

Haddow, G. 2015.

Research Classification and the Social Sciences and Humanities in Australia: (Mis)Matching Organisational Unit Contribution and the Impact of Collaboration

Abstract

The capacity to recognise the contribution of individual researchers and their organisational unit is likely to be at odds with the purpose of a national research assessment, due to the broader approach to identifying research strengths and its classification at disciplinary levels. The Australian research assessment exercise, Excellence in Research for Australia (ERA), is devised to determine research quality in this wider context. To explore the impact of research classification on the visibility of research contribution, this study analysed articles published by authors affiliated with two social sciences and humanities fields - 'education' and 'language, communication and culture'. Article classification was examined for agreement with the authors' affiliated organisational unit's field. The influence of national and international co-authorship on article classification was also examined. Articles were distributed across different classification categories and a substantial proportion did not match with the authors' organisational unit's field. National and international co-authorship by education-affiliated authors was found to be significantly associated with publishing outside their organisational unit's field. As the first investigation to focus on how research is distributed by the ERA's classification scheme when applied to journal articles by SSH authors, the study provides empirical evidence of the challenges involved in recognising the contribution of organisational units. This work builds on the existing literature relating to classification and research evaluation and has the potential to inform research managers of the complexities in setting strategic research priorities based on ERA outcomes.

Introduction

Research classification is a key component of assessing research at individual, institutional, national and international levels. The schemes used to classify research range from database subject headings (used extensively in bibliometric studies) and the names of assessment panels (disciplines or fields) responsible for evaluating research (as in the United Kingdom's Research Excellence Framework (REF)), to schemes devised specifically for the purpose (such as the OECD's *Frascati Manual* 2002). A classification scheme's effectiveness in research evaluation rests on its ability to provide reliable data, regardless of whether qualitative and/or quantitative assessment methods are used. In relation to quantitative methods of assessment, Glänzel and Schubert (2003: 357) state: 'The classification of scientific literature into appropriate subject fields is ... one of the basic preconditions of valid scientometric analyses'. Ideally, the data generated in research evaluation corresponds closely with the research and researchers' activities assessed. However, all classification schemes create artificial boundaries that rarely reflect the complexity of the subject content to which it is applied and most schemes allow only a limited number of classification categories to a single item, thereby losing the capacity to describe multidisciplinary content.

The *Australian and New Zealand Standard Research Classification* (ANZSRC) (Australian Bureau of Statistics 2008) is a highly structured scheme used to classify individual researchers and their research outputs for the evaluation of research at Australian universities; the Excellence in Research for

Australia (ERA) initiative. The ERA aims 'to identify and promote excellence across the full spectrum of research activity in Australia's higher education institutions' (Australian Research Council 2014a); that is, it takes the broad view of research in Australia and assesses research at the classification code level rather than by organisational unit. However, from a micro perspective, a researcher's classification should correspond with the classification of their research outputs, and the research outputs' classification should also correspond as closely as possible with a researcher's affiliated organisational unit. In this way a clear link between the contribution of researchers and their organisational unit can be demonstrated and, ultimately, recognised by their institution.

In the ERA, researchers who produce books and book chapters can select the most relevant classification for their outputs. However, the ERA is less flexible when it comes to classifying journal articles. An established list of journal titles with pre-assigned classification codes is used to classify articles (Australian Research Council 2012), so that an article's classification is dictated by the journal in which it is published. Butler (2001: 61) describes this as 'journal set classification as a surrogate for a publication's "true" field classification'. This mechanism of the ERA has the potential to influence the extent of agreement between journal article classification and the organisational unit to which an author is affiliated. There are consequences at the organisational unit and individual level if this mechanism results in research being assessed as belonging to a field outside the authors' affiliation. In an environment of increasing cost-cutting and competition for funding (Hurst 2015), organisational units need to demonstrate their contribution to the institution to ensure continued support. Anecdotal evidence suggests that institutions will direct funding, such as postdoctoral positions and small internal grants, and promote fields that are assessed as high quality. A result of which will be less support for fields that are not assessed in the ERA due to lack of research or assessed as low quality. In the latter case, organisational units affiliated with these fields may be perceived as primarily teaching units and the academics in those units will find it more difficult to develop a research career. This potential is the focus of interest in the study being reported here.

