

# Architects' Propensity for Sustainability: Knowledge Transformation through Education

Bing Chen and Adrian Pitts

School of Architecture, University of Sheffield, Sheffield, UK

**ABSTRACT:** Sustainability has been widely acknowledged as a multi-disciplinary concept which requires the close collaboration between different professionals. In architectural practice, however, some professionals endow this term with 'technical' implications and then guard it as a specialised area of knowledge which other stakeholders may not enter. To argue against this perspective, this paper intends to probe into its very start – education for sustainable architecture design. Through a pilot investigation, the argument about professional propensity has been concentrated on the architectural candidates' knowledge transformation in their early training programmes. Moreover, since the interviewees constitute a specially focused group, the issues about the designers' intentions and users' attentions for sustainability can be raised simultaneously. Some of the key issues relate to the understanding change for sustainable design features referring to EcoHomes and Ecological Footprint, particularly for their priorities in design process. Education for participative design and collaborative practice is then suggested for adoption in order to ensure the understanding of intrinsic lifestyle change can be widely shared in the decision making process. The principal findings indicate that there is still a deep degree of untapped opportunity in this approach.

**Keywords:** sustainability, EcoHomes, Ecological Footprint, knowledge transformation, participation.

## 1. INTRODUCTION

Sustainability has been widely acknowledged as a multi-disciplinary concept which requires the close collaboration between different professionals. However, like other 'New Knowledge' dominant in contemporary academic discourse, the perception of sustainability is contentious in practice [1]. The ambiguous contents of this term sometimes lead its key concerns to be overridden or ignored in a rush to inclusiveness. Meanwhile, the 'Information Society', simultaneously emerging with 'New Information', has brought forward three challenges to shape the future architecture and its education: 'the pressure for innovative practice, the change in the construction of buildings, and the demand for compliance' [2]. To a great extent, these three basic challenges tend to view architecture as an implicitly technological discipline that could be symbiotic with the culture of contemporary society. In architectural education, therefore, the discourse about sustainable design often falls into technologically informed contexts accordingly. Some professionals, in order to maintain their elevated statuses, even guard this 'technical implication' as a specialised area of knowledge beyond which other stakeholders or professionals may not step in.

This perspective is questioned in this paper since sustainable architecture cannot be achieved through the technical approach alone. Thus, to understand better the designers' preference for sustainable design features, a pilot investigation has been carried out among architectural students to examine knowledge transformation during their early training

programmes. Since the interviewees are made up by architectural candidates, this object can be seen as a specially focused group that represents a revised dualism – both current housing occupants and future housing designers; while the affiliation between their two roles is also mutual dependent [3]. Hence in this paper, issues about designers' intention and occupants' attention for sustainability can be raised simultaneously. An integrated socio-technical perspective has been adopted for this study and some key issues relate to the understanding change about sustainable design features referring to EcoHomes [4] and Ecological Footprint [5].

This paper addresses in particular the importance of collaboration between design work and research work within the architectural domain. Education is then supposed to act as a communicational platform to facilitate the transfer of relevant knowledge. Some assessment systems for sustainable buildings, such as EcoHomes and Ecological Footprint, have also been suggested to be applied as an aid to guide the design program towards sustainability. Rather than just assessing the final products with the benefit of hindsight, these media can help the decision making process transform from a qualitative procedure to a quantitative one. And accordingly, to change architects' understanding of sustainability at an initial stage, the understanding of intrinsic lifestyle change needs to be widely shared as well as technical design measures. Thus, to achieve a better outcome, it becomes essential that current education adopts an alternative perspective for participation and relevant trans-disciplinary collaboration.

## 2. ARCHITECTURAL EDUCATION

### 2.1 Sustainability: an educational protocol

It is well known that sustainable development requires an inter-disciplinary education program for knowledge transfer, where the implications of sustainability should be widely shared and then understood by all stakeholders. Obviously, the challenge requires an intrinsic change for existing educational procedures.

Among these disciplines, architecture has been required to take the lead in 'incorporating the concept of sustainability in its principles, and in practice' according to its importance in contemporary society [1, 6]. Accordingly, architectural education has been put at the forefront of the discourse where architects have been required to re-evaluate their design work with a longer-term view. Since architects' perspectives on sustainable design are not necessarily inherent, some training programmes have been built up in order to help them understand this topic and its relevant issues better. To a great extent, it is this early experience that shapes the architects' preferences for various sustainable design measures in their later practices. However, whether these kinds of training programs have been fully explored is a more open question.

