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HOW TO TRANSFER INNOVATIVE RESEARCH KNOWLEDGE INTO TEACHING PROGRAMMES? AN EXPLORATORY CASE STUDY IN THE BUILT ENVIRONMENT

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The higher education system in the UK has significantly changed over the last decade due to a growing emphasis on student learning activities, quality assurance procedures and research funding mechanisms. According to previous studies, there is no automatic link between research and teaching. Thus, the link needs to be created to enhance staff productivity and student learning.

This paper reports findings of the first phase of a research study that aimed at developing guidelines on how to transfer research knowledge into teaching in higher education, in order to create such a productive relationship. The framework that is presented in this paper is developed for the built environment sector through a literature survey and an exploratory study. The framework provides useful guidance for research-based higher education departments in the built environment to transfer research knowledge into teaching.

The next phase of this research will explore the implementation of this model across different disciplines through a series of case studies.

Keywords: research and teaching, built environment, knowledge transfer, learning process.

INTRODUCTION

This paper presents the findings of a research study that aimed at exploring the transfer of research knowledge into teaching in the built environment (BE) sector in UK higher education institutions. The study was conducted by the School of Construction & Property Management (SCPM) at the University of Salford. The literature findings of the study are discussed in the first section. This literature review is followed by a discussion of the empirical findings that emerged from the exploratory study. Following the complete literature synthesis and the empirical study, the paper presents a framework on 'research knowledge transfer into teaching'. Finally the conclusions and future research are presented.

KEY ISSUES FROM THE LITERATURE

Background study

The background study into the higher education system in the UK revealed several factors that impact on the research and teaching (R&T) relationship. First, the growing emphasis on student learning (for example, the initiation of the Institute for Learning and Teaching in Higher Education and the initiation of the Learning Teaching Support Network) has positively influenced the R&T link. Second, the separation of quality assurance mechanisms for teaching (Teaching Quality Assurance-TQA) and research (Research Assessment Exercise - RAE) has adversely impacted on the R&T relationship. This has created critical problems

within higher education institutions with regard to their mission (scholarly research versus excellent teaching) and also resourcing problems (research and teaching requires different resources). Third, tensions arise among academics due to the funding mechanisms and the inequity of rewards for research and for teaching (McLernon & Hughes, 2003). Due to research being more rewarding compared to teaching (Rowland, 1996), academics aim for research excellence while sacrificing their teaching duties (Baker et al, 1998). This issue is not just unique to UK, but is an issue of international relevance. For instance, the Boyer Commission report (1998) addresses this issue by calling for significant changes in undergraduate education in the United States.

In addition to these general factors, BE higher education is also affected due to specific trends. For example, the move towards collaborative approaches (Wood, 1999) has created a positive environment to introduce active learning and thereby feeds research into teaching. This positive learning environment is further enhanced by other learning initiatives in the BE sector. For example the Centre for Education in the Built Environment (CEBE) has initiated activities such as the Teaching Enhancement Networks (TENS) and Special Interest Groups (SIGS) to enhance teaching and learning in the BE (Ashworth, 2003). Further reflections are the initiation of CIB W89 International Conference on Building Education and Research and the formation of the FDTL (Fund for the Development of Teaching and Learning) funded live project: 'Best Practice Building Network' (Online 1).

With this background knowledge of the UK higher education system and the BE sector, the next section discusses the relationship between research and teaching in higher education.

THE RELATIONSHIP BETWEEN RESEARCH AND TEACHING

The complex relationship between research and teaching (R&T) has been extensively studied. The findings of these studies reveal two opposing viewpoints: the 'trade-off between R&T' against the 'synergetic relationship between R&T' (Baker et al, 1998). Generally, the quantitative studies show the lack of relationship between R&T (for example, see Hattie & Marsh, 1996) while qualitative studies strongly depict the existence of a symbolic relationship (for example, see Robertson & Bonds, 2001). However, both quantitative and qualitative research establishes the absence of an automatic link between R&T and the loosely coupled nature of these two activities (Jenkins & Zetter, 2003). By strengthening these loosely coupled activities, a productive relationship between staff research and teaching can be achieved. Recent studies have introduced several strategies to create this beneficial relationship as opposed to the problematic one that naturally exists (for example, see Linking Research & Teaching, Online 2 and LINK: Good Practice resources Database, Online 3; Fawcett et al, 2003; Cech, 2003).

