Research-teaching links and the knowledge problem

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http://www.brookes.ac.uk/schools/planning/LTRC/conference2003papers/Webster-paper.doc

There are many things that could be said of the research-teaching (R-T) link in the Built Environment including the need to understand the way the link works in vocational subjects that emphasise practical problem solving; the way it works in subjects dominated by normative issues such as beauty and justice; and the implications of an eclectic disciplinary knowledge base. In my view, architecture and planning are inherently problematic in each of these regards: normative questions of design, environmental and social justice are not easily mapped into empirical research, for example. Ron Griffith's excellent paper at the recent Oxford conference on linking teaching and research identified 5 kinds of research, including expressive research, and made the point that the nature of the teaching-research link depends not only on strategy and method but crucially on the mode of discovery (Griffiths 2003). Research in the construction and real estate field is arguably more naturally empirical by virtue of the greater agreement on underlying values and on the meaning of efficiency in the economic and building systems subject to investigation.

I will leave these questions however and use this short article to comment on a fundamental problem that, in my view, tends to be ignored in well-meant discussions on the teaching-learning link. The problem is the impact of exponential knowledge growth in both research and teaching domains. My argument is that while a harmonic balance of teaching and research might be desirable – for political, management, pedagogic and other reasons, it is becoming increasingly impossible to sustain. The strains show at individual, school and institutional level. Personally, I think researchers should teach seriously and teachers should research seriously. I am inclined to be a little suspicious of 'experts', however – including those responsible for cranking-up the teaching overheads with all manner of good-practice teaching procedures; and researchers who do not have to subject themselves to the discipline of passing on their knowledge to a class of students. However, it is also my belief that it is becoming increasingly difficult, if not impossible, to be excellent at both. Like it or not, many of us are forced into making trade-offs. The situation is exacerbated by the research assessment exercise and by the professionalisation of teaching agenda but is a more fundamental secular trend. The problem is that there is too much to know. Attempting to do everything well is not a sustainable option, however ideal it might be.

Wanting to gather evidence on this hypothesis and other dimensions of the research-teaching link, I recently conducted a quick-and-dirty email survey of academics. 140 colleagues responded: 59% from Built Environment disciplines and 41% from other fields, principally the physical sciences. My talk at the Oxford Link conference was based on the results and was reported in the Times Higher (THES 11th September 2003). A fuller analysis will be published later in the year. Here I select a few facts and figures to pursue the knowledge saturation theme in a highly speculative manner. The aim is to provoke discussion.

The first point I want to make is the obvious one that lecturers are not an homogenous group and that policies to promote all-rounder teaching and research excellence will inevitably impact individuals very differently. Individuals differ in their motivations (the outcomes they are personally trying to achieve) and in the institutional and other constraints that limit those achievements. Motivations and constraints interact over time. Figure 1 shows how the academics responding to the email survey differ on five selected indicators. Undergraduate contact hours ranged from 0 to 960 per year, and postgraduate hours from 0 to 650. Research income ranged from 0 to 6 million pounds; publications from 0 to 480; and PhDs from 0 to 55. Figure 2 shows difference across subjects.

Figure 3 gives an indication of differences in attitude towards teaching and research. Mean responses to questions about teaching or researching less or more were uniformly in favour of teaching less and researching more. There are differences hidden by the means however. Figure 4 shows responses to statements about the way the R-T link operates at a motivational level. It indicates three groups. 93 respondents (66%) in the lower right quadrant of the table perceive the R-T link as operating both ways. They are motivated to teach and to research and both activities complement the other. For the 13 respondents (9%) in the lower left quadrant, subject interest drives reflective practice in teaching but teaching does not drive their subject scholarship. They are possibly scholars/ researchers first and teachers second. There are 5 respondents (4%) in the top left quadrant for whom the T-R link does not work in the way captured in the questionnaire statements: they may be reflective teachers but this doesn't arise from their subject interest. They may be active researchers but this does not arise from their teaching interest. Notwithstanding this minority group, a balanced view of the T-R link therefore seems to prevail. This is endorsed by the "quotable insights into the link", which respondents were invited to make.