### 2.2 Architectural educational patterns

As one of the oldest professions, architecture and its relevant education can be traced back to the third millennium BC. The form of apprenticeship, the original educational pattern for architects, has lasted for many centuries thereafter. However, this has been changed during the last century. Following with the 'professionalisation', the division of occupations made the body of architects become a legally protected and socially respected elite [7]. And accordingly, their education also evolved into a 'studio-based tutorial environment' [8]. This change has often been seen as a tendency of educational centralization along with the development of modern culture and technologies. Nevertheless, its exclusive characteristic also led to the remoteness of architects from housing builders and users. Since sustainable architecture can only be achieved by the close collaboration between all stakeholders, it is very questionable whether this new educational pattern will lead to better practice, though it might increase the standards of education and examination because of its collective control.

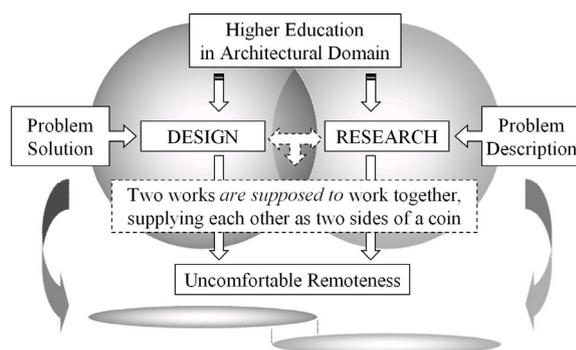


Figure 1: Interaction between Research & Design

Moreover, as shown in Figure 1, in the current higher education of architectural domain, the remoteness between design work and research work also exists though they are supposed to work together as two sides of a coin [1]. Actually, these two areas of work are separated passively by their own attributes – research is mainly about problem description while design is expected for problem solving [7]. Since the communication between them also remains remote, neither of them could easily re-educate the other into a more genuinely collaborative role. In practice, therefore, researchers have gone on researching and architects designing [7]. This often results in an uncomfortable internal relationship which may lead to an unsatisfied outcome later, especially in the progress towards sustainability.

### 2.3 Cognitive style

Some research works have shown that architects employ a solution-focused strategy in practice rather than a problem-focused one [7]. This kind of cognitive style comes from their educational experience which makes them think the way they do rather than being inherent. Normally architectural students learn through a series of design studies and receive criticism about the solutions they put forward rather than the methods. Likewise, they are not always asked to understand the problems or analyse the situations lying behind. Therefore, when they make design, their thinking behaviour seems sensible related to this cognitive style – 'learning about the problem through attempts to create solutions rather than through deliberate and separate study of the problem itself' [7]. In other words, they have often been trained to be obsessed with achieving the desired result rather than really understanding the underlying rules. Therefore, in the real architectural world, the solution is everything while the decision-making process has hardly been examined [7].

As catalyst, today's technological development inevitably accelerates this movement. With technical add-ons, architects have much more freedom when looking for a design solution. However, this increasingly specialised technological knowledge can also become a straight-jacket for architects' creative behaviours, directing their mental processes towards a predefined goal [8]. Sustainability-focused design, to some extent, has brought the debate to question whether the intrinsic aims of sustainability can be achieved through the architects' existing cognitive styles.

## 3. PROFESSIONAL PROPENSITY

### 3.1 Cultural isolation

Following rapid social development, today's design circumstance has become more and more uncertain to architects. Hence it is argued that whether the solutions provided by those architects who have not properly understood the problems might be proved to be wrong. Therefore, as Markus suggests [cited in 7], architects today should hold a view that they are not dominant in the design process

but still have some specialised decision-making skills to offer.

However, this objective is not easy to achieve in practice. Since the term 'architecture' has no legal protection as 'architect', architects often try to maintain their elevated status in practice by 'jealously guarding a specialised area of knowledge which they alone are in a position to define and thereby control' [9]. To define the boundaries beyond which the public may not step in, the architectural profession uses its own 'language' and sometimes even develops its own 'taste' [10]. Moreover, in practice, architects always resist two intrusions: 'one into the body of their profession, and the other into the body of their architecture' [3]. Take sustainable architecture as an example, some architects suggest that sustainability should only be handed to those who have fully understood this term and possess the professional skills to implement it [1]. Obviously, regarding to this kind of cultural isolation, architects still prefer to be 'on top' rather than 'on tap' in the design process [11].

