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SOLARLUX Campus - a case study of an *educating building*

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ABSTRACT: The SOLARLUX Campus in Melle, Germany, has brought to life systematically the idea of *educating buildings* for the first time. *Educating buildings* means that through the exposition of integrated sustainable solutions and technologies, the buildings themselves become conveyors of information about themselves. The applied measurements should lead to an understanding and acceptance of technological solutions that are beneficial to society and the environment, and create a model for the proper treatment and care of the buildings. These solutions are directed toward permanent occupants and visitors of the buildings. Aiming to educate the recipient during their stay, the displays fall into the category of informal education. The goals of the project are being reviewed, the methods of exposition are being analysed in accordance with the designated target audience, the exemplary display and informational measures in and outside of the buildings are shown.

Keywords: *Educating buildings*, sustainable architecture, informal learning

INTRODUCTION

Buildings - especially, modern public and industrial buildings - are increasingly complex technical structures. They contain or have been constructed from a number of cutting edge, clever facilities and controlling installations. Their tasks as the key to sustainability consist of resource saving energy production, solar energy harvesting and efficient energy use, but also increasing comfort for both the occupants of, and visitors to, a building. For this reason, it is important for them to be understood, correctly used and operated.

Many occupants and visitors to public buildings are unaware of today's opportunities to increase efficiency and to protect natural resources in the fields of construction and development. It is not uncommon for visitors to be at a loss trying to interpret technical models of installations with no other means of understanding the technology than time-consuming research or plodding through accompanying written material about the individual components of an ecological model construction. The measures applied should lead to an understanding and acceptance of technological solutions that are beneficial to society and the environment, and create a model of the proper treatment and care of the buildings and their descendants.

THE CONCEPT OF *EDUCATING BUILDINGS*

Educating buildings are buildings, which through the exposition of integrated sustainable solutions and technologies themselves become conveyors of information about themselves.

This concept is a result of the *Resource Saving Ecological Buildings as Exhibits* research project implemented by the author at the educational association Verein für Ökologie und Umweltbildung Osnabrück e. V., Germany and funded by the German Federal Environmental Foundation (DBU), within the framework of which a handbook with corresponding guidelines was created [1]. It provides a valuable aid to assuring the transparency of technical aspects and ecological relationships for occupants and visitors.

When selected problem areas and solutions are concentrated on illustrating and explaining them in generally understandable terms within the context of the building itself, chances increase for occupants and visitors from outside the building to understand, and through this, to use the building's varied technical potentials competently. As a rule,

without such noticeable indicators and explanations, non-professionals are unable to access innovative environmentally technical measures installed in a building. In this area, the large potential of possible knowledge communication stands in opposite to a considerable deficit of real, accessible explanations. At the same time, economic and ecological side effects are more positive, the higher the awareness for the complexities of the buildings is.

Unlike typical themed exhibitions, in which the contents to be exhibited must be acquired before further steps, such as defining the core statement or the communicative goal can be considered [2], in the case of *educating buildings* the contents already exist and quite often real objects can be used. Here then, the task lies in exhibiting and explaining existing relationships, systems and solutions, which communicate their function and effect to occupants in an interesting and understandable way, thus, steering attention to the underlying topic of sustainability.

EDUCATING BUILDINGS AS A FORM OF INFORMAL LEARNING

Educating buildings measures orient themselves toward visitors and occasional users. One can view this as a special form of informal learning which, depending on the type of building and functions discussed, can be quite varied. Here too, there are many interpretations of the term. The EU Commission understands it to mean:

> *…learning resulting from daily life activities related to work, family or leisure* [3].

Regarding learning objectives, time required to learn and promotion of learning, informal learning is not structured and, as a rule, does not lead to certification. Informal learning can be goal oriented, but in most cases, is not intentional (incidental/coincidental/in passing). *Educating buildings* are goal oriented. They are, however, only an offer to visitors who wish to take advantage of them to a greater or lesser extent according to their own desires and personal interests. The conception of *educating buildings* as a new approach to informal education on sustainability sets standards for consequent and plausible communications strategies in authentic learning environments.

