encourage visitors to seek relevant research and information, discover relationships within systems, and contribute by doing their

HOW CAN SCIENCE CENTRES FOSTER COMPETENCY-BASED LEARNING?

own investigations and drawing their own conclusions. Interdisciplinary thinking could be ideally learned by conducting problem solving projects set up to address sustainability risks within the community. One example is the Scienza Science Centre in Pretoria, South Africa

[3] cf. www.unesco.org/new/en/education/themes/leading-the-international-agenda/education-for-sustainable-development

[4] cf. de Haan, G. (2006): “The BLK ‘21’ programme in Germany: a ‘Gestaltungskompetenz’ based model for Education for Sustainable Development”. *Environmental Education Research*, 12/1, pp. 19-32.

[5] cf. www.unesco.org/new/en/education/themes/leading-the-international-agenda/education-for-sustainable-development/mission

[6] cf. e.g. de Haan, G. (2006): L.c.: UNESCO (2006): L.c.

that has been involved in a number citizen science⁷ projects like “MammalMap”, which promoted a greater knowledge of environmental systems and a sense that the individual can contribute to a sustainable development.

To deal with complex problems, collaborative decisions are often necessary. Thus, participatory skills are an essential competency. By using deliberative methods, participants are encouraged to express their own views and values and enabled to shift to a new view. These methods of social learning comprise discussions, learning groups and debates. The goal of the FUND project and the game PlayDecide

was specifically to facilitate the take-up of participatory methods. The resources are still available online in many languages and on many subjects including Climate change at www.playdecide.eu. Such approaches also aim at achieving active communities with common concerns. Thus,

science centres have embarked on outreach programmes and are contributing to concrete community work. One of the many examples is the Miami Science Museum in Florida, USA, which uses not only science center exhibits but also social media and land art to engage volunteers to restore coastal habitats. Another example is the Johannesburg City Parks Science Centre that has embarked on a tree planting programme, which is also aimed to address poverty alleviation by planting fruit trees.

When talking about the path to a sustainable future, it is obvious that the personal behaviour is a key factor in the equation. Science centres can support behavioural change by using experiential learning such as role plays and games. These are useful as they enable participants to see things differently and visitors have the opportunity to ‘rehearse’ new behavioural patterns. As a special type of games, serious games are



HOW CAN SCIENCE CENTRES SUPPORT VISITORS TO CHANGE THEIR BEHAVIOUR?

Community Garden Project in Soweto (South Africa).

[7] cf. for an introduction into citizen science see Hand, E. (2010): “Citizen Science: People Power”. *Nature* 466, pp. 685-687

[8] cf. for an overview of serious games about sustainability see Katsaliaki, K. (2012): “A survey of serious games on sustainable development”. *Proceedings of the 2012 Winter Simulation Conference*. Berlin, pp. 1-13.

an educational tool which is regularly used in science centers. There are an increasing number of serious games about sustainable development issues⁸, including “EnerCities” dealing with Sustainable urban development, “Clim’way” on Climate change management or “Catchment Detox” about water management.

Barriers and challenges

The science centres and museums that started initiatives to implement this new approach know this: ESD comes with many challenges. One challenge is to make topics relevant to visitors. Sustainability is broad and all encompassing. Thus, it is essential to make topics and problems relevant not only at a local level but at a level that relates to visitors’ everyday lives. Another challenge is the demand that visitors should learn competencies, though this is difficult as the visit to a centre or a museum is somewhat time-limited.

And can science centres and museums really claim to change the behaviour of visitors? One participant of the national conference marking the end of the Decade on ESD held in September 2014 in Bonn, Germany, summed it up frankly: “Institutions like science centres and museums

often struggle with incorporating the latest didactic concepts. Thus, the complex concept of ESD seems to be too difficult to implement”.

ESD IS A COMPLEX CONCEPT WITH MANY CHALLENGES FOR THE IMPLEMENTATION.

