

The Challenge of Classifying ‘Interdisciplinary Research’: An Exploration

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Abstract: Equity and social justice, health and poverty, sustainable development, environmental management, global change - these represent some of the most pressing concerns of our times. Some of the key characteristics of these issues are that they are complex and multi-causal, requiring the integration of several different approaches, also referred to as ‘interdisciplinary’ work. However interdisciplinary research is increasingly difficult to identify in the digital era of online databases. The aim of the research reported here was to identify, compare and contrast interdisciplinary work across academic fields and disciplines by using sets of peer-reviewed academic publications that self-identified as ‘interdisciplinary’ in readily-available bibliographic databases. The research found that, as expected, the number of papers self-identifying as ‘interdisciplinary’ has grown over time and that there are differences by research field (social sciences, science, medicine, health). Within the social sciences, arts and humanities some disciplines (sociology, social work) have identified themselves as interdisciplinary over time at a greater rate than others (Film and Media, Drama). The findings suggest that some disciplines in social sciences, arts and humanities may have been better positioned to adopt and integrate the language of interdisciplinarily before others.

Keywords: Arts, science, health, Interdisciplinarily, literature evaluation, humanities, multidisciplinary

INTRODUCTION

Some of the most pressing concerns of our times are complex and multi-causal. Understanding them requires that researchers move across disciplinary boundaries in order to fully understand the “wicked problems” or “social messes” that they represent. The research reported here had an overall goal of comparing and contrasting how different academic fields refer to their own study as ‘interdisciplinary.’ It sought to address two main research questions:

- Has there been an increase in peer-reviewed, academic journal articles self-identifying as ‘interdisciplinary’ over time? If so, in what research fields?
- Has the use of the term ‘interdisciplinary’ been more evident in some social sciences, arts and humanities disciplines as opposed to others?

LITERATURE REVIEW

Over the past three decades, the term “interdisciplinary” has been increasingly used in academic literature to refer to those studies and arenas of research that employ more than one field, discipline, or research approach (Salter and Hearn, 1996; Lattuca, 2001; Klein, 1996). Debates over terminology have emerged over distinctions between such terms as ‘interdisciplinary,’ ‘transdisciplinary,’ ‘multidisciplinary,

and ‘cross disciplinary’. All four of these terms are highly contested and there is growing recognition that these terms are not interchangeable (Barry *et al.*, 2008). Most concur with the work of Rhoten (2004) and refer to ‘interdisciplinary’ as study that requires interaction and learning between researchers trained in different epistemological and ontological approaches. This definition identifies a clear distinction between concepts of ‘cross disciplinary’ and ‘multidisciplinary’ (work that requires the parallel, concurrent viewpoints of multiple disciplines but does not require interaction nor change on the part of researchers), ‘trans disciplinary’ (work in which researchers transcend disciplinary approaches and collectively adopt new, overarching epistemologies and ontologies) and ‘interdisciplinary’ (work that demands the interaction of researchers from multiple disciplines and that requires researchers to learn, understand and value other epistemologies and ontologies, while not necessarily adopting them). Taken together, however, such terms all represent an attempt to integrate knowledge and speak across the boundaries of a specific field. Disciplines, by contrast, share the study of a particular phenomenon, a set of evolving theories, a set of methods, a worldview and a normative set of rules (Becher and Trawler, 2001; Salter and Hearn, 1996; Szostak, 2002; Klein, 1990) and the very nature of their social structure and composition means that disciplines are constantly changing entities. Though comprised of a sometimes considerable degrees of heterogeneity and