Awareness of issues involved in sustainable construction and the positive attitude created through understanding these issues can bring profitable multiplier effects: some occupants may be future owners of buildings built to their requirements, while others may be educators. When these individuals transmit their positive insights about sustainable solutions, they can sensitise some to build according to the principles of sustainable construction and animate others to careful utilisation of building technology.

COMMUNICATION ON SUSTAINABILITY AND SUSTAINABLE CONSTRUCTION

If a problem in society is not discussed to some extent it does not exist, or rather, it will not be solved practically. This is especially true of processes of (not) sustainable development. In the case of *educating buildings*, one could also speak of communicating buildings. The concept of *educating buildings* is about the communication processes taking place between the buildings and their various occupants and visitors in the context of sustainable development. This is sustainability communication, which is defined by Michelsen as:

> *…the process of understanding in which societal development takes place in the context of a secure future the central feature of which are the guidelines for sustainability* [4].

What sustainable construction means is not completely clear in international discussion. In any case, it means more than just ecological construction (green building). The *Guidelines for Sustainable Construction* from BMVBS (Federal Ministry of Transport, Building and Urban Development, 2012) is emphasising the cultural aspect strongly, defines the classical three-dimensional approach as follows: ecology, economy and socio-cultural issues [5]. The following are included in the socio-cultural dimension of sustainable construction: preservation of health, safety and comfort guaranteeing functionality, as well as assuring the quality of design and urban environment.

HOW TO EXHIBIT

The principle of clarity, simplicity and visibility should be followed for displays planned to exhibit the systems for sustainability in buildings. The message to be communicated by *educating buildings* should be as simple, graphic and comprehensible as possible.

In the first step, the display should attract the attention of visitors or occupants, so that they pause to satisfy their interest. It is recommendable to place displays where individuals spend time anyway. The objects exhibited, along with their corresponding information, must be durable and long lasting. The texts should be short and to the point, without unnecessary foreign words or technical terms. In order to assure understanding, a central order for texts, logically structured and properly outlined, should be formulated. References to everyday practice-oriented questions to introduce a topic, eye-catching key words and distinctive provocative expressions increase interest.

While the first step is to capture attention, in the second step, the cognitive level of information transmission is reached. Here, content and core message can be transmitted through pictures, texts, audio-visual material, interactive computer

programs or models. Ideally, the actual building or real objects should be used when possible. Real components of a building or detailed reproductions when exhibited, are more memorable than illustrations of them would be. Tactile anchoring can be strengthened when objects can be touched.

SOLARUX CAMPUS AS THE FIRST CONSISTENTLY DESIGNED EXAMPLE OF AN *EDUCATING BUILDING*

In the new manufacturing facility SOLARLUX Campus (shown in Figure 1) in Melle, Germany, the idea of *educating buildings* comes to life systematically for the first time. Besides energy and resource saving, also considered have been the socio-cultural and human aspects of sustainability - like good daylight workplace lighting, natural ventilation, visual connections to the outside, communication-friendly and ergonomic workstations, etc.

For several reasons, the SOLARLUX Campus is a perfect object for the implementation of the idea of *educating buildings*. The SOLARLUX Company is a renowned Germany manufacturer of individual glazing solutions like bi-folding glass doors, winter gardens or façade solutions. The Campus contains several today's more common cutting-edge ecological and energy related technologies. Additionally, the client wished to make visible the building's energy efficient qualities, as well as its ecological and social advantages to those inside and outside the building. The intention was for the building itself to act as an exposition piece.

The basis of the positive energy balance of the complex is the highly insulated exterior of the building, the extensive geo-thermal systems, concrete core activation of the floor slabs, heat exchange devices, co-generated heat and power units, and structural solutions for passive solar energy use. The roofs of the building are large-scale greened. The photovoltaic systems is planned. The transparent film covered atrium of the publicly accessible forum harvests solar energy and offers space for various events and exhibits. All technical installations in Campus are networked through an energy management system that generate synergies between technical installations and structures in the building.

