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RESEARCH-LED HIGHER EDUCATION AND 'THE BIGGER PICTURE'

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ABSTRACT. There is increasing pressure on higher education institutions to be research-driven and consequently populated by individuals whose main strength is research. It has already been established that the skills necessary to make a good researcher are not the same with those that make a good teacher. There are, however, other implications with respect to how teaching content is structured in terms of breadth and depth, and how breadth and depth of knowledge in turn may affect students' knowledge in their field – but also broader world views. The aim of this paper is to examine how conflict may arise from the concurrent pursuit of these goals. This discussion is based within the context of split-brain theory (breadth being a right hemisphere attribute, and depth added primarily by the left hemisphere), and highlights the potential of this theory in enhancing the higher education experience.

Keywords: *breadth of research interests, higher education, split brain theory, world view.*

ZUSAMMENFASSUNG. Der Druck auf die Hochschulen forschungsorientiert und somit von Personen getragen zu sein, deren Hauptstärke die Forschung ist, steigt. Es wurde bereits festgestellt, dass die Fähigkeiten, die erforderlich sind, um ein guter Forscher zu sein nicht die gleichen sind, wie die, ein guter Lehrer zu sein. Es gibt aber auch Auswirkungen bezüglich der Breite und Tiefe der Lehrinhalte und darauf, wie die Breite und Tiefe des Wissens sowohl das Wissen der Schüler in ihrem Bereich, als auch die weitere Weltanschauungen beeinflussen. Diese Abhandlung untersucht, wie sich Konflikte aus der gleichzeitigen Verfolgung dieser Ziele ergeben können. Die Diskussion basiert auf der Split-Brain-Theorie (Breite als ein Attribut der rechten Gehirnhälfte

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und Tiefe wird in erster Linie von der linken Gehirnhälfte beeinflusst), und weist auf das Potential dieser Theorie hin, zur Verbesserung der Erfahrung an Hochschulen beizutragen.

Schlüsselwörter: *Breite der Forschungsinteressen, Hochschulbildung, Split-Brain-Theorie, Weltanschauung.*

Introduction

It appears the 'right brain-left brain' theory popular in the mid-twentieth century (Harrington, 1987), was not entirely wrong. The two hemispheres of the human brain do indeed serve different functions, although not those initially attributed to them. The left hemisphere is not so much about rational thinking, as it is about adding detail to things that are already known. The right hemisphere is not so much about emotion, but about the bigger picture and staying open to the unexpected. Today we live in a left-brain world (McGilchrist, 2009; 2012). An understanding of brain lateralization is highly relevant to education (Yarlott, 1986). Recent studies have, for example, applied this theory in performance appraisal training (Selden, Sherrier & Wooters, 2012), or in characterizing learning styles (Kelly, 2013).

Even more importantly though, the distinction between narrow and broad focus, as dictated by the two brain hemispheres, is not without relevance to higher education. Having research at the core of academic activities at universities is tremendously important to what and how students get taught. On the one hand, research has become increasingly specialized (Belmaker, Cooper, Lee & Wilman, 2010), and research specialization is precisely what provides academics with an identity (Chalmers, 2011). Interdisciplinary approaches are often viewed as a lack of focus by academics and research funding bodies alike. Fields of research act in a very much left-brain manner, by simply adding details to already crystalized cores of knowledge. Where interdisciplinarity is encouraged, this is often in a focused sort of way, which soon results in the addition of new cores of knowledge – but not necessarily in keeping disciplines connected in the long run (Rafols, Leydesdorff, O'Hare, Nightingale & Stirling, 2012).

On the other hand, university teaching should ideally first ensure that the students get the bigger picture of whatever they are studying, and only then start adding detail (Malamud, 2010), unless there is an implicit assumption that students bring along that bigger picture from home or from school level. This separation between a 'breadth phase' and a 'depth phase' resulted in the initial distinction between undergraduate and postgraduate studies, but the differences between these two stages have become more complex (Lindsay, Breen & Jenkins, 2002; Malamud, 2010).

Teaching and research require different attributes and thus imply different personality traits (Eble, 1976). The researcher is very often an introvert who prefers to stay focused on idea generation, as opposed to the teacher who is more social and able to have multiple focuses and enjoys spending time with students (Nehme, 2012). Indeed, in their meta-analysis of studies on this topic, Hattie and Marsh (1996) found no support for a beneficial link between research and teaching. While much may have changed since in the functioning of universities, this has apparently not. For example, Pan, Cotton and Murray (2014) found that academics still experienced difficulty maintaining a balance between the various demands pertaining to research and teaching.