The study examined the articles published by researchers affiliated with organisational units in two social sciences and humanities (SSH) fields - 'education' and 'language, communication and culture' (fields defined by the ANZSRC) - and sought to determine whether the classification of researchers' articles aligned with their affiliation fields. These fields were selected to represent social sciences (education) and humanities (language, communication and culture) and was a purposive choice in that the study required organisational units with titles as closely aligned as possible with Field of Research (FoR) code titles. More broadly, SSH rather than science fields were selected because SSH in Australia has been the subject of much less research of this nature.

In addition to examining the affiliation aspect of the ERA's article classification mechanism, the study also investigated the influence of co-authorship. This component of the study was prompted by the drive by governments, funding agencies and institutions for researchers to engage in collaborative work, particularly at an international level. Collaboration, as reflected in co-authorship, involves two or more people sharing expertise and knowledge to produce a publication. This suggests that the authors are likely to have different expertise and knowledge to contribute to the publication and that may include expertise in a different field. A potential consequence is that the resulting publication will be published in a journal with an FoR outside of one of the affiliated authors' fields. To determine whether research classification of articles by the 'education' and 'language, communication and culture' authors differed for co-authored publications at national and international levels, the study also examined these subsets for correspondence between author affiliation and journal article classification.

Background

The Excellence in Research for Australia research evaluation exercise

In the ERA, a researcher can select between one and three ANZSRC FoR codes to represent their individual research interests and for research outputs other than journal articles. With few exceptions, a journal article will be assigned one, two or three FoR codes from a defined list of 'eligible' journal titles which are already classified with FoR codes. This method of applying a research classification to journals for national research evaluation appears to be unique to the ERA (Goldfinch and Yamamoto 2012). For example, New Zealand, while jointly responsible for the ANZSRC development, does not use the FoR codes in their research evaluation exercise, the Performance-Based Research Fund (2012); Norway pioneered the development of a two-tiered journal list in Europe, followed by Finland, Denmark and Flanders, but none apply classification at the journal level (Engels, Ossenblok and Spruyt 2012; Federation of Finnish Learned Societies 2014; Ossenblok, Engels and Sivertsen 2012; Schneider 2009); and the UK's REF does not use a journal list. Instead, journal articles are assessed by subject-specific panels aligned with 'Units of Assessment', regardless of the journal in which they are published (Research Excellence Framework 2014).

The assignment of FoR codes to journal titles in the *ERA Journal List* (2012) was carried out through a national initiative involving individuals, research groups, professional associations and the learned academies (Australian Research Council 2012). There have been several public consultation rounds for journals to be reviewed and added to the list, which comprises over 22,000 titles. Of these, less than 3.5% have been assigned a multidisciplinary code (MD), which allows researchers to make their own selection of codes for an article published in one of those journals. Some flexibility in article classification is also available for researchers to argue that over 66% of an article's content is outside the publishing journal's assigned FoR codes. There is no data to indicate what proportion of authors in the 2012 ERA took this approach.

When the ERA was first introduced, the journals were ranked and this mechanism of the ERA attracted a great deal of commentary and research. Journal ranking is no longer part of the ERA journal list. Comparatively less attention has been paid to the role of the research classification of journal articles. A handful of studies have investigated different aspects, such as authors' perceptions of the classifications assigned to their articles, journal scope statements and FoR codes, and the terms used in titles and abstracts of articles published in journals with a single FoR code (Bennett, Genoni and Haddow 2011; Genoni and Haddow 2009; Haddow and Noyons 2013). These studies have found that a journal's FoR codes are often not representative of its content or stated scope. In addition, a survey by the National Tertiary Education Union (Kwok 2013), which explored the impact of the ERA on universities and staff, noted problems relating to organisational units at institutions and the correspondence (or not) with FoR codes.

With some similarities to the research being reported here, a study by Bennett *et al.* (2013) focused on Australian educational research in response to the ERA results - in which it was assessed as being at below world standard. Over several papers the authors set out to produce a profile of educational research and researchers in Australia. They comment on the researchers from university organisational units outside of education schools and departments that carry out educational research (Bennett *et al.* 2013: 477), confirming Haddow and Noyons (2013) findings. The authors (Bobis *et al.* 2013) also analysed ERA submission data sourced from 13 Australian universities, finding that

researchers from education organisational units publish into FoRs across a range of fields. While the data is not disaggregated to indicate what proportion of journal articles contributed to the results, Bobis *et al.* (2013: 468) report that about 16% of the submissions to ERA 2012 by researchers from education organisational units 'contributed to fields of research outside of FoR 13-Education', highlighting the potential for organisational units to 'lose' research to other fields.

