Education for Sustainable Development of the Built Environment: Problem-Based Learning Approach for Embedding Sustainability

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Contents

• Context
• Introduction
• Education for Sustainable Development (ESD)
• Initiatives for ESD of the built environment in Egypt
• Education for sustainability of the built environment
  • First: Critical thinking skills as a basis
  • Second: Problem-Based Learning (PBL) for embedding sustainability
• Conclusion
Context

• This research is integral to a Newton Institutional Links project (ID 2015EGY01) funded by the British Council Newton Fund.

• The project is: Building Capacity for Sustainable Development of the Built Environment (BC-SDBE).

• The grant is a total of 288,000 GBP for a duration of 2 years.

• The main partners are the University of East London and Ain Shams University in Cairo.

• University of Strathclyde is the project collaborative partner.
Introduction

Education for sustainable development (ESD) is a key vehicle against which both energy consumption can be reduced and GHG emissions curtailed. It is fundamental to steer education towards the conservation of energy in the built environment (Taleghani et al., 2011).

Sustainability education must equip learners with capabilities to reflect, think critically and problem solve accordingly in order to make timely decisions in response to the issues of depleting resources.

Hence, developing critical and creative thinkers who feel empowered to act as responsible citizens is key to ESD (Sewilam et al., 2015).
Education for Sustainable Development (ESD)

"Education for Sustainable Development allows every human being to acquire the knowledge, skills, attitudes and values necessary to shape a sustainable future” as defined by the UNESCO (2014).

The UK Quality Assurance Agency for Higher Education (2014) defines ESD as “the process of equipping students with the knowledge and understanding, skills and attributes needed to work and live in a way that safeguards environmental, social and economic wellbeing, both in the present and for future generations”.
Initiatives for ESD of the built environment

In Arab countries, ESD initiatives have been generally dispersed both in professional training and HE programmes.

Existing pre and post-professional training in Egypt have not satisfactorily addressed aspects of sustainable design and planning.

The Green Pyramid Rating System (GPRS) has been introduced in 2011 as a whole-building approach to sustainability that recognises performance in seven key areas: Sustainable Sites Development, Water Efficiency, Energy Efficiency, Materials and resources, Indoor Environmental Quality, Management, and Innovation and Design Process.

In order to activate the GPRS, educating and training students, architects, engineers, practitioners and professionals who will employ this rating system in their planning, design and construction and environmental performance assessment of buildings is vital.
Initiatives for sustainable development of the built environment

Several HEIs in Egypt introduced sustainable and environmental design at PG level while others introduced this as either core or optional modules at UG levels (Ain Shams University, Cairo University, Arab Academy for Science, Technology and Maritime Transport, the British University in Egypt, and others).

Only a few HEIs in Egypt have recently introduced UG programmes focusing on environmental design.

This confirms the necessity to educate and train UG and PG students, practitioners, academics and professionals in the construction sector in Egypt to close the gap in the knowledge and skills in aspects of sustainability of the built environment.

As a result of preliminary skills-needs analysis, BC-SDBE project aims to facilitate ESD to address this skills gap through its training programmes and workshops.
Building Capacity for Sustainable Development of the Built Environment (BC-SDBE)

The aim of this study is to emphasise the drivers to this capacity-building initiative and set out potential approaches to educate and train diverse stakeholder groups in state-of-the-art strategies for embedding SD strategies in the BE in Egypt.

The study advocates the need to develop **critical thinking** as a catalyst for effective education in this field.

It identifies **Problem-Based Learning** (PBL) as a viable pedagogic approach to embed holistic sustainability in learning and practice.

This approach is also supported by the constructive alignment of teaching and learning activities, intended learning outcomes (ILOs), and assessment activities to develop thorough and systematic deep learning (i.e. learning with understanding).
Education for sustainability of the built environment

To implement sustainability in the built environment, ‘training the trainers’ is a fundamental step in raising awareness, embedding sustainability-related knowledge, and highlight the key role education plays in developing a more sustainable built environment.

One of the core principles underpinning ESD is the development of ‘critical thinking skills, analytical skills, empathetic capacity and the ability to be an effective person who can take action to achieve desired development introducing education for sustainable development outcomes’ (Tormey 2003, p. 2).

This study proposes a two-step transformative pedagogic approach to ‘train the trainers’; developing critical thinking skills, to subsequently apply and use in problem-based learning for effective ESD in the built environment.
First: Critical thinking skills as a basis

Why are Critical Thinking skills important?

- greater precision and accuracy to different tasks
- better at problem-solving and project management
- make better decisions from verified information
- avoid unexamined assumptions and prejudices
- become more effective individuals in the society (Jeschofnig, 2014)

Critical thinking is a crucial skill that improves attention and observation, encourages more focussed reading and writing skills, and helps develop analytical skills, which, in turn, support higher levels of attainment (Pithers & Soden 2010).

Critical thinking demands effective problem solving and communication skills using self-directed and self-disciplined thinking (Paul & Elder, 2008).
First: Critical thinking skills as a basis (cont’d)

Critical Thinking skills should be developed in student-centred learning environments.

Student-centred learning essentially puts learner responsibility and activity at its heart with the teacher acting as a facilitator and mentor instead of conventional ‘teacher-controlled’ learning (Cannon & Newble 2000).

Student-centred learning facilitates flexible learning environments which can occur anywhere and at any time if supported with proper technology.
First: Critical thinking skills as a basis (cont’d)

Embedding Critical thinking skills

- More open-ended questions and assignments
- Higher-level thinking questions
- Discussions and debates that promote CT
- Learning material on VLE that support CT
- Use Bloom’s taxonomy to integrate CT in learning and assessment activities
Second: Problem-Based Learning (PBL) for embedding sustainability

Research studies argue that PBL may be considered a key vehicle to developing students’ critical thinking skills.