Senaratne et al (2003) provide a synthesis of these strategies through three sets: 'General Strategies', 'T to R Strategies' and 'R to T strategies'. 'General Strategies' were identified as necessary for both teaching-based and research-based departments, and include strategies such as changing staff roles; reviewing current research and teaching policies; allocating new resources; changing the reward structure; and creating a cultural change. 'T to R Strategies' were considered as more important for teaching-based departments, which include strategies such as generating research from teaching activities; engaging students in staff research activities; and generating research through industrial training. 'R to T strategies' were identified as more appropriate for research-based departments and includes strategies such as student awareness of staff research; provide students with research training, use teaching as a medium to transfer research findings; and use research staff in teaching. However, in

practice, for managing staff research with teaching commitments, both 'T to R' and 'R to T' strategies appear to be useful to appropriate degrees based on type of department.

Comparing these strategies based on this two-way nature of the R&T link, the generation of research from teaching activities is straightforward despite the doubts about the quality of such research. Activities associated with the transfer of research into teaching are comparatively difficult and form part of a long-term process. Further, it is the 'R to T' transfer that enhances student learning processes rather than the T to R transfer. Taking these facts into account, the research study, on which this paper is based, focuses on how to implement 'R to T transfer for research-based departments' as opposed to 'T to R transfer for teaching-based departments'.

Among the previous research on R&T link in the BE sector, the work of 'Link: Good Practice Resource Database' (Online 3) offers significant contributions. This provides a generic model with guidelines on how to set-up the environment in linking R&T and a list of strategies that can be considered. Although this stands as a seminal work, the work is limited in identifying appropriate strategies for research-based departments, in implementing and also maintaining such a link. The work also lacks the due appreciation of the extant knowledge transfer literature that helps to understand the total process of research knowledge transfer into teaching. Hence, this study is different from this earlier work in that it aims to provide a guide in the light of knowledge transfer literature which can be followed by research-based departments in the BE to improve student-learning processes. The next section will attempt to bring in the knowledge transfer literature into this discussion along with student learning processes.

RESEARCH INTO TEACHING: KNOWLEDGE TRANSFER AND LEARNING PERSPECTIVE

Feeding research knowledge into teaching can be viewed as a knowledge transfer process. According to Davenport & Prusak (1998), effective knowledge transfer does not involve mere transmission, but also absorption and use following the transmission. As such, simply initiating the R&T link in a department and feeding research knowledge into teaching is insufficient. This transfer needs to be viewed from the recipient's end, in that it is equally important to explore to what extent this knowledge is absorbed and used by the student.

Szulanski (2000) identifies the difficulty of a knowledge transfer process. First, the strength of tie between the staff (staff research) and students influences the effectiveness of the transfer. The tie can be strengthened by creating positive attitudes among students towards staff research. Second, the direct transfer of research findings to students is inappropriate as this can create ambiguity; for example the research findings can be too abstract or too complex or incompatible with the syllabus. In order to overcome this difficulty research output of projects can be re-constructed to suit the student audience. Third, the absorptive capacity of students differs depending on their prior knowledge (Cohen & Levinthal, 1990) and the strategies need to take this into account. For example, at level one, students can be given an introduction to the basic research process and at a higher-level can access direct research experience. Fourth, the reliability of research results is an important factor in transferring research knowledge into teaching. This leads to suggest that in feeding research results into teaching a filtering process (by comparing student standards and the syllabus) needs to take place. Fifth, Szulanski (2000) also points out motivation as an influencing factor during knowledge transfer. Not only staff motivation but also student motivation is required in creating this R&T link. This can be created by a cultural change within the department. Finally, since the transfer does not occur in a vacuum, the contextual factors that

originate from the organisation level (research-based department in this case) such as resources, strategies and practices should also need to be considered.