These findings, along with the National Tertiary Education Union report and the few studies that have explored the role of research classification in the ERA go to the primary question being asked in this research; that is, to what extent does a research classification assigned to journal articles correspond with the organisational unit affiliation of the authors.

Research Classification

Glänzel and Schubert (2003: 357) open their article with the statement: 'After many centuries of constructive but yet inconclusive search for a perfect classification scheme, the only sensible approach to the question appears to be the pragmatic one: what is the optimal scheme for a given practical purpose?'. The authors could be referring to the *Frascati Manual*, first published in the 1960s (Organisation for Economic Co-operation and Development 2002), the National Science Foundation's (NSF) scheme developed by Carpenter and Narin in the 1970s (Archambault, Beauchesne and Caruso 2011), Katz and Hicks' (1995) journal classification in the 1990s, or indeed the *Australian Standard Research Classification* (ASRC), based on the *Frascati Manual* and published in 1998 to classify research projects in Australia (Australian Bureau of Statistics). There are many more, varying in purpose and specificity of classification categories. Some are designed for particular disciplines, such as the *Health Research Classification System* used by the European Science Foundation (2014) and the *European Reference Index for the Humanities and Social Sciences* (Norwegian Social Science Data Services 2014). Others were developed to classify journals, such as the scheme developed by Katz and Hicks (1995: 106) to examine 'sectoral output and collaboration patterns', as well as interdisciplinary publishing, in UK scientific research. Many more have been designed to conduct bibliometric analysis at journal level (for example, Archambault, Beauchesne and Caruso 2011; Feeney and Bozeman 2005; Glänzel and Schubert 2003; Van Leeuwen and Calero Medina 2012; Waltman and Van Eck 2012).

Australians Paul Bourke and Linda Butler played a significant role in the research conducted into classification of research for assessment purposes in the 1990s. These authors and Katz and Hicks (1995) had drawn on each other's work in the previous decade in their similar aims to explore research activity in Australia and the UK, respectively. Bourke and Butler mapped the Institute for Scientific Information (ISI) categories of the *Science Citation Index* (SCI) to the ASRC fields to examine the 'correspondence between the designations of departments and the designations of the fields and subfields to which members of these departments contribute through their publications' (1998: 711). They argued that organisational unit names should be avoided as categories in a classification scheme for research assessment, finding that at 'the very least, 20% of publications in a field come from departments outside that field, and the figure can be as high as 84%' (1998 : 716). This research was concerned with the broader perspective; that of the full body of Australian research in a field. Taking this view, and predicting the ERA mechanism, Bourke and Butler suggested 'the most useful approach ... are Field of Research (FOR) and subfield classifications based on journal sets' (1998: 718). Although they note 'Journals do not coincide precisely with fields and subfields of science and care must be taken about boundaries and overlaps' (Bourke and Butler 1998: 713), the authors did not raise the related and important issue that journal content may not be reflected accurately in a journal's classification.

This is a point noted, however, by Archambault, Beauchesne and Caruso (2011: 69) in their list of limitations to journal-level classification schemes; stating 'subject delimitations based on journal classifications are likely to contain articles that have a weak relation with the target subject'. In addition to the problems of article correspondence with a journal's classification, the authors comment on the difficulty of classifying interdisciplinary research and that many schemes lack criteria for how categories are assigned to journals. Pertinent to the ERA's mechanism, they ask: 'What guides the selection of one category in one case and more than one category in another?' (Archambault, Beauchesne and Caruso 2011: 71). In fact, in developing their own scheme, the authors borrowed from a number of schemes, including the NSF's, Web of Science (previously ISI) and one category from the ANZSRC's FoR structure.

On the matter of matching or mis-matching institutional unit (such as department, school or institute) to the classification used by university ranking exercises, Robinson-García and Calero-Medina (2014: 1956) argue that this 'usually leads to misinterpretations by media and research policy makers'. An alternative scheme that more closely matched an institution's structure would, they write, 'allow an attribution of the performance of a given university in a particular field to researchers assigned to the units related to such field'. The National Tertiary Education Union's report into the impact of the ERA raises a similar point, with one participant is quoted as saying: 'For every journal that they publish in outside of our department, it's not helping us' (Kwok 2013: 35). The FoR code mechanism was also noted as an issue for multidisciplinary research, in that content did not 'match well against a limited number of FoR codes' (Kwok 2013: 34).