practiced in various geographical and social settings (Livingstone, 2003), disciplines have traditionally represented sets of bounded knowledge (Lattuca, 2001; Heckhausen, 1972; Swoboda, 1979). Over time, disciplines have evolved - particularly within the academy - to become esteemed knowledge producers based on growing degrees of specialization (Rhoten, 2004; Klein, 1996). However throughout the 20th century, this knowledge structure became increasingly criticized (Klein, 1996; Salter and Hearn, 1996; Lattuca, 2001; Moran, 2006) and calls went out for an instrumental, problem-solving approach that demanded integration of these different sets of specialized knowledge (Lattuca, 2001). In this way, interdisciplinarily developed through the recognition that different disciplines examine sub-components, but that none alone can provide the knowledge and/or tools capable of understanding and explaining the whole (Newell, 2001). More recent theorizing on interdisciplinary work suggests that sets of internal logics underpin most interdisciplinary work and that emphasis must be placed on the role that the social sciences play in interdisciplinary teams (Barry *et al.*, 2008). This study criticizes the fact that researchers in the social sciences, arts and humanities are often relegated to the role of simply making science more accountable. Instead many newer approaches point to the role that the social sciences, arts and humanities can play in supporting a "logic of ontology" in interdisciplinary work and in extending and expanding our notions of interdisciplinarily (Barry *et al.*, 2008). To meet the challenge of examining complex issues, 2 complementary approaches to interdisciplinarily have evolved. On one side are philosophers and sociologists of science, who identify disciplines and interdisciplinarily as objects of research (Salter and Hearn, 1996; Klein and Newell, 1997; Newell, 2001; Szostak, 2003). This approach represents a theoretical examination of interdisciplinary research as it ought to or should take place and focuses on setting up a schema or evaluative criteria by which research can be evaluated according to whether or not it meets the criteria of being interdisciplinary (Szostak, 2003; Klein, 2008). On the other side are practitioners that actually 'do' interdisciplinary work in an unreflective manner. Examples of this type of study can be found across the natural, health and social sciences in such fields as development studies (Van dusseldorp and Wigboldus, 1994), environmental sciences (Hanson, 2000), forestry (Steele and Steer, 2000), agriculture (Meinzen-Dick, 2004), health (Almedom, 2005), engineering (Raj, 2000) and many others. However there has been a growing and conscious reflexivity and consideration of the intent and challenges of 'doing' interdisciplinary

work within these kinds of broad-ranging fields (Carpenter *et al.*, 2006) within the context of the Millennium Ecosystem Assessment and the Interdisciplinarily and Society group at Oxford University. And more recently, greater consideration has been given to how to teach (Rhoten *et al.*, 2006), evaluate (Klein, 2008; Oberg, 2009) and support (Kandiko and Blackmore, 2008) interdisciplinary work. Within this context of growing interest in interdisciplinary research, the goal of this study is to interrogate the academic literature to identify trends, patterns and potential challenges in interdisciplinary research across the social sciences, arts and humanities.

Stage one results – general trends in publishing: In order to situate the social sciences, arts and humanities within broader sets of knowledges, this project adopted a 3-stage data collection and analysis method. Stage One cast a net very broadly in order to capture trends across social, health and natural sciences, as well as engineering using Academic Search Complete, Web of Science and Medline - all readily available search engines at academic institutions. Since each of these search engines uses slightly different search parameters and delimiting criteria, details of search parameters were adjusted for each of the search engines. Boolean searches were employed within topics and keywords, as well as a standard set of delimiters and dates (Fig. 1). Delimiters included English language, peer-reviewed materials employing the four most-often used synonyms for interdisciplinary work (interdisciplinary or multidiscipline or transdisciplin or crossdisciplin) and further broken down by decade (60-69, 70-79, 80-89, 90-99, 2000-8). The result was a set of data identifying the number of records in each database self-identifying as 'interdisciplinary' per decade. As might be expected, the sheer volume of peer-reviewed publications has risen steadily over the past decades, reflecting the effects of increased access to information, globalization processes and the explosion of the knowledge society. Figure 2 shows that all three search engines experienced a steady rise in total number of publications between 1960 and 2008. While the growth in numbers for both Web of Science and Medline shows a steady pattern, Academic Search Complete (ASC) displays an explosive growth in the post-2000 period. Despite these growing numbers, however, the number of records specifically self-identifying as 'interdisciplinary' are extremely low in all databases. In fact, interdisciplinary records represent less than one-quarter of one percent of all publications at its highest point in Web of Science (Fig. 3) and much lower in both Medline and Academic Search Complete.