Following the above discussion, the importance of focusing on the user perspective is affirmed. In fact, Huberman (2002) claims that research data penetrates only very slowly into the consciousness of the potential user, helped along by discussions and observations and that the dissemination depends on usefulness to the user and the absorptive capacity of the users. Accordingly, when students are considered as the users of research knowledge, student learning, followed by such a diffusion of research into teaching, is an essential consideration. In fact, learning is the key driving force that link research and teaching (Bradley, 1999; Turrell, 2003).

As such, in transferring research knowledge into teaching, different student learning styles need to be addressed. The literature on learning styles can be grouped into various theories. These theories on learning suggest that everyone cannot be taught in the same way and the teaching approach needs to consider these differences.

- The field dependency theory-learning can be influenced by the context within which the students learn; for example, student learning can differ depending on whether they learn within a field environment or a classroom environment (Smith, 2002);
- Holistic vs. sequential learning theory - the fact that some students prefer visual approaches whereas some prefer verbal approaches (Smith, 2002);
- Experiential learning theory originated by Kolb (1984, cited in Smith, 2002) - an individual's learning cycle has four stages: activist, reflector, theorist and pragmatist. This role of experience in learning calls for activities such as project-based work that provide students with first hand experience; and
- Surface vs. deep learning theory – Vita (2001) argues that it is the deep-learning styles that should be encouraged in higher education institutions.

In summing up, the educational research has established that R&T link is not automatic and needs to be created in each academic department based on their specific discipline. The applicability of different strategies is further dependent on the type of department, whether it is research-based or teaching-based. The knowledge transfer and learning literature values the importance of absorption and use following an immediate transmission process. To this end, the user perspectives and the maintenance of R&T link are of high priority. In effect, the key research question formulated for this study is 'how would a research-based department transfer its research knowledge into its teaching activities in the BE sector? An exploratory case study was carried out in finding solutions to this particular research question. The next section will describe this empirical study.

THE EMPIRICAL STUDY

Validating literature findings: Case Study Method

As identified elsewhere, the aim of this empirical study was to primarily validate and strengthen the literature findings and thereby formulate a generic model with guidelines. Accordingly, a single case study method was selected that aimed to further explore the issues discovered through literature review. The case selected was the School of Construction & Property Management (SCPM) at the University of Salford, UK. Data was mainly selected through an active workshop, which comprised of key staff members such as programme directors and co-ordinators. This was followed by a few additional staff interviews. To gain students' views, student representatives were interviewed. In addition, relevant documents

such as school review reports were referred to. The questions addressed at the workshop and interviews were mainly on five aspects: the importance of the R&T link; key issues/concepts; present examples of the existence of R&T link; present barriers and enablers in creating such a link; and finally suggestions to improve the R&T link.

DISCUSSION ON FINDINGS

The importance of the ‘R to T’ transfer

The academic staff and students were positive towards creating an explicit R&T link within SCPM. The benefits that they identified were gaining academic rigour, creating market differentiation, raising standards, keeping ahead of change and complying with the mission statement. Research staff and postgraduates also made positive remarks in that they said the opportunity to present their work to a different audience might trigger new insights into their research. An interesting view was the opportunity for financial gains by way of implementing academic enterprises and short programmes for undergraduates using research staff and postgraduates as teachers. Students on the other hand, were happy as they felt they were the immediate party who benefited from such a link.

Key issues and concepts on ‘R to T’ transfer

Regarding new insights on the R&T link, the staff raised the issue as to ‘what research knowledge is more important to be transferred to students.’ Some members said that it is the research learning process that is more important compared to research project findings. However, the majority view was that both types of knowledge are equally important to be fed into teaching. Another recurring issue was how to address different learning styles. In achieving compatibility between curriculum and research activities, staff suggested using process mapping techniques to map the existing links within the school. In an industry which is still favouring old practices, the staff view was that students should be exposed to research outputs that are suitable for the industry of today. A final point was the clear distinction between student groups. It was evident that the link is clearly different between postgraduate and undergraduate levels. At postgraduate level, the R&T link was already in place at a satisfactory level. Even within the undergraduate level, the part-time students viewed the R&T link differently to full-time students. For part-time students, who are closer to the industry, such a link should relate to their work prospects, whereas for full-time students the value is not immediate.