Academic staff primarily prepared for research – especially those with postdoctoral experience (Rybarczyk, Lerea, Lund, Whittington & Dykstra, 2011) – are often thrown in at the deep end of a poorly prepared teaching career (Quinn, 2003). Many have already figured for themselves in their research-only days that dwelling on the bigger picture is unlikely to take them too far. Some may even perceive teaching as diluting their specialist, research-driven identity (Chalmers, 2011). In this context, they often fail to attain the 'teacher' status as defined by McMillan (2007) – implying that they do not assume the role of shaping students in the field, but remain at the 'lecturer' status, merely imparting knowledge.

Furthermore, the double-duty of teaching and research is not perceived by academics as an ideal situation. Pan et al. (2014) indicated a tension between teaching which is often viewed as more of a professional obligation, and research which is more related to academic desirability and career advancement. Gibbs (2013) also noted the increasing demands of performance-based research and the 'publish-or-perish' maxim, which according to her is not

an effective means of motivating academics to write. At a glance, this situation seems to be a perfect recipe for schizophrenic academics and poorly prepared students. Of course, things vary across countries, institutions, and fields of knowledge.

This paper emerged out of reflection on practice, and followed the approach of Boyd, O'Reilly, Rendell, Rowe and Wilson (2012) in drawing on reflection-in-action and reflection-on-action, as advocated by Schon (1987). Both authors of this paper are based in a tertiary education institution, but with very different backgrounds – thus allowing for a broader overview of academic endeavors. One is a natural scientist primarily teaching undergraduate students, while the other is a social scientist teaching solely postgraduate students. The researchers have lived and experienced the multiple realities that academics face – teaching and research being the main objectives of a higher education institution. The paper was therefore conceptualized out of this background of a lived reality of the teaching-research nexus. The paper integrates key references from the fields of higher education, teaching and learning, scientometrics and psychology, in order to critically inform the research questions that were set.

These questions were: (1) how do current research structures support or inhibit research breadth?; (2) how does this impact on researchers' teaching skills and approach?; and (3) how can split-brain theory be used to understand the research-teaching nexus?

The nexus in a historical perspective

The research-teaching nexus started with von Humboldt's ideas (Elsen, Visser-Wijnveen, van der Rijst & van Driel, 2009) and von Humboldt was *the* encyclopedic spirit by definition. This, according to Visser-Wijnveen, van Driel, van der Risjt, Verloop and Visser (2009), entailed a university being about harmony between research and teaching. Looking even further back, higher learning was largely encyclopedic and furthermore holistic – being driven by worldview approaches (Osakwe, Keavey, Uzoka, Fedoruk & Osuji, 2015). This was the case across the world, from Indian gurukulas and Buddhist schools to medieval European institutions, with teaching being centered on sometimes

religious but often purely philosophical paradigms, and subsequently refined top-down (Perkin, 2006). From a split-brain perspective (McGilchrist, 2009), those were the days when the right and left hemispheres were running the world in good balance.

The modern shift in the philosophy of education, from promoting breadth to focusing on depth of knowledge, originated in 19th Century US (Florer, 1968) – yet it is the US that still promotes, in some cases, a balance of the two (Nightingale & Scott, 2007). However, most present-day academics would probably view von Humboldt's ideas as being too idealistic in the present setting of massification (Anala & Makinen, 2011). The loss in breadth has been associated with the contemporary university curriculum becoming more and more applied (Boyd et al., 2012).

The contemporary literature on the research-teaching nexus distinguishes between research-led, research-informed, research-tutored and research-oriented teaching, and indicates how each one can make universities a better place (Elsen et al., 2009). Willcoxson et al. (2011: 2) define research-informed teaching as involving the subject matter being crafted on discipline-based research. Research-led refers to how the "curriculum is structured around teaching current subject content" (Willcoxson, Manning, Johnston & Gething, 2011, p. 2). Research-oriented is where the "curriculum emphasizes processes of knowledge construction in the subject" (Willcoxson et al., 2011, p. 2). Finally, research-tutored is where the "curriculum emphasizes learning focused on students writing and discussing essays and papers" (Willcoxson et al., 2011, p. 2). While one can prepare teaching according to one of these recipes, the specific class dynamics may be critical when it comes to how exactly research and teaching are put together (Horta, Dautel & Veloso, 2012).