Returning to Glänzel and Schubert's (2003) remark, a classification scheme must be fit for purpose. The purpose of the ERA is to assess research fields at an institutional and national level, however, a number of other classification schemes would achieve that same purpose. No other national research evaluation exercise appears to have implemented the highly structured mechanism that is manifested in assigning FoR codes to journals (and researchers) and this paper is exploring whether the mechanism will produce results that, at the institutional level, will drive other agendas. It is a question that deserves asking because, despite their recommendations for a scheme such as that used in the ERA, Bourke and Butler (1998: 718) acknowledged: 'Universities will, of course, always have important grounds for wanting to study departments'.

Collaboration

Another important agenda for Australian research is to increase international collaboration. It is a key target at the national level and parallels that of many countries and funding agencies elsewhere (Association of Universities and Colleges of Canada 2009; Australian Research Council 2014b; Fogarty International Center 2014; House of Representatives Standing Committee on Industry, Science and Innovation 2010; Universities UK 2008). International collaboration has been the subject of inquiries and reports in Australia, with extensive work underway to measure collaboration by Australian scientists (Commonwealth of Australia 2010; Office of Chief Scientist 2012). Using data from databases, such as Web of Science, the focus has been on scientific research and to date very little is known about collaboration by Australian researchers in SSH.

A substantial body of literature about international research collaboration exists, with modern-day studies emerging in the 1970s (De Bellis 2009: 268). This work comes with a diverse set of definitions of research collaboration, ranging from staff and student exchange (van Raan 1997) to projects in which the collaborators work together throughout and produce co-authored papers (Katz and Martin 1997). Co-authorship is the most often used proxy by researchers examining collaboration

patterns because, as Wagner (2008: 12) notes, co-authored publications are the 'traces' that are left behind by a collaboration. There are limitations to using co-authorship as a proxy for collaboration, some conceptual, such as authorship reflecting actual contribution, and others technical, such as the availability and reliability of author affiliation data in major indexing sources (Bordons and Gómez 2000: 200). However, as a method of analysis, co-authorship continues to provide an accessible quantitative approach for researchers to examine collaboration.

Co-authorship by authors affiliated with two or more countries is equated with international research collaboration (pioneers are Frame and Carpenter 1979; Luukkonen *et al.* 1993; Schubert and Braun 1990), and co-authorship studies have found a rapid increase in international research collaboration since the 1950s (Beaver 2001; Wuchty, Jones and Uzzi 2007). According to a UK report, Australia has experienced an average growth in international collaboration of 162% between 1996 and 2005 (Universities UK 2008). Two Australian sources note that about 40% of research outputs involve international collaboration; the earlier study did not disaggregate the data by fields (Biglia and Butler 2009: 10) and the later report did not include social science and humanities publications (Office of the Chief Scientist 2012: 140). In the area of Australian educational research, Bennett *et al.* (2013: 487) found that 49.4% of a sample of 504 had been involved in international collaboration, although this was not specified as co-authorship.

That international collaboration differs across fields is widely accepted, at least since Frame and Carpenter developed three rules, one being: 'the more basic the field, the more international collaboration' (1979: 481). To some extent, the nature of scholarly communication practices in different fields explains why collaboration varies (Hicks 2005), but the many different approaches to bibliometric analyses of collaboration make it problematic to draw specific conclusions about collaboration across SSH fields. A general finding is evident however; that humanities demonstrate the lowest levels of collaboration and more collaboration occurs in the social sciences, although this differs according to the field. In their study of Spanish publications, Bordons and Gómez (2000: 203) found that SSH had the lowest proportion of co-authored papers at national and international levels and the highest rate of sole-authored papers, compared with science fields. Puuska, Muhonen and Leino (2014) separated social sciences from humanities in their analysis of Finnish publications and found humanities had the most sole authored papers. The same results were reported in a study looking at geographical distance and collaboration by European researchers (Hoekman, Frenken and Tijssen 2010). When international collaboration in SSH was examined for Canadian authors, humanities was again found to engage in less collaboration than social sciences (Larivière, Gingras and Archambault 2006). Moreover, humanities collaboration increased at lower rates than social sciences and science fields over the publishing period analysed, 1980-2002. The study compared different SSH fields, finding 73% of psychology publications and 55.9% of 'economics and management' were international collaborations. In other fields, including education, less than 50% of publications were co-authored with an international partner. 'History' had the highest international collaboration for the humanities fields, at 12.2% (Larivière, Gingras and Archambault 2006: 525). Abramo, D'Angelo and Murgia's (2014) analysis of Italian researchers found 'psychology and pedagogy' faculty collaborated (nationally and internationally) at higher rates than those in the field of 'economics and statistics'. These authors were specifically interested in academic level of collaborating authors and their results showed that full professors in 'psychology and pedagogy' were engaged in more international collaboration than their junior colleagues. Recent studies of Chinese SSH collaboration (Ma, Li and Chen 2014) and SSH co-authorship in Flanders (Ossenblok, Verleysen and Engels 2014) did not differentiate between national and international co-authorship. However, each study arrived at findings that are similar overall to those discussed above. Ma, Li and Chen