Best practices of ‘R to T’ transfer

In exploring the current status of this R&T link, interviews revealed that a mixed approach is already informally in place and the question was whether it was in right balance. Staff strongly favoured creating the missing strategies or workable processes to deal with this at a formal level. The best practice examples were project-based work such as the Group Integrated Project and special modules such as ‘Construction Innovation’, the Dissertation module at undergraduate levels, and other research modules at postgraduate levels. In fact, certain research within SCPM has generated new Masters level programmes showing the effective R&T link at postgraduate level. Other informal best practice examples within SCPM as identified in the School Review (2003) are certain workshops that present research outputs to undergraduates, active engagement of all members of professorial staff in teaching activities and new academic staff recruitments such as the Graduate Training Programme.

Enablers and barriers on ‘R to T’ transfer

When queried on barriers for creating such a link, the conceptual barriers such as the inherent mismatch between R&T; mismatch between research and curriculum; and working in a

slowly changing industry were raised. From the staff-side barriers, personal goals and resources were highlighted. From student-side barriers, their lack of motivation, attitudes towards gaining wider knowledge and self-learning and tendency to do superficial research were noted. With regard to implementation barriers staff pointed out the fear and risk factor such as students' ability to absorb research knowledge, wrongly designed programmes and key staff leaving amidst implementations. On the other hand enablers found were the mission statement of SCPM; research strength within SCPM; positive attitude of all staff members; and the external links with CEBE, LTSN and other universities. Another enabler for improving student learning in general was setting the infrastructure for a personal development planning programme (PDP) through a pilot project.

Suggestions to improve 'R to T' transfer

In terms of suggestions, first consideration was how to overcome the existing barriers. In order to overcome the conceptual barriers, suggestions raised included engaging staff more in teaching and learning activities; structuring the programme to highlight research; and improving interaction with industry. To avoid staff concerns, suggestions such as generating business through new programmes were made. With respect to students' side barriers, creating a cultural change was suggested by way of encouraging project-based work; improving students' research skills from inception; engaging students in various research activities; and informing students of the value of research. An interesting idea that came from the interviews was creating a live interaction between undergraduates and postgraduates, so that both parties will benefit. With regard to implementation issues, departmental support in terms of resources (both physical and human), changing policies, valuing teaching to align both teaching and research activities and changing recruitment policies were proposed.

Through the findings of the literature review and this exploratory case study, a generic model with guidelines was developed to assist research-based departments to transfer their research knowledge into teaching activities. The next section will briefly explain this model and its development.

GENERIC MODEL TO TRANSFER RESEARCH INTO TEACHING

Model Development

As explained in the literature review, previous studies have introduced various strategies to create the R&T link. However, they do not explain how to formalise these strategies. This led to recommend assigning a new staff position called 'R&T co-ordinator' with 'R&T team'. By allocating human resources in this way, not only can the link be initiated but it can also be maintained, while creating a learning environment. Therefore, the start-up activity of the model will be assignment of ownership and resources.

To enable 'R to T' transfer, three processes are identified as necessary. It is important to review current research and teaching policies as the first step in creating the R&T link. Having identified the importance of using research staff in teaching activities through the literature review and primary survey, the second activity considered under the enabling processes is review of research staff recruitments periodically. Thirdly, to improve the learning environment and to make effective use of IT facilities, a 'R&T web page' is proposed. The purpose is to link students, researchers and the academic staff in the department in order to strengthen relationships and create a shared space for interaction. This web site will create the forum to disseminate best practices and to initiate 'a research showcase' as mentioned in the primary survey.