Ways to move forward

As UNESCO advocates, in the context of ESD, science “should be regarded broadly to include social sciences as well as natural sciences”⁹. Science centres are challenged to embrace this broad understanding and incorporate more social science research into their exhibitions and programmes. This integration of social sciences also shows the need for a truly interdisciplinary team and approach in centres and museums. At the interface of research and public, science centres can also act as stakeholders in transdisciplinary research¹⁰ and facilitate citizen science projects. By making these activities an important aspect of the programme, science centres could contribute hugely to the cause of ESD. Thus, a growing number of science centres make sustainability their key topic, e.g. the Crystal in London, UK or the Klimahaus in Bremerhaven, Germany¹¹.

Regarding the whole science centre field, Charles Hopkins, UNESCO Chair for ESD, underlines: “Strategizing with science centres and museums for ESD for a more sustainable future could be very powerful”. So how could this be done? A first step might be to bring together all science centres and museums who are interested in this approach. Although the Nature Group has lead discussions on the topic, the establishment of a fully-dedicated Ecsite working group on ESD could be one way to achieve this.

We are convinced that, although the UN Decade on ESD ended in 2014 without significant involvement of the science centre field, it might just be the right time to strengthen the cooperation. UNESCO is following up the Decade by drafting a Global Action Programme on ESD¹². It is the responsibility of the science centre community to get involved in the Global Action Programme not only to benefit from the UNESCO activities but to show their importance in the field of ESD, to put the Mechelen Declaration into action and to contribute to the sustainable future that we wish to create for future generations.

**THE SCIENCE CENTER
COMMUNITY
NEEDS TO GET
INVOLVED IN
THE GLOBAL ACTION
PROGRAMME ON ESD.**



[9] UNESCO (2006): *Framework for the UN DESD International Implementation Scheme*, Paris, p. 17.

[10] cf. for an introduction into the concept of transdisciplinarity see Hirsch Hadorn, G. et al. (2008): *Handbook of Transdisciplinary Research*.

[11] For more information about these institutions visit www.thecrystal.org/exhibition.html and www.klimahaus-bremerhaven.de/en

[12] Find the proposal of the Global Action Programme at: <http://unesdoc.unesco.org/images/0022/002243/224368e.pdf>



Discovering characteristics of animals is a first step in designing protection activities within the community. Here at Dynamikum Science Centre, Pirmasens (Germany).

Connect with the authors

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Michael has delivered conference papers on ESD at the SAASTEC Conference in 2013 and at the Science Centre World Summit in 2014.
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Christopher has organized and spoken at a session on ESD at Ecsite conference in 2013 and organized and convened a session on ESD at the Science Centre World Summit in 2014.
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Putting concepts into practice: Nausicaá, Boulogne (France)

Nausicaá is more than an aquarium – much more. Since its opening, its aim has been to foster a more sustainable use of the ocean; after its active participation in the 1998 international Year of the Ocean, Nausicaá was named “Centre of Excellence for Marine Education” by the International Oceanographic Commission / UNESCO.

When the idea of the Decade of Education for Sustainable Development was first discussed in 2002, Nausicaá not only supported this idea, and participated in the initial planning, but also fully endorsed its principles: to learn about and deepen awareness of environmental issues, to reflect on our modes of living, shifting these toward sustainability, to empower people to take concrete actions to resolve the environmental challenges they face.

With the first exhibit on Ocean and Climate in 2003 and the new one to be open in 2015, Nausicaá shows the links between our daily lives and global issues; the “Environment Friendly House” is an interactive exhibition engaging the public to change their consumer habits in order to reduce pressure on the Earth's natural environment and climate. Since 2010, the Mr. Goodfish programme aims to sensitize the general public and the seafood industry professionals about the sustainable consumption of seafood. On an international scale Nausicaá is a founding member of the World Ocean Network whose objective is to inform, mobilize and encourage everyone to act for the sustainable use of the ocean.

www.nausicaa.co.uk