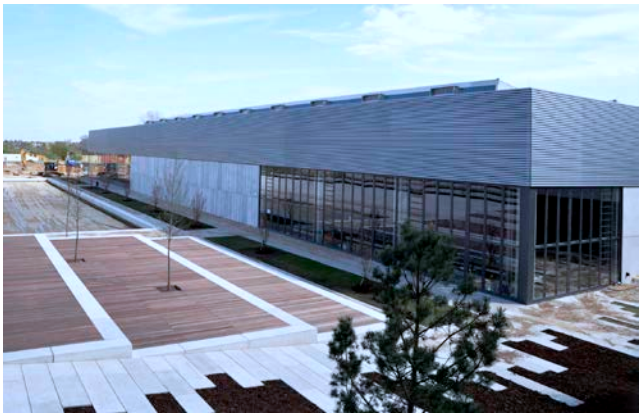

Figure 1: Solarlux Campus in Melle - production hall 3.

In the first phase of the project, each of environmentally relevant components were analysed and rated according to their ability to be used as a display. For this purpose, respective systems and solutions in the building were considered. Ecological building materials and greened roofs have also been taken into account. After conclusion of analysis, a concept was created with the following goal: how can the SOLARLUX Campus with all its environmentally relevant features be used to exhibit? That is, how can environmentally relevant information be transmitted to the differing target groups entering and using the building?

At the outset of the project, a detailed analysis of the planning concept, including external installations, was completed in agreement with the announced permanent exhibition. The goal was to integrate the display measurements with relatively little effort and at low cost. Subsequently, the *corporate design* for the SOLARLUX Campus was created with the goal of visually making the most of its environmentally sustainable aspects by immediately bringing them to the attention of visitors. The design and development of a guide system with an appealing graphic symbolic code followed. It was intended to merge the informative permanent displays with the architecture of the building complex and signage both inside and outside. For presentation purposes, a photo and video documentation of the entire phase of construction had been executed.

COHERENT COMMUNICATION CONCEPT

Educating buildings depend on coherent, conclusive and adequate communication concepts. These are the basis for the design of presentation measures about the sustainable aspects of a building. The communication concept serves as a guideline for all further implementation. The communication concept must be translated into a unified, clearly understandable and recognisable image. The trick lies in finding the right balance between *eye-catching* and *complementary/appropriate*. This is only possible through individual design attuned to the communication concept and the unique characteristics within a structure.

Corporate design for display measures was developed during the planning phase of construction and was included in corresponding interior design concepts, involving existing master control systems. Information transmitting measures were harmonically integrated into existing surroundings. Requirements of differing target groups had been considered, when developing graphic design for a building.

To lead interested persons via a recurrent theme, characteristic logos and recognisable designs for all stations in the building were developed. Faced with the complexity involved in a number of the topics exhibited, reduction of most of the contents to their fundamental core message was unavoidable. Further information will be offered in the form of additional material, such as flyers, brochures, books or explanations on the Internet. Additionally, further programmes will be developed, such as guided tours through the complex or open house campaigns.

THE RIGHT DEPTH OF INFORMATION FOR DIFFERENT TARGET GROUPS

To develop a conclusive concept about display measures in buildings, it is initially necessary to designate the respective target groups. The more exactly the target groups are defined, the better the communicative content can be formulated and shaped, and the more effective and well targeted the exhibits become.

The target groups for the planned display measures at the SOLARLUX Campus were defined in advance. Sporadic, as well as permanent occupants and visitors to the building belong to the typical target group. Thus, flexibility of composition and depth of information were, therefore, a necessity. This is only possible if the design approach allows for a certain amount of *multi-layeredness* in the messages offered.

Generally, three levels on information depth can be offered in *educating buildings*: at the primary level the topic is defined and its solution shown; the next level makes further explanations available; and the third level, high content and further explanations are aimed particularly at those familiar with the subject matter involved. The display measurements at the SOLARLUX Campus are limited mainly to the first two levels.

EXEMPLARY DISPLAY AND INFORMATIONAL MEASURES IN AND OUTSIDE OF THE BUILDING

At the outset, in the construction phase of the SOLARLUX Campus, an external information stand had been developed and designed by the author. Composed of two intermodal containers (one horizontal, one vertical), it serves as a mobile info-box, which can be positioned and displayed in different public places. Figure 2 shows the exterior view and the internal space with video screen and information boards about sustainability around the SOLARLUX Campus.