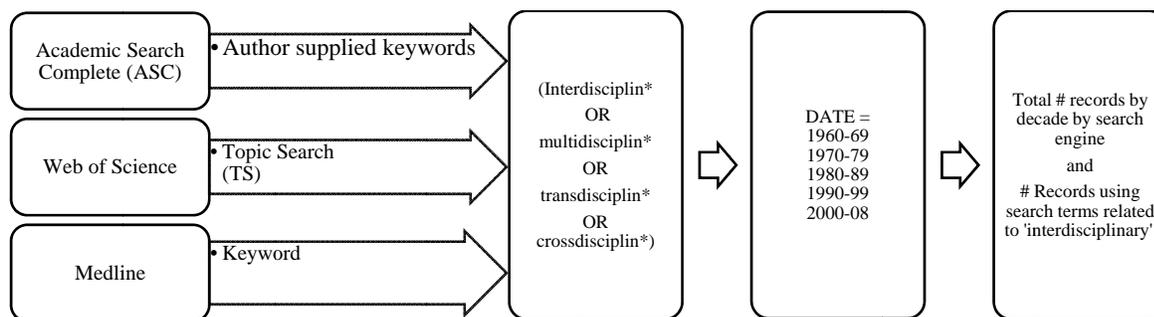


Fig. 1: Stage one search parameters and delimiters by database

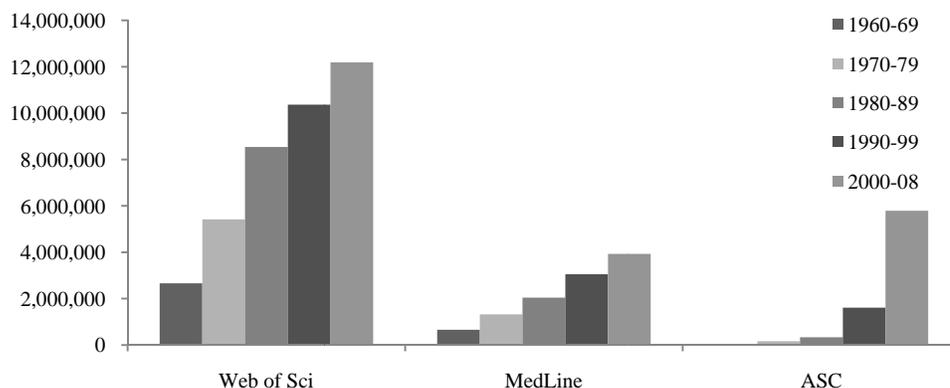


Fig. 2: Total publications by database by decade 1960-2008

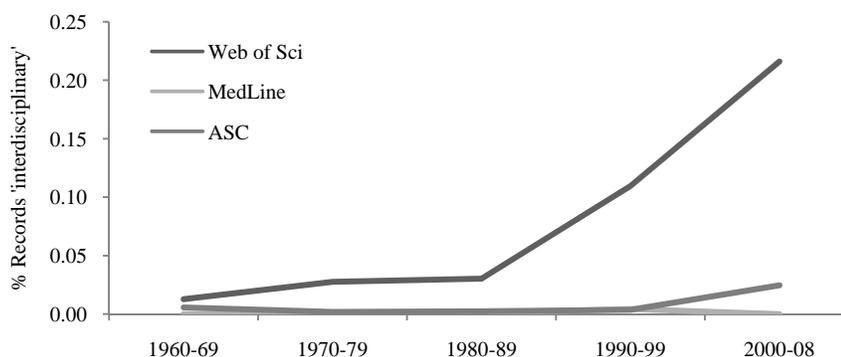


Fig. 3: % Records self-identifying as 'Interdisciplinary' by database and decade

Stage two results - Web of science and Medline by research field: In order to further interrogate these data, the searches were expanded to provide greater detail and to identify patterns and trends across different research fields. Differences in the construction and search parameters in the three databases insisted that slightly different search strategies be engaged in order to examine sub-fields and disciplines. This section reports the process and results for the detailed searches on Web of Science and Medline (which

utilized similar structures), while the following section provides details on the search employed for the social sciences, arts and humanities. For both Web of Science and Medline, I employed the key disciplines identified by the Web of Science search. This search first classified search results by seven key research fields: Social Science, Health, Engineering, Science, Medicine, Humanities and Arts. The Stage 2 search therefore employed both the results from Stage 1 and further differentiated interdisciplinary articles by