Boyd et al. (2012, p. 12) also argue that the "professional cultural apprenticeship may be the crucial personal epistemological and ontological impediment to engaging the nexus" – as opposed to only constraints within the organization. This means that the coexistence of research and teaching can be viewed as problematic not only at an institutional level, but also at a personal identification level (Chalmers, 2011; Gough, 2014). Essentially, it may be down to the coordinators of research-education programs to consider how to prepare materials that facilitate the research-teaching connection (MacDougall, 2012).

Research structures and the breadth of researchers' interests

Breadth and depth are the two key dimensions when measuring specialization in higher education (Malamud, 2010) – specialists being characterized by limited breadth and substantial depth, while more encyclopedic spirits show the opposite pattern. Knowledge accumulation is either driven by a pure desire for knowledge, in which case breadth or even completeness would be ideal, or by more practical purposes, in which case there are areas of immediate interest, and depth takes precedence at the expense of breadth (Crow & Tucker, 2001). The latter approach is viewed as critical for justifying research, and while universities were initially bastions of 'pure' research they are increasingly switching to 'applied' research (Calvert, 2004).

The needs of society change in a very dynamic fashion. However, once a field has been identified as critical, research funding allocated to it can result in the building of research capacity which then needs to justify its continued existence (e.g. Young, 2015). While the importance of measuring research impact can hardly be denied, the development of such measures has also provided fields of research with a means of self-justification (Brown & Duguid, 2001).

Although evidence of practical applications is taken into consideration when dividing the research funding pie at international, national or institutional level, citation-based impact measures for journals and individual researchers (Ball, 2005; Zoller, Zimmerling & Boutellier, 2014) are increasingly viewed as key – generally without looking in detail at self-citations and within-field citations. This means that, at least in certain cases, research can now be viewed as high-impact, simply because it cites itself. Within-group citation is particularly relevant here, as it creates boundaries around certain research groups and research fields (see Newman, 2001). Citations within such a field further increase the field's credibility, whereas collaboration with other fields, institutions, groups and authors (especially if these do not self-cite) has been shown to actually decrease research impact (Jones, Wuchty & Uzzi, 2008). This can explain why the percentage of all research represented by interdisciplinary projects is actually decreasing, although interdisciplinary studies, as an absolute number, are on the increase (Bhupatiraju, Nomaler, Triulzi & Verspagen, 2012). Essentially, this means that the use of citation measures can result in suppressing

interdisciplinary research (Rafols et al., 2012). In some cases, not only is the link between disciplines suppressed, but the existence of entire disciplines becomes endangered – with tragic effects on tertiary education programs (e.g. Arlinghaus, 2014).

Undergraduate versus postgraduate teaching

From the above, it can be gleaned that teaching by specialized researchers suffers from the rejection of concepts originating in other disciplines, referred to as the "Not-Invented-Here" syndrome (Kathoefer & Leker, 2012). There is, however, a lack of studies addressing this question directly, and so refining this finding requires looking into studies that are somewhat different in focus.

Importantly, Jawitz (2007) found that new academics are shaped by two distinct communities of practice in higher education. The first is the research community of practice which is focused on research and providing teaching to postgraduate students, and is composed of senior academics. The second group, the undergraduate community of practice, comprises junior and some middle-level staff who are responsible for delivering undergraduate-level teaching (Jawitz, 2007). This divide affects new staff seeking to develop a research profile and this may align their research interests with prevailing research niches, whereas new academics who may have a different interest from the dominant area are likely to be left on the periphery. This results in a narrow area of specialization for the entire teaching complement, which places students at a disadvantage. Indeed, a diversity of expertise, skills and experience of academics in a department or discipline, should provide learners with a valuable learning experience (Pan et al., 2014).

Whether an academic teaches undergraduate or postgraduate students, also dramatically shapes their career. Horta et al. (2012) alert us to the differences in teaching undergraduate and graduate students – with graduate students being able to specifically contribute to the publication of refereed journal articles.

Lecturer and student perceptions of the research-teaching nexus

Studies on how research and teaching fit in together in higher education institutions, tend to focus on positive aspects. Quinn (2003), for example, emphasizes the relationship between research and teaching by arguing that lecturers should be informed of the comprehension and advancement of knowledge in their disciplines, in order to facilitate learning. Engaging in research can ensure that academics stay abreast of recent findings – which entails more than just following a textbook (Pan et al., 2014). This is echoed by Visser-Wijnveen et al. (2009) in noting how important it is to understand how academics perceive research and teaching, particularly by way of their beliefs and how they perceive knowledge.