(2014) reported that collaboration in humanities fields, such as art and literature, was less than 15%, while co-authorship in the social science fields of education and psychology was evident in 38% and 85% of publications, respectively. The study of collaboration in social sciences and humanities in Flanders (Ossenblok, Verleysen and Engels 2014) included book chapters with articles in the sample and found collaboration had increased in social sciences and humanities over an eleven year period. Surpassing the findings of other studies are the results for co-authorship in education (84%) and psychology (95%).

The study being reported here is the first Australian investigation to focus on how research is distributed by the classification applied to journal articles by authors in SSH fields. It is important because classified 'fields' are ranked for research quality by the ERA and some of these fields can, and do, correspond with named organisational units. In addition, the study examined how research classification is distributed in collaboratively authored outputs by comparing the classification of sole-authored, national co-authored, and international co-authored publications.

An important outcome of the study is in its potential to provide a better understanding of how effectively the ERA classification mechanism applied to journal articles identifies research strengths of organisational units. These findings will inform research managers about the reliability of using ERA outcomes when making strategic decisions for their institution. As well, the study's results will contribute to the currently limited body of literature about research collaboration in two SSH fields.

Methodology

The study was conducted using bibliometric research methods to examine the classification of journal article publications by authors affiliated with a specific organisational unit. Quantitative data analysis, using functions of Excel, was undertaken to generate descriptive statistics. In addition, Chi-squared tests were used for a comparison of the categorical variables and differences were considered statistically significant when the *p* value was <0.05. The statistical analyses were conducted using Stata 12 (StataCorp LP 2014).

Two fields that are core to SSH were selected for the study after browsing university web pages to identify named organisational units that corresponded with research classification fields. Whereas almost all the Australian institutions have a named department or school of education, many of the humanities FoR titles did not correspond to the names of university departments and schools. The humanities-aligned FoR title that was represented most often as an organisation unit was variations of 'language, communication and culture'. These two fields align with the research classification FoR codes 13 (Education) and 20 (Language, Communication and Culture), respectively. Under the two-digit FoR code for Education (13), there are subdivisions: 1301 – Education Systems; 1302 – Curriculum and Pedagogy; 1303 – Specialist Studies in Education; and 1399 – Other Education. The subdivisions under the two-digit FoR code for Language, Communication and Culture are: 2001 – Communication and Media Studies; 2002 – Cultural Studies; 2003 – Language Studies; 2004 – Linguistics; 2005 – Literary Studies; and 2099 – Other Language, Communication and Culture. Given the previous research findings about collaboration patterns in social sciences and humanities, it was anticipated that there would be more co-authorship in publications affiliated with education departments than in publications affiliated with the more humanities aligned language, literature and culture departments.

A sample of universities with a department or school named 'education' and a department or school titled with two or three of the terms 'language, communication and culture' was required for the study. Firstly, the list of all universities was divided into three groups representing different types of Australian institutions: the Group of Eight (go8 - generally older and research-intensive universities); Australian Technology Network (ATN - originally technical colleges with strong links with industry and a focus on practical courses); and Innovative Research Universities (IRU – established in the 1960s and 1970s as research universities). Secondly, the universities' web pages were searched to identify those institutions with named organisational units closely aligned to the two FoR division codes 13 and 20, and had staff publications lists readily available. A random number generator was used to select one institution from each of the groups, which provided three departments/schools of education and three departments/schools of language, communication and culture, from a possible 11 institutions, for the analysis.

The bibliographic details of journal articles published by academic staff (at associate professor and professor levels) affiliated with the organisational units over the previous five-year period (2009-2013) were copied into an Excel spreadsheet. The decision to include only associate professors and professors was based on the assumption that academics at this level would be expected to have a strong publishing record. For this reason, adjunct, honorary and emeritus staff were excluded because their status is an association, rather than employment, with a university. The time frame for publication was selected because it approximates the period included in an ERA assessment round. Publications that clearly indicated they were book reviews or letters to the editor were excluded from the analysis.