Figure 2: Mobile info-box: exterior view and internal space (design P. Kuczia).

Modern technical installations are complex entities, the structure and function of which are only accessible to specialists. For many observers, however, their very complexity and foreignness arouses fascination. Appropriately displayed, this effect can be used to transmit information and pique interest in modern utilities engineering.

For this reason, in the SOLARLUX Campus, the HVAC building facilities room is accessible to the public (mainly as a guided tour). As knowledge of the potential advantages of, and opportunities for, using renewable resources is often very limited, focusing on this aspect by giving visitors and occupants an explanation of pertinent techniques in an attractive manner can be effective. The fact that renewable energy is being used in a building is usually not apparent at first sight. Graphic illustrations and schemata, which make the building's energy sources apparent are well suited to initial, rapid clarification. Information posts in front of each device or system explain its function. The installations and devices are slightly separated from visitors. As visitors are led via specially designed walkways, security is assured. The supply lines in the building are being exhibited in many areas and arrows with explanations mark the average flow in each individual conduit.

Concrete core activation of building elements is an energy saving and economic alternative or supplement, to conventional heating and cooling systems. However, they are not a precise method of temperature control. Being rather more of a low-tech, less drastic measure, it is necessary to increase occupants' acceptance by means of suitable explanations and presentations of the technical concept. A photo documentation of a floor plate taken at different phases of construction illustrates the construction with pipe grid for thermal activation of the slab (Figure 3).

Figure 3: Display with a photo documentation taken in the construction phase.

Boards with *peepholes*: aimed directly at visible sections of different building components with corresponding explanations in each section. Figure 4 shows such a board inside a production hall.

Figure 4: Information board with *peepholes* in the production hall 3.

Green roof offers numerous technical and ecological advantages. There are two different display measures at the Campus: in non-visible areas with greened roofs in the form of mirror systems on the edge of the roof or inside the building as window views of greened roofs from a higher vantage - directly lettered with brief informative statements or signs, as shown on Figure 5.

Figure 5: Directly lettered window view on greened roof seen from a meeting room.

These few measures - all designed by the author in cooperation with B. Witkowski from Ultrabrand - exemplarily illustrate how the idea of *educating buildings* has been implemented at the SOLARLUX Campus.

CONCLUSIONS

Modern, sustainable industrial and public buildings can be turned into broadcasters of knowledge about themselves and, thus, become multipliers in the process of educating towards sustainability. Aspects of building technology can be placed into a context of ecological, economic, social and cultural relationships - set against a background of resource protecting and energy saving.

The idea of *educating buildings* is a new and innovative approach to informal learning, and has come to life for the first time in the new manufacturing facility SOLARLUX Campus in Melle, Germany. The aim of the project was to create measures, which will raise the acceptance for increasingly complex technologies in buildings (with their hardly comprehensible and understandable facilities, and controlling installations), move occupants to the proper use of them and, eventually, inspire people to behave responsibly and sustainably [6]. Thereby, the employees can better identify with their production building, the measures can have positive effects on productivity and enhance the image of the company.

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BIOGRAPHY

Piotr Kuczia graduated as Master of Architecture and a Doctor of Engineering with honours from Silesian University of Technology in Gliwice (Poland) in 1989 and 2008, respectively. With more than 20 years of experience working in Germany and Poland, he is an expert in ecological and solar constructions. He has been awarded over 30 international prizes and distinctions for his architectural work, which covers a wide range of building types. He has been exhibited in 12 countries and published in over 40 books and 80 professional journals. He has published 13 peer-reviewed conference and journal papers, and a further 40 articles in professional journals in the field of architecture, sustainable construction and architecture communication. He has been juror/jury chairman in 14 international competitions and an active participant at 17 architecture workshops in Europe, North America, Asia and Africa. Dr Kuczia is a guest lecturer at Cracow University of Technology, Silesian University of Technology in Gliwice, Wroclaw University of Technology, and the WST University of Science and Art in Katowice (Poland), as well as at Miami University in Oxford, Ohio, and the California State Polytechnic University in Pomona, California (USA). He is an idea generator and author of the book *Educating Buildings - Learning Sustainability through Displayed Design.*