Very few articles refer to any negative aspects resulting from putting research and teaching together. Visser-Wijnveen, van Driel, van der Risjt, Visser and Verloop (2012) found that students valued having a teacher who was conducting actual research, and also the way in which this affected their understanding of research. Lindsay et al. (2002) found that the engagement of lecturers in research made them appear more reliable and eager in the eyes of both postgraduate and undergraduate students.

Students who took part in the research of Healey, Jordan, Pell and Short (2010) indicated several less-than-ideal views about their lecturers being involved in research – but the most commonly reported among these was the perception that these two activities compete for their lecturers' time. Stappenbelt (2013) also noted the constraints of time and resources which are required for teaching and research. More relevant here, and also frequently cited in that study, was a lack of interest in teaching on the lecturers' side; even more relevant, but seldom noted, was the fact that lecturers' "… research interests distort […] the content of what they teach" (Healey et al., 2010, p. 242). However, how exactly this distortion happened, was not further dissected.

Buckley (2011) suggested that students and lecturers have different perceptions of how teaching and research fit together, but that they also have much in common. Robertson (2007) on the other hand, pointed out that, insofar as teaching and research success can be measured, the two are not really related. The same work moves across to apparently different matters and highlights the difficulty of bringing into teaching the kind of critical thinking needed in

research, and concedes that "… it may be possible for (some) students to graduate from higher education study with little awareness of the contested and constructed nature of knowledge", and that there may be "… a dissonance between the rhetorical objectives of the (liberal) university and the reality of belief and practice at a local, disciplinary level" (Robertson, 2007, p. 552). This would be alarming, considering that higher education is becoming increasingly complex – with employers expecting graduates to have transdisciplinarity and problem-solving skills (O'Brien, 2002).

Robertson's (2007) alarm bell thus provides a link between breadth of knowledge within one's own field of study and one's overall worldview. O'Brien (2002) challenges all those in the higher education domain to become aware of how they view knowledge and knowing – but also how students see it and how this be reconciled. This primarily places emphasis on academics becoming more student-centered, but also more aware of the breadth-depth balance when designing curricula. Quinn (2003) notes that lecturers have to first critically engage their own beliefs about the epistemological and ontological nature of their disciplines, before considering how to present students with the discipline. This call clearly resonates better with depth than with breadth, as applicable to both teaching and research.

Back to the split brain

The impact of the search for research excellence on the functioning of universities has already been decried (Martin, 2011). But what about the graduates produced in the process, who are expected to function as the educated tier of entire societies? Can the present-day (already left-brain-driven society) truly benefit from the coexistence of teaching and research in universities, or is the teaching-research nexus just a fashionable phrase trying to justify a *posteriori* these institutions' current structure? A vast literature focused on the positives of the nexus points to the former (e.g. Elsen et al., 2009; Visser-Wijnveen et al., 2009; 2012; Gilmore, Lewis, Maher, Feldon & Timmermann, 2015). However, analyses of university management discourse (Mayson & Schapper, 2012; Geschwind & Broström, 2015) more likely support the latter. A solution may have to be sought in a clearer division of duties between different academic paths – assisted by informed career counselling (e.g. Jepsen, Varhegyi & Edwards, 2012).

This paper started with a reminder of the lateralization of brain function. Although most of what followed was focused on education science, it is probably appropriate to revert to the paper's neuropsychological beginnings. The understanding of hemispheric function is undergoing rapid and most exciting progress (Hervé, Zago, Petit, Mazoyer & Tzourio-Mazoyer, 2013). In an applied perspective, there is a promise that split-brain theory, at individual level, can be highly relevant to defining one's career path (Morton, 2003; Morton, Svard & Jensen, 2014), and also applicable in an educational context (Gülpınar, 2005). There is certainly great potential for this type of research to influence the structure and functioning of academic institutions and the worldviews of graduates, insofar as the willingness to apply such research can be found within them. Beyond indicating academics' likelihood to succeed better in teaching or research, an understanding of individual strengths can be viewed in a multidimensional context, avoiding simplistic dualist approaches (Macfarlane, 2015). A first step beyond the dual approach followed here could be an application of split-brain theory to the four-way scholarship of discovery, integration, application and teaching (Boyer, 1990).

Conclusion

The way in which teaching and research, as well as the nexus, can be viewed in a split-brain perspective, is summarized in Figure 1, emanating from this study.

In brief, the globally prevalent academic setup seems to be favoring those academics who are highly specialized in their research and convey their knowledge and skills at postgraduate level. The more encyclopedic spirits make good lecturers at the undergraduate level, but their research career may face numerous difficulties. This minor and insufficiently recognized separation within disciplines is, however, dwarfed by the division between academic disciplines as promoted by research specialization. This is likely to have serious implications for both individuals and society. From tertiary education, lack of cohesion is likely spreading into the realm of the personal worldview, and holistic thinking is relegated to the realms of religion and philosophy. In universities, this is left to those who study these fields – a dwindling cluster. In a societal multicultural context, world views often become in-group only topics, dividing rather than uniting society.