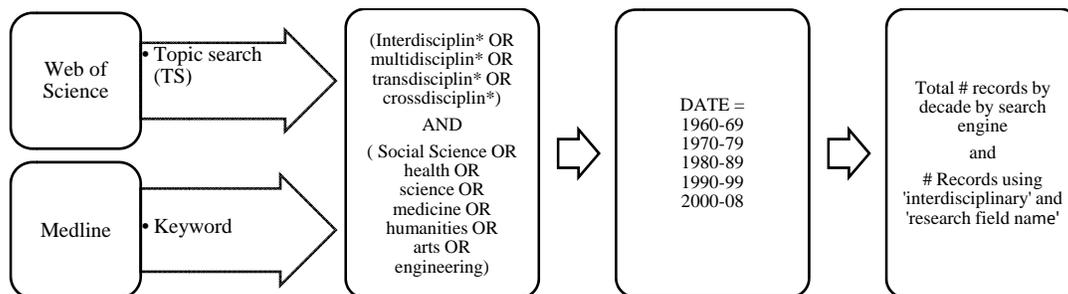


Fig. 4: Stage two search parameters (medline and web of science)

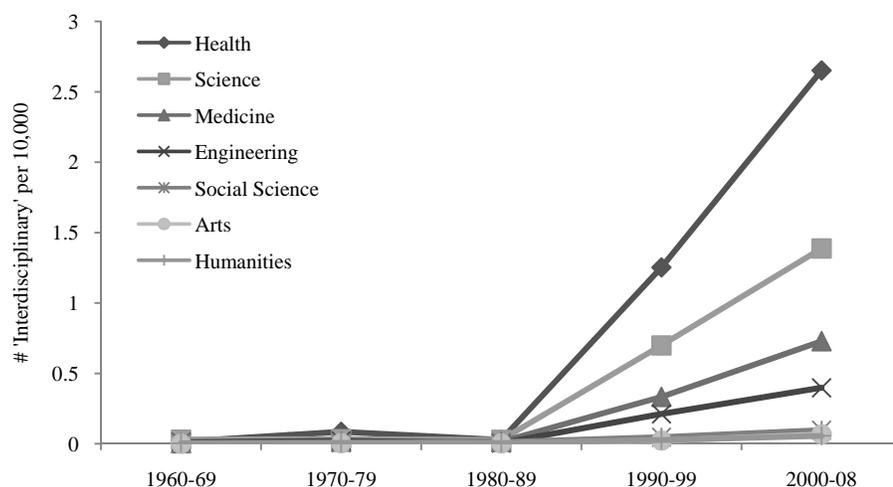


Fig. 5: Web of Science results by field and decade

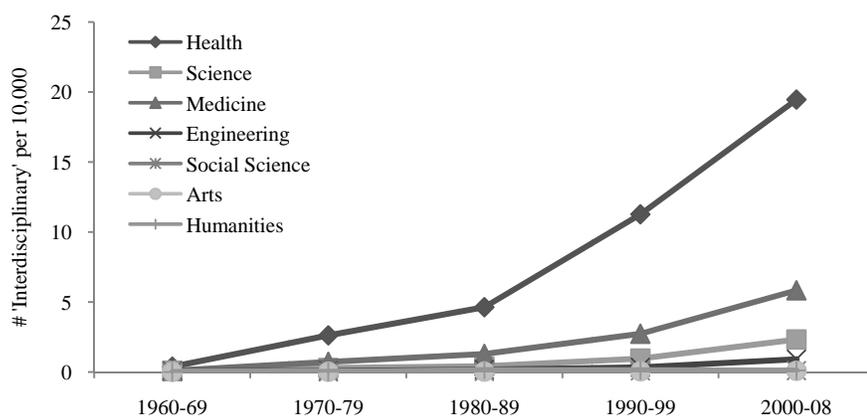


Fig. 6: Medline results by field and decade

research field and by decade (Fig. 4). It is clear in the results from both Web of Science (Fig. 5) and Medline

(Fig. 6) that there has been an exponential growth in both the number of articles self-identifying as