The *ERA 2012 Journal List* (Australian Research Council 2012) was consulted to identify the FoR code(s) assigned to the journals in which the authors had published. FoR codes were counted proportionally for each article according to the number of FoR codes assigned to the journal in which it was published. That is, for an article in a journal assigned a single FoR code the research classification code was counted as 1; for an article in a journal with two FoR codes the research classification codes were each counted as 0.5; and for articles in journals with three FoR codes the research classification codes were counted as 0.33. In the process of recording FoR codes, the articles that were published in ineligible journals for an ERA assessment (those not on the List) were noted. The articles in ineligible journals were excluded from the FoR code distribution analysis.

Subscription databases and other web sources were searched to determine the affiliation of co-authors of articles, either with national or international institutions. If one co-author on a paper with two or more authors was affiliated with an international institution the publication was counted as 'international'.

Data for each organisational unit were analysed separately to establish the distribution of research classification for that group of authors. The analysis aggregated all four-digit FoR codes to the two-digit FoR code level and was applied to all publications, all co-authored publications and its subsets national and international co-authored publications. To examine whether sole authorship and co-authorship at national and international levels influenced the distribution of research classification on a wider scale, all data for the 'Education' organisational units were included and analysed for statistically significant differences. The same analysis was carried out for all data relating to the 'Language, Communication and Culture' publications.

Results

Table 1 presents the findings for each organisational unit examined in the study. It lists the number of associate professor and professor authors from each unit and the total number of articles published by them between 2009 and 2013. Both the number of authors and the number of articles per author varies across the organisational units. The number of authors is a reflection of the size of the unit, while the articles-per-author is a measure of productivity. However, this calculation does not take into account the authors' other publication outputs such as book chapters, books and conference papers and is not included in the table. The numbers 1, 2 and 3 represent organisational units at a research intensive university (go8), an ATN, and a research university (IRU), respectively. Although the research universities tend to publish more overall, this appears to be related to their staff numbers rather than productivity. When articles per author is analysed for the organisational units the results are: ED1 7.3; ED2 9.8; ED3 9; LCC1 6; LCC2 5.4; and LCC3 8.5.

Of the total articles published by an organisational unit, a smaller number were eligible for assessment in the ERA. The research intensive university is particularly affected by the ERA mechanism that limits eligible journal publications, with over 25% of its 'education' and 'language, communication and culture' articles excluded from assessment.

Table 1. Article publications by organisational unit, eligibility for ERA assessment, and collaboration

Org. unit	Authors	Total pubs.	ERA pub.		Sole auth.		Nat. co-auth.		Int. co-auth.	
			% total pubs.		% ERA pubs.		% ERA pubs.		% ERA pubs.	
			#	%	#	%	#	%	#	%
ED1	18	132	98	74.2	18	18.4	57	58.2	23	23.4
ED2	6	59	49	83.0	13	26.5	22	44.9	14	28.6
ED3	17	153	130	84.9	35	26.9	86	66.2	9	6.9
LCC1	11	66	51	72.3	32	62.7	11	21.7	8	15.6
LCC2	9	49	40	81.6	31	77.5	3	7.5	6	15
LCC3	8	68	52	76.5	28	53.8	12	23.1	12	23.1

In terms of authorship, 'Education' organisational units demonstrate a high degree of national collaboration in their article publications than their colleagues in 'Language, Communication and Culture' units. For each 'education' unit, the highest proportion of articles was co-authored at a national level. The findings also indicate that at two of these institutions (1 and 2), there was a higher proportion of internationally co-authored than sole-authored publications. 'Language, Communication and Culture' authors displayed a different publishing pattern, and one that tends to reflect the norm for humanities fields, with the highest proportion of articles being sole authored. At two of the institutions (2 and 3) the international co-authorship is equal to or greater than the national co-authorship.

In the following figures, the distribution of research across classification codes is presented for the 'Education' results for each institution, followed by the 'Language, Communication and Culture' analyses. These figures include the findings for the full set of ERA eligible publications, and the FoR codes distribution for sole authored, all co-authored, national co-authored, and international co-authored articles by researchers affiliated with the organisational unit.