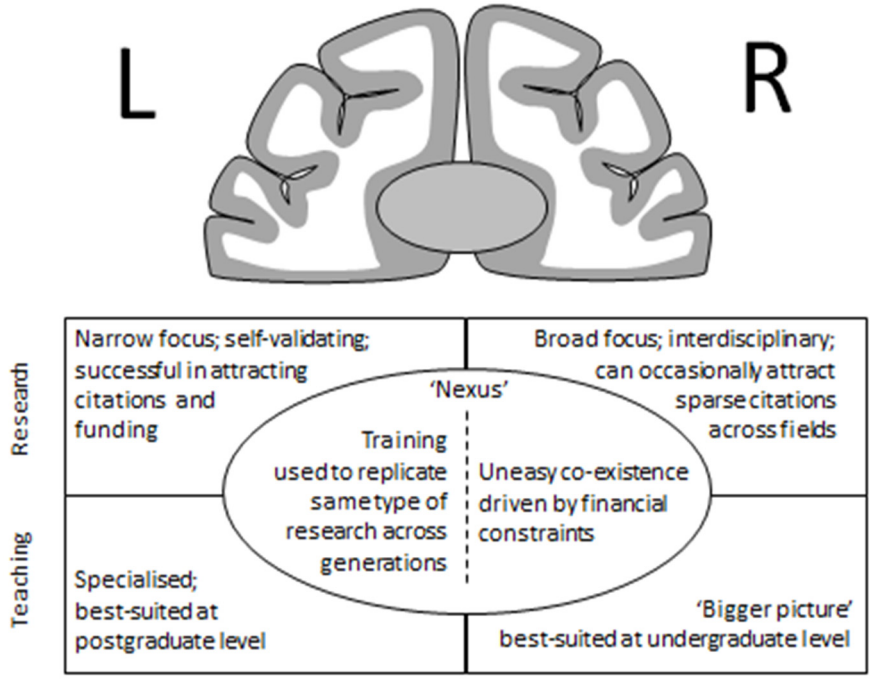

Figure 1. The teaching-research nexus from a split-brain perspective (compiled in this study)

Recommendations

In revisiting this paper's research questions, the following preliminary recommendations can be made (while keeping in mind the limitations of the study):

- An increased recognition of research breadth as a means of promoting interdisciplinarity in research. This can be achieved by new metrics measuring the spread of citations across disciplines (see Schiebel, 2015).

- Incorporating a psychology- and sociology-informed understanding of the research-teaching nexus in decisions regarding the content of undergraduate and postgraduate curricula. Allowing for flexibility in academic job profiles –

contrary to the one-size-fits-all approach which is becoming increasingly prevalent. Academics should be encouraged to achieve excellence in any one or several of the recognized academic duties (undergraduate teaching, postgraduate teaching, research, community outreach and/or administration), without forcing all of these duties on all academic staff (cf. Karagiannis, 2009). One useful theoretical tool towards understanding this need is the the expansive–restrictive workplace learning environment continuum (Boyd, Smith & Beyaztaş, 2015).

- An approach to academic career pathing that combines knowledge of brain lateralization (Szirony, Pearson, Burgin, Murray & Elrod, 2007), assessment and development of research and teaching competencies, and an understanding of both research-related and teaching-related organizational cultures (Macfarlane & Hughes, 2009).

Most of these recommendations are backed up by very little research at present, and would require novel approaches and sustained efforts prior to any attempt at implementation. It is probably only the last of the points listed above, that is already backed by some research momentum. Even here though, the brain lateralization and organizational culture aspects are understudied, and only the development of teaching and research competencies is receiving substantial attention (Hemmings, 2015; Hemmings & Kay, 2015; Požarnik & Lavrič, 2015), with some implementation underway (Heinrich, 2013; Ginns, Kitay & Prosser, 2015). These measures do however still require fine-tuning as regards the teaching-related issues specifically arising in a research-dominated context.

Limitations

This brief enquiry was intended more as an appetizer for further questions, rather than as a fully formed set of answers. The self-validating nature of today's dominant left-brain institutions means that the findings could only be limited, and that searching for them has been somewhat frustrating. The authors do, however, feel that this paper has make a few useful connections between concerns that had been previously raised only separately.

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