"*My teaching interest and quality is directly dependent upon an active involvement in research. For my specialism and my students, this means involvement in practical research projects with clear policy application"*

"_teaching without research offers students only the status quo; research without teaching is a missed opportunity in the academic community"

"My best and most inspirational teachers were those most actively engaged in research"

"Removing the research link with teaching at Universities would transform them into schools that are more difficult. How dull is that? Being an inspiring teacher is much more important than being a qualified one. We need mixtures of the two, but an institution where the research-teaching link has been removed will die."

However, respondents were keenly aware of the difficulties of doing well at both teaching and research:

"In practice the pressures to produce RAE research and to find time to be a good teacher are at odds with each other"

"few people I know do both well, but those that do are also the best in their fields at both"

"At my university, research is becoming less important for most faculty as our budget is largely determined by the number of students we enrol"

"Research led teaching means that academic staff are never available for the undergraduate student"

"I would have liked to do more research in my academic career but I don't know that it would have made me a better teacher. "

There is evidence from these and other quotations that trade-offs are made; that specialisation happens – by choice or constraint; and that it is perceived to be difficult to do both teaching and research excellently. There is some evidence in the quantitative data too, though this needs further investigation. When scores on the TEACHMOR statement were regressed against a set of profile variables (including age, gender, years in employment, research productivity, teaching hours) the only significant determinant was publication productivity (number of publications divided by the number of years employed as an academic), the sign of the coefficient being negative. This is a weak indication of the cumulative dynamic that intuitively might be thought to drive specialisation. Respondents who publish less tend to have a positive attitude to the idea of teaching more and researching less should the choice (and incentive) be there.

All of this suggests (but in no way proves or quantifies) the relationship between teaching and research that is stylistically depicted in Figure 5. In words: doing teaching enhances research and doing research enhances teaching, but there are trade-offs within a finite time budget. The trade-offs are a function of, among other things, the quantity of knowledge available and human cognitive capacity. Figure 5 shows productivity of research and teaching on the vertical axis and percentage of time spent on research and teaching on the horizontal axis. Moving from left to right, the time spent on research changes from 0 to 100% and moving from right to left the time spent on teaching moves from 0% to 100%. From 0 to 100% in either direction causes productivity to rise, assuming the more you do of a sophisticated activity, the better you become at doing it (economies of scale). The shape of the productivity curve reflects the learning curve – easier tasks will yield productivity gains with less practice. Both curves peak and fall before they reach 100%, however, because teaching and research are complementary.

Several points can be made from the diagram. First, point A is the minimum % of time spent on research needed to maximise teaching productivity. B is the minimum amount of teaching necessary to maximise research productivity.

Second, the steepness of the curves and their relative shapes determine whether or not an equally balanced teacher-researcher policy is an efficient one or not. In Figure 6, the curves indicate that high productivity can be reached in teaching and research without majoring on either in terms of time – consistent with rapid learning curves. The point of maximum joint productivity (the peak of the dashed curve) is 50:50 teaching:research (assuming symmetrical T and R curves). (It is interesting to note that time allocation formulae in some universities, Salford University for example, limit to 50%, the percentage of time an individual can spend on research – this being the percentage a 5 rated researcher is permitted). If learning curves are steep and productivity gains require more extensive practice (Figure 7), then the joint productivity curve will bifurcate into two peaks, one associated with expert teachers doing a little research and the other with expert researchers doing a little teaching. A policy requiring 50:50 teaching:research is in no-one's interest under these circumstances. Assuming the existence of wider market and policy forces that lead institutions and individuals along trajectories that improve private and social productivity, such a policy is not only socially inefficient but also an unstable equilibrium – with inherent dangers for the stability of an HE organisation or indeed for an entire HE system.

The problem we all face is that while we might be motivated by both teaching and research and while our experience and the pedagogic research evidence might tell us that research and teaching are complementary activities, most of us feel that we no longer have the time to do both well. The feeling is compounded by the 'professionalisation of teaching' agenda and the RAE agenda. It is wrong to blame these policies alone however. Without either, it would still be true that knowledge about how to do teaching well is expanding rapidly and that the quantity of substantive subject-domain knowledge continues inexorably upward. One fears that in most subjects, Figure 7 better represents reality than Figure 6.

Does this mean bowing to the processes of specialisation – spontaneous market movements and policy-engineered? Four kinds of intervention suggest themselves.

First, enlightened school and institutional management strategies can surely help maximise R-T synergies and make life more bearable. They need to be grounded in the realities of time and cognitive limitations, however.