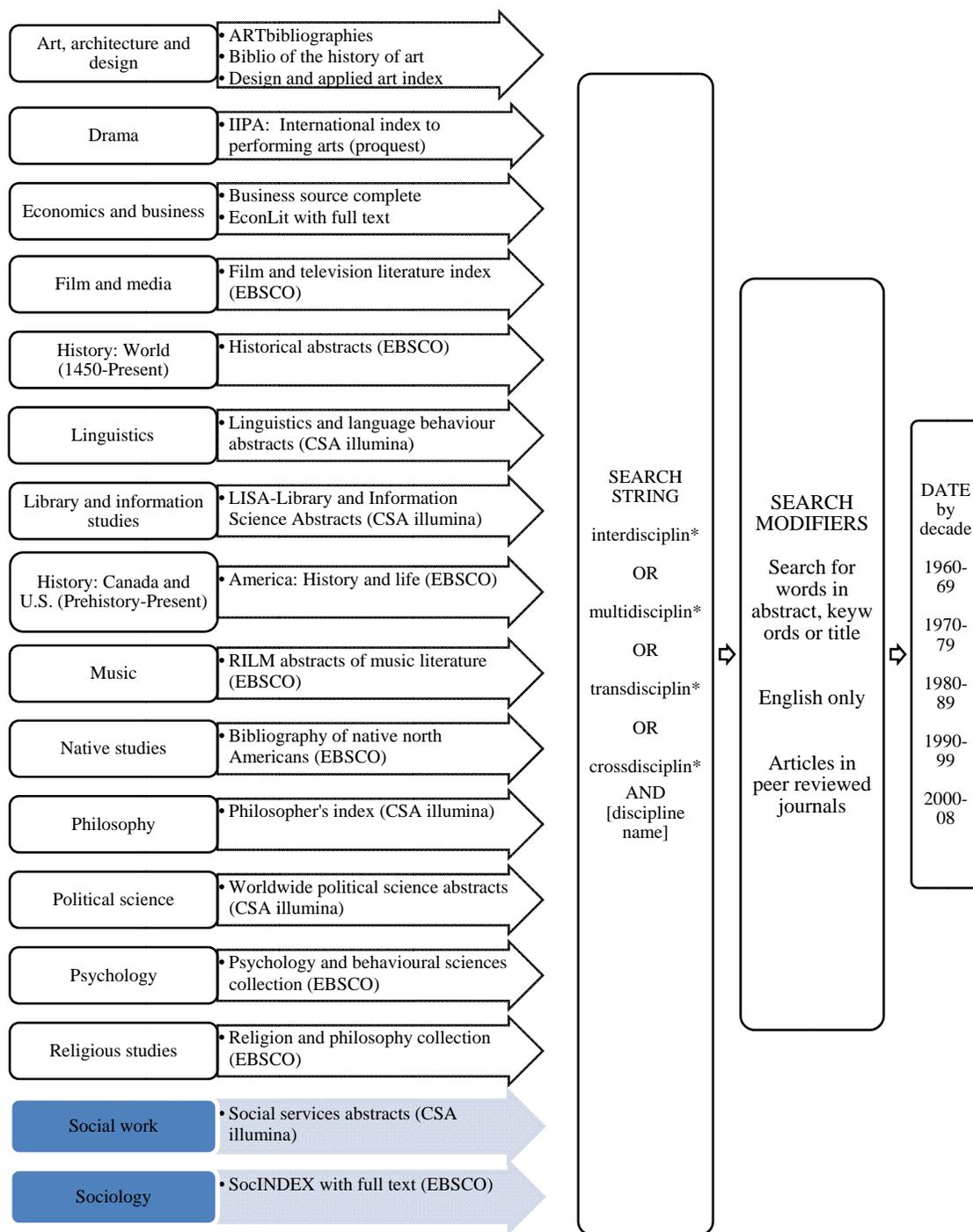


Fig. 7: Stage Three search parameters and delimiters by database (The Drama database did not permit the search to be delimited by abstract only. therefore the findings from the Drama database are limited to words found in the citation information including title, abstract, and keywords)

'interdisciplinary' and that the use of the term is most evident in works in the fields of Health, Medicine and Science.

Stage three results – Social sciences, arts and humanities: The final stage of the data collection focused specifically on Social Sciences, Arts and