A lack of communication may result in misunderstanding, which then might breed distrust at times, between all stakeholders. Likewise, because of this kind of communicational absence, the relationships between different stakeholders tend to be broken down. In an early investigation of the housing market, the results indicated that homeowners had lost their confidence to the term of 'architect' – it had been ranked far behind 'council environmental architect' and 'environmental architect' to give the homeowners advice for energy efficiency [12]. However, according to the investigator [12], these three terms were not designed for different meanings but two of them had been given a short modification.

From this perspective, it can be seen why architects have been described by the public as 'arrogant, poor listeners' and their existing education has also been blamed [13].

### 3.2 Professional priority

Although some architects have realized these conflicts and suggested that architecture should act as the link between other stakeholders, few of them have been able to put it into practice. On the contrary, to achieve their likely impact on the solution as a whole, architects firmly hold the power to select the aspects of the problem he or she wishes to consider [7]. According to Lawson [7], designers are often distinctly 'defensive' about their solutions and 'possessive' about their preferences. To a great extent, therefore, it is architects' priorities that decide the ultimate solutions as well as the contents of problems or constraints in the design process. The ultimate design decision can be seen as an embodiment of architects' views, related to their professional priorities.

Therefore, to make an informed decision, it is essential that architects have insight into the relevant impact of the options open to them. However, although it has been suggested that sustainable practice should go beyond the minimums [14, 15], many architects simply meet the minimal standards because of various constraints like time, budget and

so on. Therefore, the question that has been put on the table is – how the final decision delivered from architects' technical perspective alone could truly coordinate all stakeholders' requirements regarding to sustainability.

An educational procedure that could help architects guide their professional priorities towards participative design protocol is therefore at forefront of this discussion.

### 3.3 Participative design process

To alleviate all these conflicts, therefore, a more collaborative procedure is suggested to be adopted regarding to the increasingly participatory democratic progresses in present social and political climate [9]. Moreover, to get the message across, an open communicational platform and some efficient assistant media should be set up to facilitate the knowledge transfer. However, when tapping into this resource, most educational systems freely admit that this is something easy to say but difficult to do.

Hence as research work for design, the following investigation aims to argue an alternative to this viewpoint by examining the knowledge transformation in architectural candidates' early training programmes.

## 4. ECOHOMES & ECOLOGICAL FOOTPRINT

In this pilot investigation, a group of current Master of Architecture students have been surveyed. Since most of them have had relevant work experiences in housing schemes before and are now taking a training course involving sustainable design, their preferences of understanding and applying sustainable strategies are important to understand. Moreover, since they constitute a specially focused group, presenting perspectives from both current housing occupants and future housing designers, the issues about the designers' intentions and users' attentions for sustainability can be considered simultaneously. The hypothesis is that designers' intentions about sustainable design and occupants' attentions about sustainable lifestyle might vary if the related message has not gotten across properly. Thus, two existing assessment systems, EcoHomes and Ecological Footprint, have been applied to see the difference between the architectural students' priorities in their design process and everyday lives.

### 4.1 EcoHomes: a designer's perspective

Since its first launch in 1990, BREEAM (BRE Environmental Assessment Method) has been widely accepted in the UK construction and property sectors to review and improve the environmental performance of buildings [4]. The homes version of BREEAM is called EcoHomes which provides an authoritative rating for property sectors [4]. Compared with some sustainability regulations often remote from the design process, EcoHomes is a more straightforward, flexible and independently verified environmental assessment method [4]. Moreover, it needs to be applied in conjunction with some other important building regulations. As environmental issues become more important in the housing market, EcoHomes is