Second, individuals can borrow from best practice and explore more efficient ways of achieving synergies within given institutional constraints.

Third, while there is a role for quality enhancement (one of CEBE's goals) and quality assurance processes, school and university managers should be acutely aware of the costs of any attempt to

improve or enhance teaching. At present there is, I think, a wide spread feeling that the overheads of teaching are becoming overbearing.

Fourth, the scope for a better and more productive T-R balance can be improved by limiting the curriculum and focusing narrowly in research. This would tend to move the curves more towards those in Figure 6. Sadly for applied and vocational subjects such as ours in the built environment, there are strong tendencies for knowledge domains to proliferate and curricula to creep, making Figure 7 the more likely dynamic. Our research also, tends to be more diverse and less focused, requiring us to keep up with an impossible scope of knowledge. It may be that scientists who research narrow fields and work with well defined knowledge domains that at least at the undergraduate level are prescribed and limited by tradition, are better able to handle a balanced workload of teaching and research. There is some evidence of this in our email survey. There are currently real opportunities to influence the nature of curricula in built environment subjects, however. We could help ourselves and those we teach by looking for ways of drastically reducing the scope of knowledge. Hopefully too, changes in the RAE and more realism in university and school missions will give individuals a chance to be less opportunist and less ‘flighty’ in research, enabling them to stay tuned to a narrower field with less effort.

Finally, if the new RAE requires a return of 80% of staff in a unit of assessment with a research requirement in their contract, then universities will have the incentive to devise infrastructure that induces more T-R specialisation. Contracts and incentives are likely to change, with the possibility, if handled sensitively, of allowing greater scope for staff to move towards more productive R-T allocations.

Figure 1 Differences between 140 academics

	N	Range	Minimum	Maximum	Mean	Std. Deviatio
PGHOURS	130	650	0	650	87.29	102.925
UGHOURS	131	960	0	960	189.66	159.708
RESINC	121	6000000	0	6000000	435913.22	947859.804
PUBS	137	480	0	480	52.36	64.922
PHDS	132	55	0	55	5.30	8.086
Valid N (listwise)	118					

Key:
PGHOURS=post graduate contact hours per year
UGHOURS=undergrad contact hours per year
RESINC= research income over you career so far
PUBS=number of publications (all types) in your CV
PHDs=number of PhDs supervised during your career so far

Report

SUBCODE		PGHOURS	UGHOURS	RESINC	PUBS	PHDS
arch	Mean	125.27	367.09	107272.73	74.64	3.18
	N	11	11	11	11	11
	Std. Deviation	129.606	207.627	236509.7	139.278	5.076
constr	Mean	74.77	148.91	321868.97	33.58	2.62
	N	35	35	29	36	34
	Std. Deviation	89.659	84.567	926053.1	43.860	4.149
civil	Mean	104.50	191.63	770366.67	92.33	9.56
	N	8	8	9	9	9
	Std. Deviation	48.104	163.303	637350.7	90.061	10.573
geo	Mean	64.62	205.38	297826.92	41.62	9.23
	N	13	13	13	13	13
	Std. Deviation	55.508	139.021	540244.6	26.282	14.652
other	Mean	108.42	139.75	146520.83	36.62	2.83
	N	12	12	12	13	12
	Std. Deviation	131.468	177.806	206434.3	41.596	3.664
plan	Mean	132.40	142.67	297250.00	36.63	3.13
	N	15	15	12	16	16
	Std. Deviation	171.652	237.591	482186.1	32.329	3.575
sci	Mean	66.39	204.73	745742.86	69.49	7.70
	N	36	37	35	39	37
	Std. Deviation	73.187	129.733	1393761	62.750	8.990
Total	Mean	87.29	189.66	435913.22	52.36	5.30
	N	130	131	121	137	132
	Std. Deviation	102.925	159.708	947859.8	64.922	8.086

Figure 2 Comparison of selected indicator means by subject area

Figure 3: Comparison of attitude toward teaching and research by subject

Report

Mean

SUBCODE	TEACHMOR	RESCHMOR
arch	2.45	3.27
constr	2.30	3.35
civil	2.00	3.44
geo	1.91	3.67
other	2.67	3.40
plan	1.94	3.69
sci	2.49	3.23
Total	2.31	3.39