The specific 'R to T' transfer strategies are then considered. With the recurrent issues on 'student motivation' and 'use and absorption' that emerged from the literature on learning and from the primary survey, a cultural change is introduced within departments through an "Innovation Week" at each year of study. Both literature and primary survey results on 'R to T' transfer strategies are integrated through this Innovation Week. The understanding received from the knowledge transfer and learning literature further led to suggest all possible learning loops in enhancing the student learning process through this Innovation Week at each year. The primary survey highlighted the importance of enabling different group interactions and industry-student interaction. Hence, this Innovation Week will not just provide a research environment among students by promoting research awareness and improving their research knowledge, but will also provide an enabling context for 'PhD-undergraduates interaction' and 'industry-student interaction'. Both literature and primary survey revealed the importance of project-based learning. Thus, an integrated project task is introduced as another 'R to T' transfer strategy. Further, to provide not only new findings within the discipline, but also to give students first hand research knowledge, a separate module called 'Research Module' and short courses on specific subjects are proposed. The best practice examples from the selected case study shaped these proposals.

Both literature and primary data raised the importance of valuing teaching activities in research-based departments. Consequently, as an outcome activity of this 'R to T' transfer process, recognising and rewarding best 'R to T' practices are finally proposed.

A MODEL FOR "R TO T" TRANSFER PROCESS

Figure 01 integrates the above model development discussion into a framework on 'how to transfer research knowledge into teaching'. The nine activities associated with the transfer of research into teaching are categorised into four elements: start-up, process-specific, on-going and outcome elements. The start-up and outcome elements act as input and output activities in the 'R to T' transfer process. The most significant activities related to 'R to T' transfer process are grouped under the process-specific element, where the real transformation takes place. The four activities under this are shown in a loop to represent the learning cycles within and in between the activities. Three activities, which should take place on a regular basis to enable the 'R to T' transfer process, are identified under on-going element.