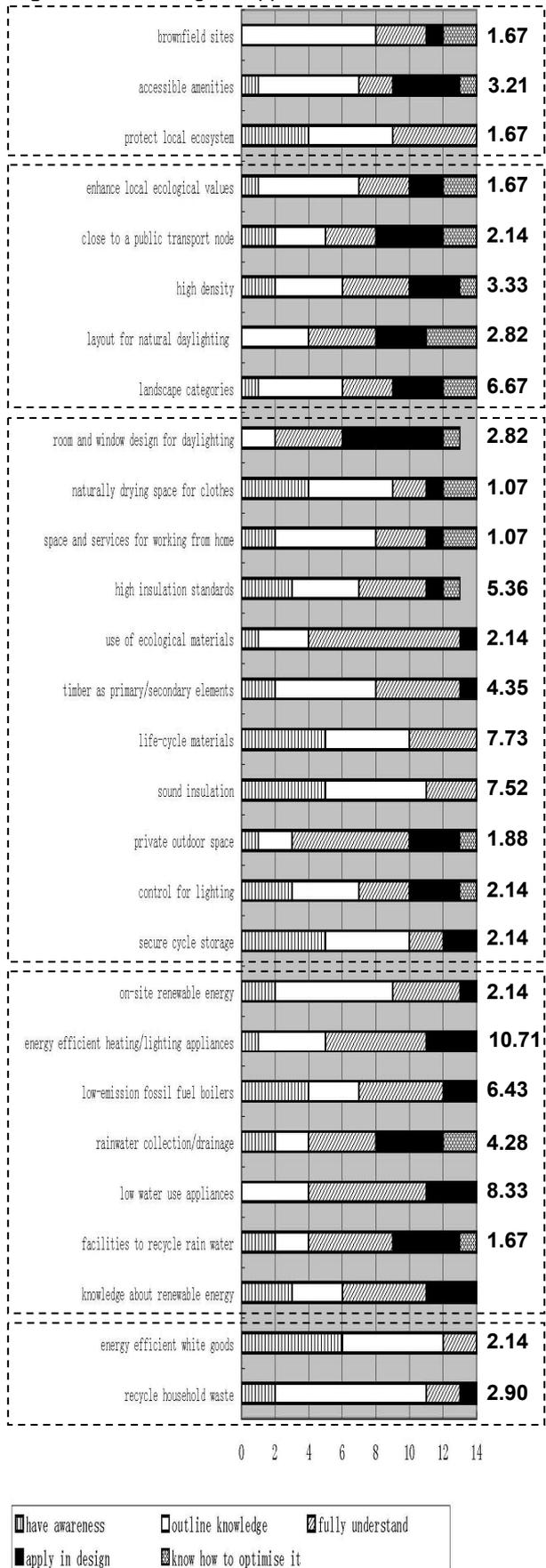
proposed to be widely applied as an Eco-labelling scheme in the future.

In the first strand of this investigation, therefore, EcoHomes 2005 has been applied to examine the architectural students' awareness and consciousness of applying sustainable design measures during the housing design process. The questionnaire has been designed according to the main content of EcoHomes and simultaneously the architectural students have been asked to design a sustainable housing project towards the rating of 'excellent' in the EcoHomes assessment. Thereafter, to improve the sustainable possibility, these students have been required to evaluate their knowledge and use of the design guidelines from EcoHomes as five categories: 'have awareness'; 'know the outline'; 'fully understand'; 'apply in design' and 'know how to optimize it'.

Figure 2 summarizes some results from the survey. It can be found that the sustainable design strategies have often been rated by the students as 'have awareness', 'know the outline' or 'fully understand' while rarely as 'applied in design' or 'know how to optimize it'. Moreover, most of the good results fall into the categories related to conventional architectural education, such as 'layout for natural daylighting' and 'rainwater collection and drainage'. This may be because the interviewees have not truly distinguished these issues from conventional design strategies. Take the issue 'close to a public transport node' as an example, those students who have marked this may only know about the general ideas but barely have insight into the relative impact of the options, like the requirements of frequency and distance and so on. To make an informed decision, therefore, future architects should be expected to learn more about the detailed criteria of EcoHomes during the training programme.

However, the situation in practice is not optimistic. On one hand, architectural students normally take training programmes for sustainable design as a particularly technological focused extension for their existing tutorials; and see EcoHomes as a specialised assessment system which should only be used by professional consultants. With this perspective, they focus their interests and energy on tech-dependent solutions and use the EcoHomes to judge their final products passively. This was noted in the follow-up discussion session where the most welcome topic was about how to use specialized technologies and technical add-ons to implement 'renewable energy' in practice while how to achieve the relevant credits in EcoHomes was rarely mentioned. On the other hand, architectural students would like to see sustainable design measures with negative motive. Some items, like the issue 'low water use appliances', have been given high rank of understanding but barely been applied in design since the interviewees argue that their application will be heavily depend on the clients' requirements. However, the problem is that their clients do not understand everything but simply ask for an outcome with high value of sustainability. Therefore, without the positive attitude towards sustainability, such architectural students will hardly be able to engage their clients in the decision-making process.