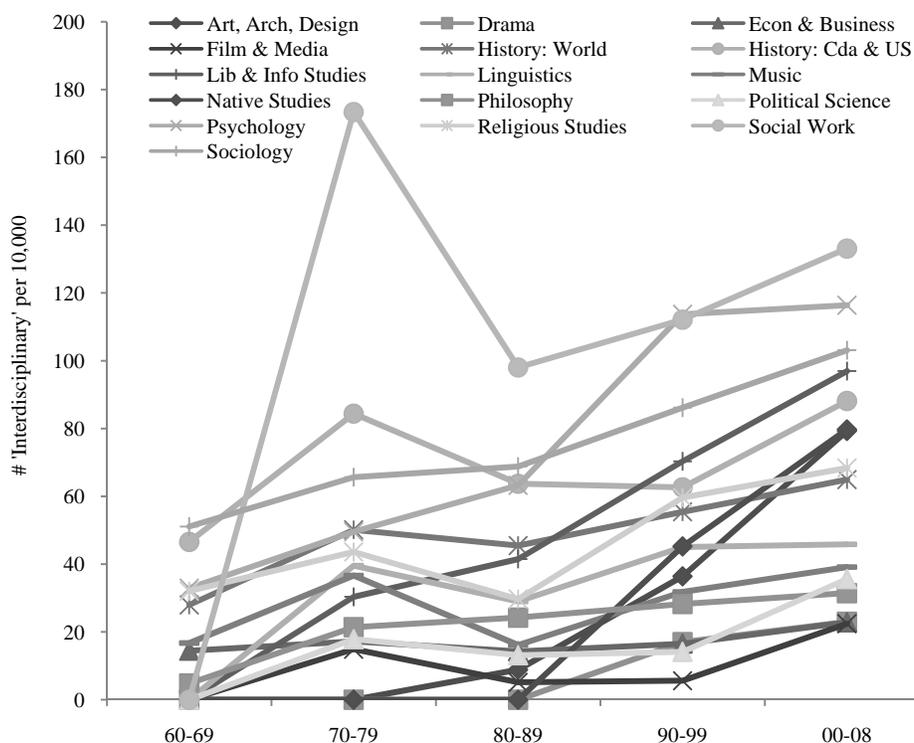


Fig. 8: Social sciences, Arts and Humanities results by discipline and decade

Humanities. A preliminary search of Academic Search Complete resulted in extremely low numbers because of limitations in engaging keywords for disciplines. Therefore a targeted search was conducted using multiple discipline-specific databases based out of 16 key disciplines in the Social Sciences, Arts and Humanities. A total of 19 databases covering the 16 key disciplines were identified as the most important in collaboration with library scientists. As with the previous strategies, Boolean searches identified the total number of records using multiple manifestations of the term 'inter disciplinary' and the disciplinary title such as Sociology, History, Psychology and so on as outlined in Fig. 7. In order to better capture nuances in work within the Social sciences, Arts and Humanities, searches were expanded to include title, abstract and keyword fields. Records were again delineated by decade (60-69; 70-79; 80-89; 90-99; 2000-08). This resulted in a total number of records by discipline, per decade, that self-identified as somehow 'interdisciplinary.' To generate the total number of records per discipline by decade, a similar search was conducted employing the word "the" or "a*" in place of the multiple manifestations of 'interdisciplinary,' with the working understanding that those words would appear in almost all records searched. This process resulted in a baseline number of publications per decade

in each discipline (denominator) as well as the number of publications self-identified as 'interdisciplinary' (numerator) among the Social science, Arts and Humanities records. Within the Social Sciences, Arts and Humanities, similar patterns of increased use of the term over time are evident in all fields (Fig. 8). Importantly, there is considerable heterogeneity expressed in the results. As early as the 1960s, some disciplines (such as Sociology and History) self-identify some works as interdisciplinary. By the post-2000 era, the differences between disciplines has spread with some (Psychology and Social Work) reporting comparatively high numbers, with others (Film and Media, Economics and Business, Drama) reporting comparatively low numbers. By discipline, Social Work, Sociology and Psychology have consistently showed increased focus on interdisciplinary work in terms of proportions of publications explicitly using the term, while the largest increases over time are found in Library and Information Sciences and Social Work (and, to a lesser extent, Psychology and Art, Architecture and Design). Most importantly, even the disciplines with the lowest proportions of interdisciplinary work as reported in Fig. 8, hover around the 20/ 10,000 mark in the post-2000 period. These results suggest that Social science, Arts and Humanities disciplines with the lowest proportional

representation of interdisciplinary work are still greater than work in Health, Science and Medicine as found in both Web of Science (Fig. 5) and Medline (Fig. 6).

RESULTS

Results from this 3-stage process show that there has, indeed, been an increase in peer-reviewed, academic journals self-identifying as 'interdisciplinary' over time. In addition, that increase seems to be prevalent across all major academic research fields (Science, Health, Medicine, Engineering, Social science). Overall, records found in the Social sciences, Arts and Humanities databases have consistently identified themselves as interdisciplinary at the same rate (Fig. 6) or as much as five times more (Fig. 8) as opposed to records in Health, Science, Medicine and Engineering found in Web of Science and Medline. Finally, some disciplines such as Social Work, Psychology and Sociology have consistently self-identified as interdisciplinary as compared to other disciplines such as Film and Media Studies, Drama, Economics and Business, Philosophy, Political Science and Music (Fig. 8).