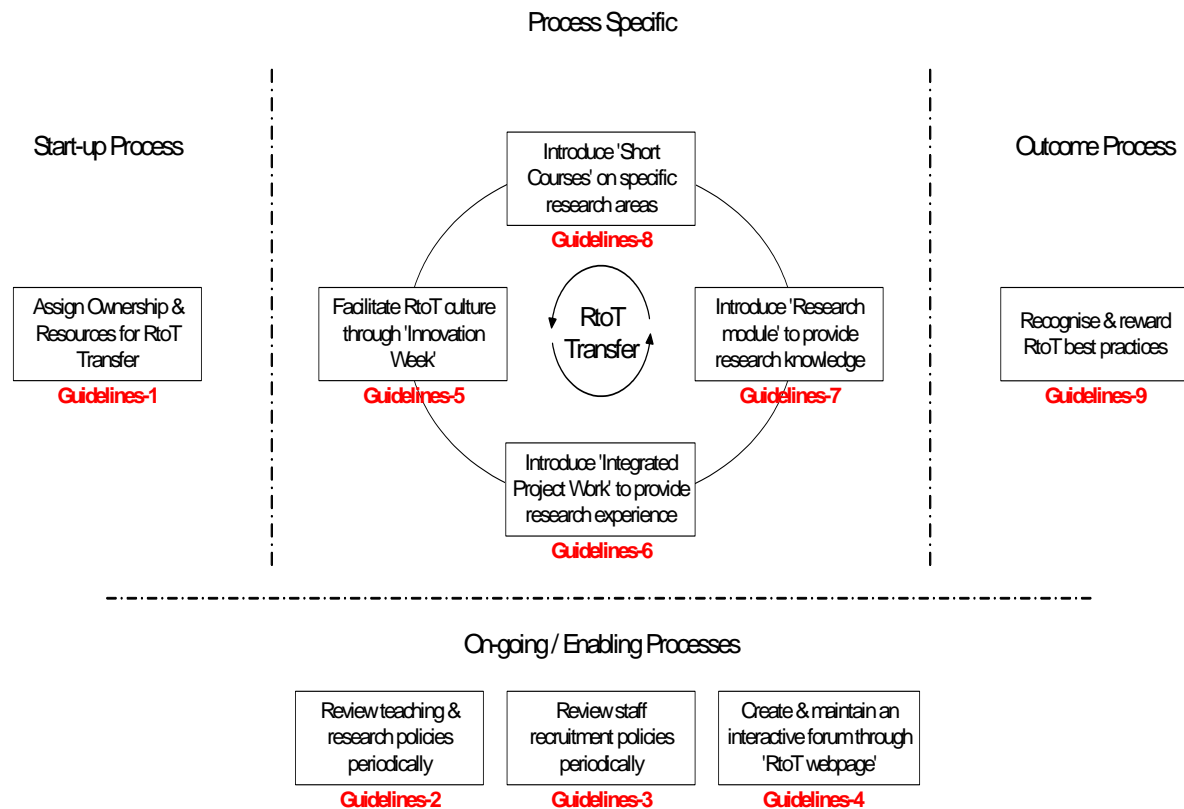


Figure 1: 'R to T' Transfer Process

Brief descriptions on associated guidelines are listed below:

Guideline 1: Assign ownership and resources:

As explained in the literature review, previous studies have introduced various strategies to create the R&T link. However, they do not explain how to formalise these strategies. This led to recommend assigning a new staff position called 'R&T co-ordinator' with 'R&T team'. By allocating human resources in this way, not only can the link be initiated but it can also be maintained, while creating a learning environment. Therefore, the start-up activity of the model will be assignment of ownership and resources.

Guidelines 2-4: Review teaching and research policies; Review staff recruitment policies; Create and maintain an interactive forum through web

To enable 'R to T' transfer, three processes are identified as necessary. It is important to review current research and teaching policies as the first step in creating the R&T link. Having identified the importance of using research staff in teaching activities through the literature review and primary survey, the second activity considered under the enable processes is review of research staff recruitments periodically. Thirdly, to improve the learning environment and to make effective use of IT facilities a 'R&T web page' is proposed. The purpose is to link students, researchers and the academic staff in the department in order to strengthen relationships and create a shared space for interaction. This web site will create the forum to disseminate best practices and to initiate 'a research showcase' as mentioned in the primary survey.

Guidelines 5-8: Facilitate ‘R to T’ culture through a week of research-based activities; Introduce collaborative project-based work; Introduce a research-focused module; Introduce short courses on specific research areas

The specific ‘R to T’ transfer strategies are then considered. With the recurrent issues on ‘student motivation’ and ‘use and absorption’ that emerged from the literature on learning and from the primary survey, a cultural change is introduced within departments through an “Innovation Week” at each year of study. Both literature and primary survey results on ‘R to T’ transfer strategies are integrated through this Innovation Week. The understanding received from the knowledge transfer and learning literature further led to suggest all possible learning loops in enhancing the student learning process through this Innovation Week at each year. The primary survey highlighted the importance of enabling different group interactions and industry-student interaction. Hence, this Innovation Week will not just provide a research environment among students by promoting research awareness and improving their research knowledge, but will also provide an enabling context for ‘PhD-undergraduates interaction’ and ‘industry-student interaction’. Both literature and primary survey revealed the importance of project-based learning. Thus, an integrated project task is introduced as another ‘R to T’ transfer strategy. Further, to provide not only new findings within the discipline, but also to give students first hand research knowledge, a separate module called ‘Research Module’ and short courses on specific subjects are proposed. The best practice examples from the selected case study shaped these proposals.

Guidelines 9: Recognise and reward ‘R to T’ best practices

Both literature and primary data raised the importance of valuing teaching activities in research-based departments. Consequently, as an outcome activity of this ‘R to T’ transfer process, recognising and rewarding best ‘R to T’ practices are finally proposed.

CONCLUSIONS AND FUTURE RESEARCH

Through the literature survey and the case study, this paper presents a model of the transfer of research knowledge into teaching. This model is supplemented by a detailed guidelines document, which is produced as a key deliverable of this study. Furthermore, with the new insights from the literature on knowledge transfer and learning processes, in addition to the initiation of research to teaching transfer, the absorption and use, including learning loops are captured substantially into this model and guidelines. Next stage of this research aims to test the implementation of the guidelines and to extend the study beyond the Built Environment sector to other related disciplines. Thus, in the phase-02 of this research study the above-developed guidelines will be validated by using a series of case studies across other disciplines. The final outcome of the research will be the development and validation of a more generic set of guidelines relating to the transfer of research knowledge into teaching.

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