Key:
Scores: (1=strongly disagree to 5= strongly agree)
TEACHMOR= “Given the choice and incentive I would opt to teach more and research less”
RESCHMOR= “Given the choice and incentive I would opt to research more and teach less”

SUBJECT * TEACHING Crosstabulation

Count

		TEACHING					
		1	2	3	4	5	Total
SUBJECT	1	2					2
	2		3				3
	3	1	1	4	2	1	9
	4	1	4	11	25	5	46
	5	1	7	9	23	40	80
Total		5	15	24	50	46	140

Figure 4: Teaching interest drives scholarship by subject interest drives teaching innovation

Notes:
Numbers in table are numbers of respondents in each category
Row and column headings are scores 1-5 (strongly disagree to strongly agree on two questions:
TEACHING= “Interest in teaching keeps me actively engaged in research/ scholarship of my subject”
SUBJECT= “Interest in my subject keeps me actively exploring more effective ways to teach”

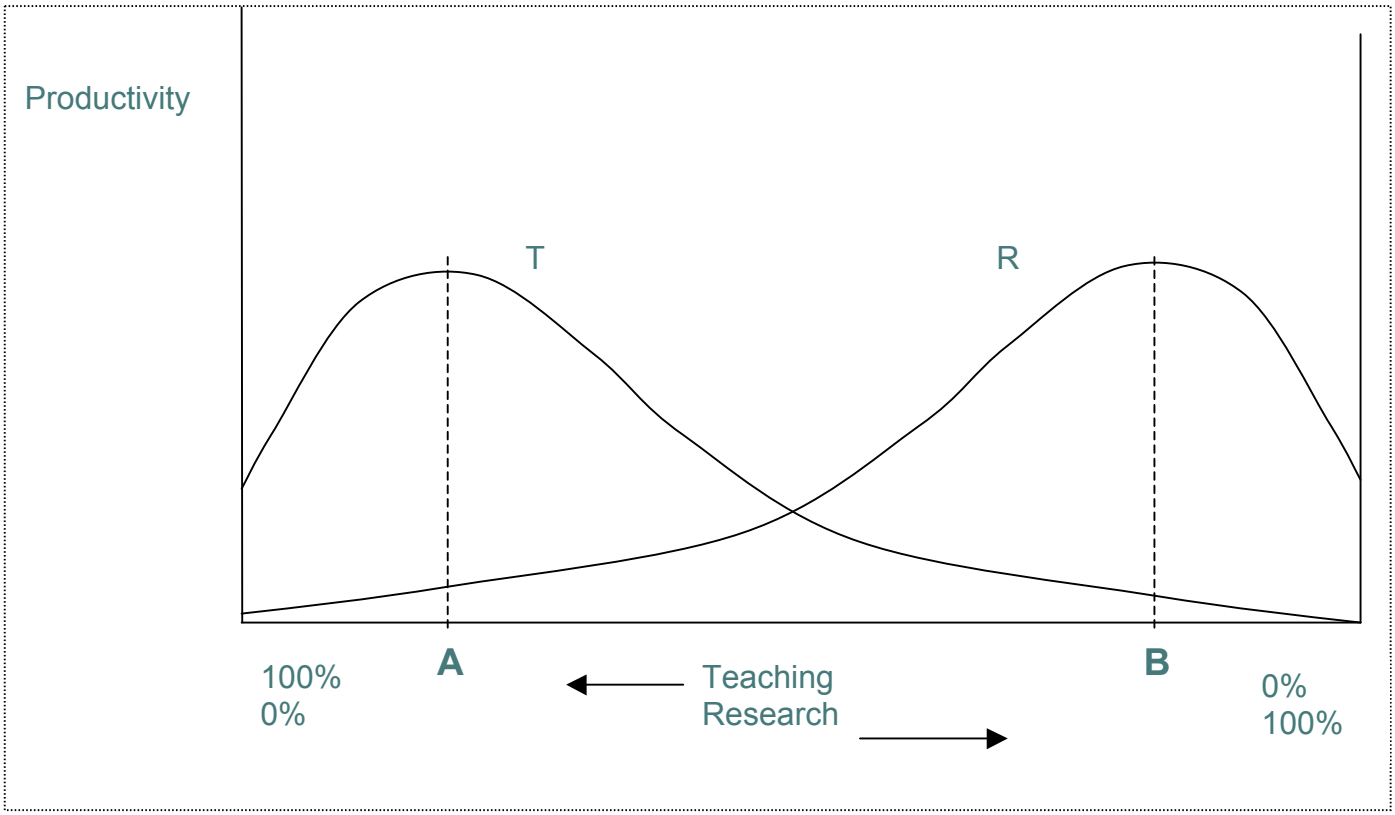

Figure 5: productivity curves and the optimal teaching-research balance

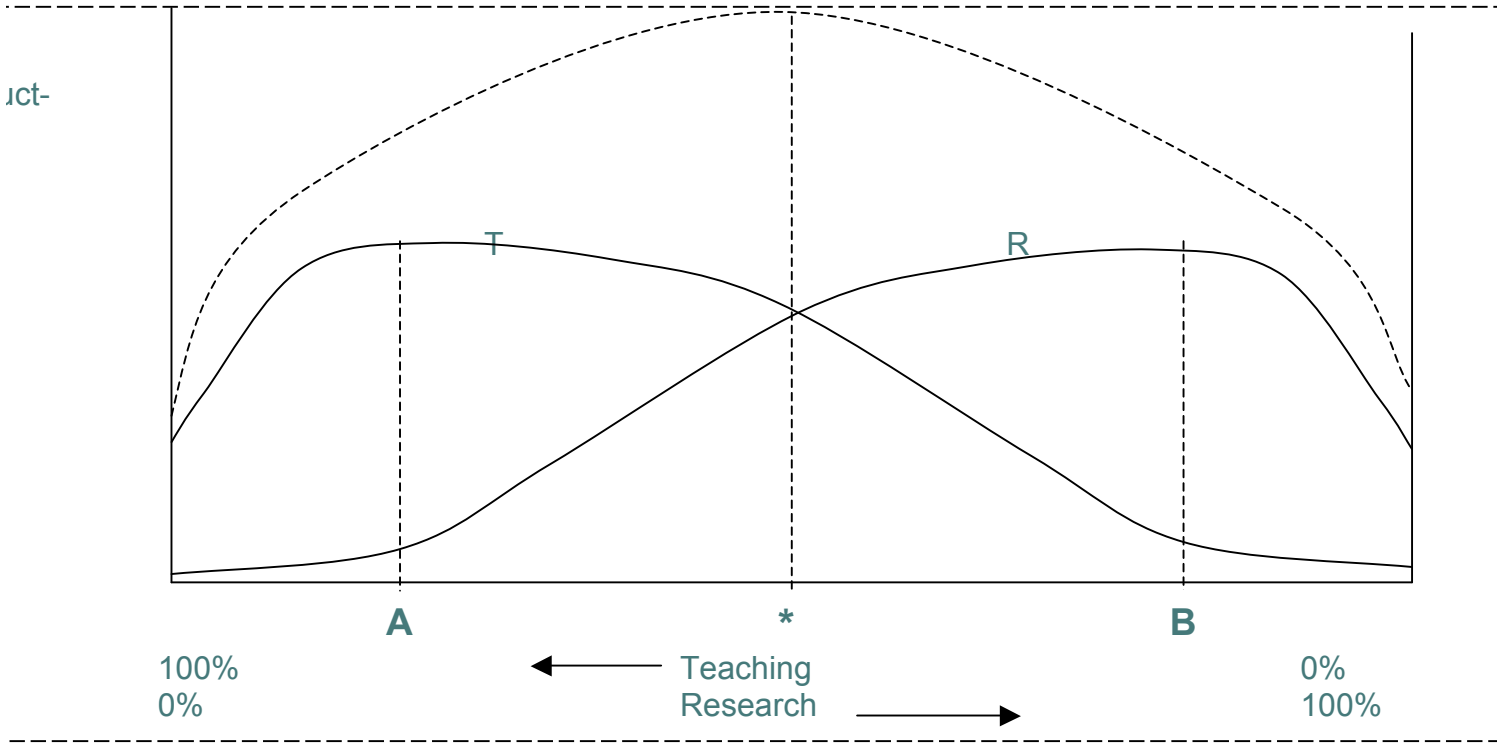

Figure 6: Rapid learning curves suggest a R-T balance can be an efficient strategy

Figure 7 Steep learning curves lead to a natural force for specialisation