DISCUSSION

Across the English-speaking world there has been an increasing push towards Mode-2 science with a focus on making research more applied and moved into productive use very quickly (Gibbons *et al.*, 1994). This has occurred both within and across Social sciences, Humanities, Health and Science fields (Kandiko and Blackmore, 2008) as well as in policymaking settings in the United States (National Academy of Sciences, 2005), the UK (HM Treasury, 2006), Australia (ARC, 2009) and Canada (NSERC, 2002). However within this concern over moving research into use, the focus has been overwhelmingly on Natural sciences, Engineering and Health. Less attention, it seems, has been paid to the role of the Social sciences, Arts and Humanities. In those cases where Social sciences, Arts and Humanities fields have been included in interdisciplinary research teams, they have been – for the most part –relegated to the position of finding ways to make science more accessible to policymakers and the public (Barry *et al.*, 2008) or creating linkages between science and society (Jasanoff, 2004). The data provided here suggests that this role has not been adopted homogeneously across the Social sciences, Arts and Humanities. Rather, some fields have embraced interdisciplinarily more than others. To be sure, the data reported here has limitations, resulting in at least three important consequences. First, the fact that

the search was conducted via keywords means that work was only identified as 'interdisciplinary' if the author(s) specifically invoked particular keywords. The selection of keywords is certainly targeted as authors choose words most appropriate to their own specific research area (Becher and Trowler, 2001). Therefore keyword selection itself is bound by disciplinary practice. As Barry *et al.* (2008) point out: "Disciplines discipline disciples." By choosing to invoke (or not) specific language in keywords and abstracts authors assist the construction and re-construction of disciplinary boundaries and practices, thus structuring their research fields (Foucault, 1969). Such structuring seems evident over time with some disciplines maintaining concern (e.g. Sociology and Social Work), others showing a developing interest (e.g. Psychology and Library and Information Sciences) and still others maintaining little interest (e.g. Political Science and Philosophy).

A second consequence of the data collection process was that some disciplines were intentionally omitted. For example, both Anthropology and Geography were both intentionally left out of the work because they are 'bridging' disciplines (Youngblood, 2007). The considerable heterogeneity within these fields made them poor examples for the keyword-based search conducted here. Because these disciplines claim inherent linkages (and sometimes cleavages) between natural and social processes (Youngblood, 2007), they would certainly require separate examination using an alternative research method. The final important consequence of this study's methods was the challenge of identifying interdisciplinary work that did not self-identify by using those words. Others have addressed this challenge by examining specific research fields (Barry *et al.*, 2008), training practices (Rhoten *et al.*, 2006) or groups of practicing researchers (Klein, 2008). However the broad sweep of the work reported here identifies that, within the Social sciences, Arts and Humanities, there are indeed some disciplines that might form the central core of being interdisciplinary. This finding suggests that those disciplines, due to their interdisciplinary experiences, might be best situated to link across ontological divides (Barry *et al.*, 2008) and epistemological divides (Garvin, 2001) to engage in interdisciplinary work with researchers in other fields such as Science, Medicine, Health and Engineering.

CONCLUSION

The work reported here is part of a larger research program examining interdisciplinary research practices in connecting Social science, Arts and Humanities researchers with those in Science, Health, Medicine and

Engineering. As the first broad sweep at the field, the research concludes that there has indeed been an increase in peer-reviewed, academic journal articles self-identifying as interdisciplinary over time. This pattern appears both across broad research fields (Social sciences, Health, Medicine) as well within the disciplines in Social sciences, Arts and Humanities. When compared, researchers in Social sciences, Arts and Humanities self-identify as 'interdisciplinary' at a much higher rate than those in other fields. And within Social sciences, Arts and Humanities there are some disciplines that have continually self-identified as interdisciplinary at a greater rate than others. Within the context of linking broad research fields such as Arts with Science, Humanities with Engineering, or social scientists with health/medicine researchers, this findings suggests that some disciplines (such as Sociology and Social work) might be more practiced in engaging interdisciplinary work as opposed to others and therefore better situated to begin additional work across broad research fields.

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