Figure 2: Knowledge & Application of EcoHomes



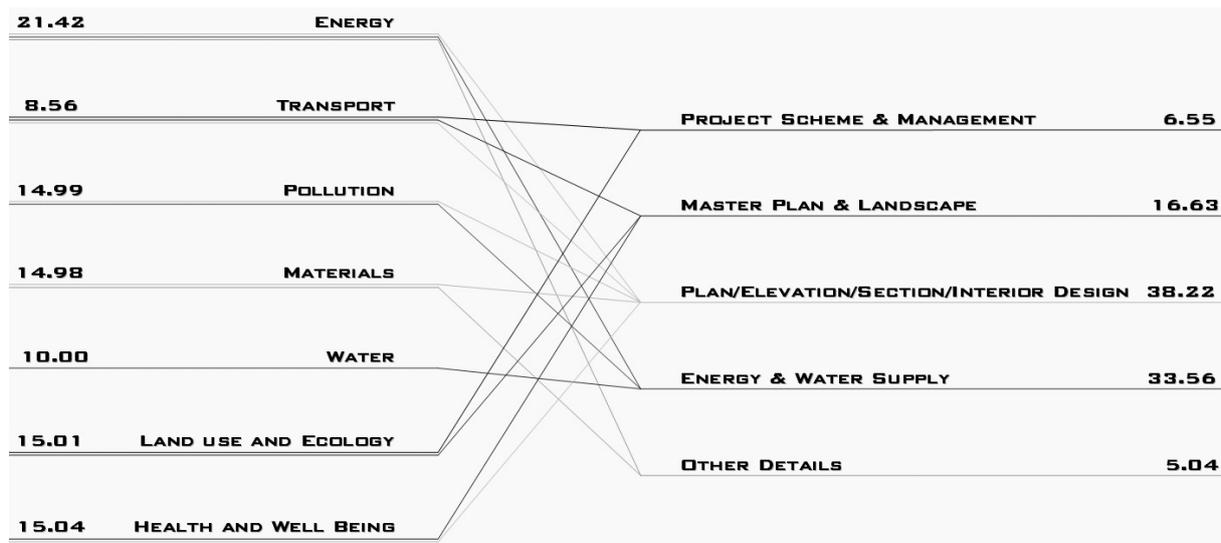


Figure 3: EcoHomes & Sustainable Design Process, from qualitative procedure to quantitative one

Obviously this situation needs to be changed. But it also raises another question: with time and budget often limited in the housing market, how can all the competing parameters be coordinated from an architectural outset?

To solve this, a converse thinking procedure is proposed to be adopted by architectural students. As a quantitative assessment system, EcoHomes has provided a relevant credit for each design measure together with detailed criteria. Thus, architects can use it as a checklist and decide to accept or reject a particular design measure according to its related credit as well as how easy it is to meet the requirements in the scheme. Since the issues in EcoHomes were originally set out for assessors rather than architects, they cannot fit into the relevant design phases immediately. Therefore, some work has been done to re-arrange these items, link them to the related design phases and give each design measure a corresponding credit (Figure 2 & 3). Some architects may argue that this work contributes to another series of constraints for the design process. However, as Lawson points out [7], it is the need to absorb the special constraints into a continuing and developing design philosophy that becomes one of the chief challenges in the practice of design. Towards sustainability, therefore, this solution-focused method can guide the design process from a qualitative procedure to a quantitative one. But whether it can lead to better sustainability is a more open question.

From the investigation, it can also be found that some issues which have been highly graded in the EcoHomes have been less well rated by the interviewees. Take 'life-cycle materials' as an example, this design measure has been highly awarded as 7.73 credits referring to the issue of 'environmental impact of materials' in EcoHomes 2005. However, architectural students only rate their knowledge for this design feature as 'have awareness', 'know the outline' or 'fully understand' while none as 'applied in design' or 'know how to optimize it'. Obviously, even in the solution-focused perspective which architects employ, the architectural

students' priorities for some sustainable design measures are different from their proper proportions in the assessment system. In other words, the current architectural education procedure for sustainable design does not work well as a communicational platform for knowledge transfer. To allow the important message get across, therefore, it needs to be improved.