Education organisational affiliation publications

At institution 1, the classification scheme distributes the education-affiliated articles over 11 different fields, however the ‘Education’ FoR is strongly represented across all publication sets. Only minor differences are evident in the distribution of ‘Education’ codes between sole authored and co-authored articles; 67.6% and 60.8% respectively. A feature of all the co-authored publication sets is ‘Psychology and Cognitive Sciences’, with between 11-15% of the articles distributed to this classification. This is in contrast to the sole-authored publications, to which ‘History and Archaeology’ is proportionally assigned at over 10%. There are also differences in research classification distribution between national and international co-authorship, with the national collaborators publishing into ‘Medical and Health Sciences’ and ‘Language Communication and Culture’, while the international co-authored articles are distributed into ‘Philosophy and Religious Studies’ and ‘History and Archaeology’.

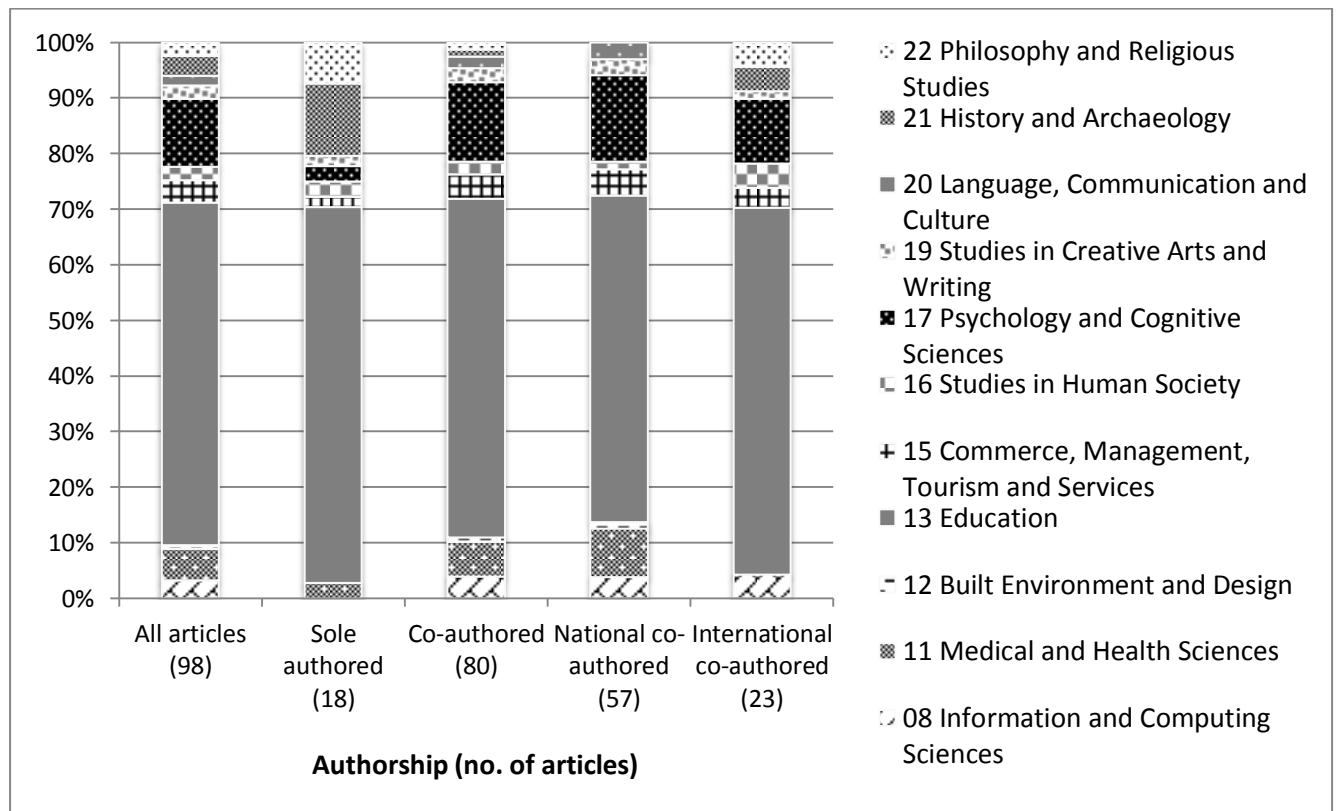


Figure 1. Institution 1: Research classification distribution of Education-affiliated author articles.

In the second university, the journal articles were distributed across a different range of research classification codes. At this institution, authors published into ‘Multidisciplinary’ (MD) journals, which can be reclassified as ‘Education’ by an author for ERA assessment. There is also strong publishing into ‘Language, Communication and Culture’ across each publication set, however this classification is distributed at a lower level for sole-authored publications. Conversely, it is the sole-authored publications that make up the ‘Studies of Human Society’ classification. While ‘Education’ is the dominant research classification for sole authored articles, it is a considerably smaller proportion of the international co-authored publications, in which ‘Psychology and Cognitive Sciences’ represents the largest distribution of research classification.