PBL is acknowledged as one of the forms of **active learning** where learners are active participants and independent critical thinkers enabled by the tutor who facilitates opportunities for learning through open-ended situations and problems.

Research in PBL assert that this approach makes students more proficient at **problem-solving, group working and critical analysis**.
Second: Problem-Based Learning (PBL) for embedding sustainability (cont’d)

‘Lecture-based cases’ where ‘students are presented with information through lectures and then case material used to demonstrate the information’ (Barrows 1986 cited in Savin-Baden & Major 2004).

Savin-Baden & Major (2004) suggest to start with a real life, authentic problem which learners are quite familiar with to help develop confidence and enthusiasm and to use problems relevant to practice to gain learners’ interest. The problems should contain some uncertainty to augment critical thinking and problem solving but should not be too narrow nor over complicated.

Case-based multidisciplinary and role play learning for students of architecture, engineering and construction in the delivery of sustainability has demonstrated that students develop a better understanding of the SD requirements for project delivery when compared to traditional learning methods (Korkmaz, 2011).
Second: Problem-Based Learning (PBL) for embedding sustainability (cont’d)

When designing the learning outcomes of modules for ESD, Bloom’s revised taxonomy should be applied in order to ensure a gradual build-up of the levels of learning (Biggs & Tang, 2007).

Key problems within professional practice which require students to undertake specific activities to learn from real life problems would be set up for assessing PBL, as a shift away from outcome-based examination.

The proposed framework in Table 1 would ensure that learners could achieve the ESD learning outcomes through constructive alignment of learning activities and assessment tasks, and ILOs.
Building Capacity for Sustainable Development of the Built Environment (Project ID: 2015 EGY01)

### Constructive alignment of teaching/learning, ILOs and assessment tasks

<table>
<thead>
<tr>
<th>Teaching/learning activities</th>
<th>Intended Learning Outcomes</th>
<th>Assessment tasks</th>
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<tbody>
<tr>
<td>Lectures. The didactic content of the modules will be explained in lectures, assisted by visual aids, interaction with the students and demonstrations.</td>
<td><strong>Module 1: Introduction to Sustainable Development of the Built Environment</strong></td>
<td>Conceptualise and articulate own standpoint with regards to SD in the built environment (reflective journal).</td>
</tr>
<tr>
<td>Case studies. Discussions and presentations of real-life examples to demonstrate how the theory studied in the module is implemented in practice.</td>
<td>1. Demonstrate knowledge and understanding of principles and concepts of sustainability (environmental, social and economic) in the context of building planning and design;</td>
<td>Critically assess ideas, concepts and approaches relating to environmental, social and cultural implications of SD in their context / practice (case-based individual essay).</td>
</tr>
<tr>
<td>Set texts. Core texts will be used as main reference sources to ensure that learners have all the resources for theoretical material covered.</td>
<td>2. Develop a critical position in comparing and assessing SD approaches across all scales of the BE;</td>
<td>Develop analytical and synthetic skills in developing unique but appropriate approaches and tools that are effective and fit for SD purpose (portfolio, presentations).</td>
</tr>
<tr>
<td>On-line support material. Materials, and forums will be accessible to students in an e-learning platform. This increases opportunities for distance and needs-related tuition.</td>
<td>3. Critically evaluate concepts, methods and outcomes in relation to SD and its short – and long-term implications.</td>
<td></td>
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<td>4. Analyse sustainability implications in designing buildings of different typologies;</td>
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<td>5. Evaluate environmental, and socio-economic attributes of SD in a national and global perspective.</td>
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Conclusions and next steps

ESD should combine direct teaching with critical analysis of real life case studies while continuously sharing its knowledge for the benefit of society.

Effective stakeholder participation promotes grass roots interest within the learning community that would work in tandem with top-down approaches.

The next stage of the BC-SDBE project is a comparative analysis of ESD in the UK and Egypt with an aim of knowledge transfer of lessons learnt from the UK to the Egyptian context.

To achieve this, government industry need to work collaboratively with academic and research institutions in facilitating the appropriate medium for ESD and providing sufficient funding to ensure appropriate training standards are achieved to support the national Sustainable Development Strategy 2030 in Egypt.

However, it must be noted that the uncertain political climate in Egypt has a significant impact on how ESD initiatives will be perceived and positioned in its social, cultural and political context.
International Conference for Sustainable Design of the Built Environment (SDBE 2017)

Conference Themes
- Sustainable urban design
- Education for sustainability
- Bioclimatic and passive design
- Zero and low carbon design
- Sustainable construction and technology
- Building Performance Evaluation
- Post Occupancy Evaluation (POE)
- Energy efficiency in buildings
- Renewable energy technologies
- Indoor Environmental Quality, health and wellbeing
- Building Simulation and Building Information Modelling (BIM)
- Innovative didactics for sustainable development

Key Dates
- Abstract submission deadline: 15th July 2017
- Notification of acceptance: 30th July 2017
- Full paper submission deadline: 15th Sept. 2017
- Notification of acceptance: 30th Sept. 2017
- Deadline for full paper submission: 15th Nov. 2017
- FREE REGISTRATION FOR ALL SELECTED PAPERS: 30th Nov. 2017

Keynote Speakers
- Prof. Philip Jones Welsh School of Architecture, Cardiff University
- Prof. Steve Sharples School of Architecture, The University of Liverpool
- Prof. Rajat Gupta School of Architecture, Oxford Brookes University

To submit an abstract visit: www.newton-sdbe.uk
References

References

Thank you

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