#### 4.2 Ecological Footprint: a user's perspective

The Ecological Footprint relates the consumption of goods and services to the amount of the planet's surface required to produce them in a sustainable way [16]. Therefore, Ecological Footprint has often been taken as an important index for sustainability, particularly referring to people's daily lifestyles from a problem-focused perspective. To a great extent, the concept of 'One Planet Living' tries to force people to re-evaluate everything they do with a broader public purpose in mind. And also, according to this perception, housing occupants' perspectives for lifestyle change have been envisaged as important elements in the decision-making process towards sustainability.

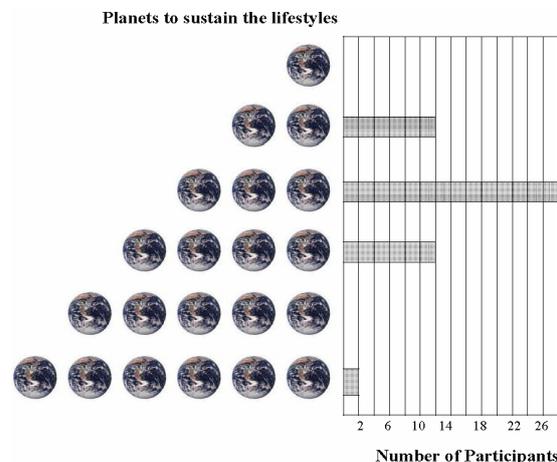


Figure 4: Consciousness of 'One Planet Living' [Data source: 5]

Therefore, the second strand of this investigation is to examine the students' priorities for sustainable lifestyle according to the criteria of Ecological Footprint [5]. It aims to find out that how these people, who are supposed to be well informed, would like to change their lifestyles to live in a more sustainable way. Unfortunately, however, as the Figure 4 shows, the architectural students' knowledge in this approach also stays far behind what it is supposed to be. Most architectural students need more than two planets to sustain their existing lifestyles. And a large proportion of resources have been consumed by their reliance on private cars or foodmiles. To achieve intrinsic sustainability, architects might be required to change their existing lifestyles towards sustainability before they ask others to do it.

However, this has not often been explored in related training sessions. To some extent, architectural students have not understood that they hold the representative position for lifestyle change towards sustainability in other people's perspectives. And some of them have even not realised that, although housing itself can be designed towards sustainability by using integrated technical add-ons, it is the residents' lifestyles that decide whether the long-term sustainable objective can be truly achieved.

#### 4.3 Problems or Solutions

The architectural candidates' priorities for different assessment systems can be seen as the reflection of their intrinsic cognitive styles: EcoHomes from a solution-focused perspective and Ecological Footprint from a problem-focused one. As drawn from the earlier review of architectural education, the application of EcoHomes can probably provide a temporary solution for the current housing market; but it is people's consciousness of Ecological Footprint that decides how far they want to go to do this [17]. The opportunity for change exists but its enactment will depend heavily on whether the components of education, students and teachers, become part of the problems or the alternative solutions.

## 5. CONCLUSION

Collaboration between design work and research work in the architectural domain is essential to carry out sustainable design. Thus, to facilitate the transfer of knowledge, an education procedure should be built up as a communicational platform. This participative training programme should also help architects define their priorities for sustainable design measures by addressing the relevant issues at the early stage of knowledge transformation. However, it can be found that current education in this approach only passes on some general ideas about sustainability to future architects. Although it might help architects breed a basic perception towards sustainability, it is not enough to help them implement the principle in practice.

Therefore, an alternative training programme for sustainable design has been suggested that involves an ongoing interaction between all stakeholders. Accordingly, EcoHomes and Ecological Footprint

have been brought forward as means to create an interface, through which architects' knowledge transformation can be examined both in detail and the wider perspective.

The principal finding indicates, though architects have had a general awareness of sustainability, that it has so far made only limited impact on their design preferences or lifestyle change. Therefore, there is a great degree of untapped opportunity in the approach of participation-based trans-disciplinary collaboration. Some more research should be carried out towards a problem-focused design perspective. And the body of architects should also be required to adopt a more positive attitude to promote this change, as designers as well as building occupiers.

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