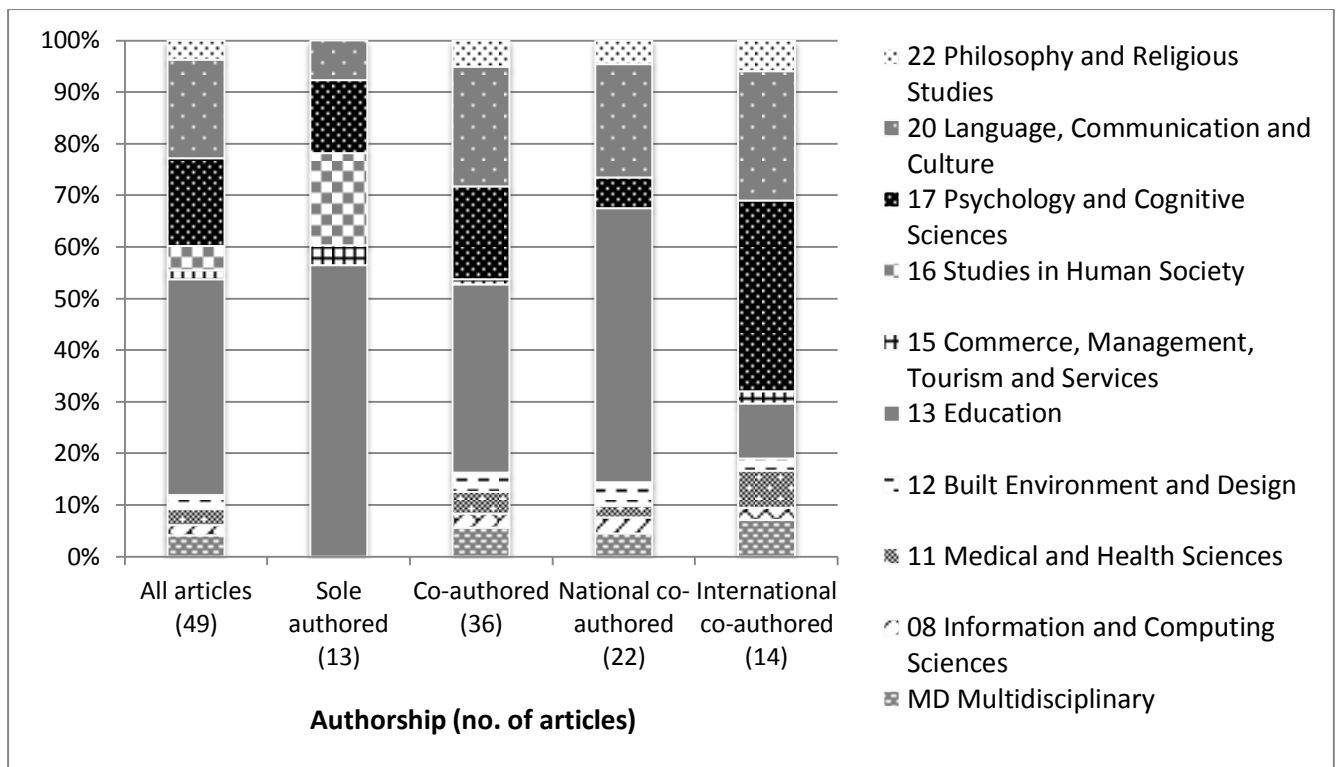


Figure 2. Institution 2: Research classification distribution of Education-affiliated author articles.

The publications by authors affiliated with the education unit at the third university are strongly focused in journals classified with the ‘Education’ code. A feature of this set of publications is the relatively dominant classification of ‘Commerce, Management, Tourism and Services’ to publications, particularly in the international co-authored articles. However, only nine articles comprised this set. A very small proportion of the publications have been distributed into the ‘Multidisciplinary’ classification, and these were for national co-authored papers. Compared with institutions 1 and 2, these authors’ articles indicate less publishing into journals with the ‘Psychology and Cognitive Sciences’ classification. In addition, the international co-authored publications differ in that there are fewer classification codes distributed to than the number of codes for national co-authored articles. Institutions 1 and 2 had a wider distribution of classification in their international co-authored articles.

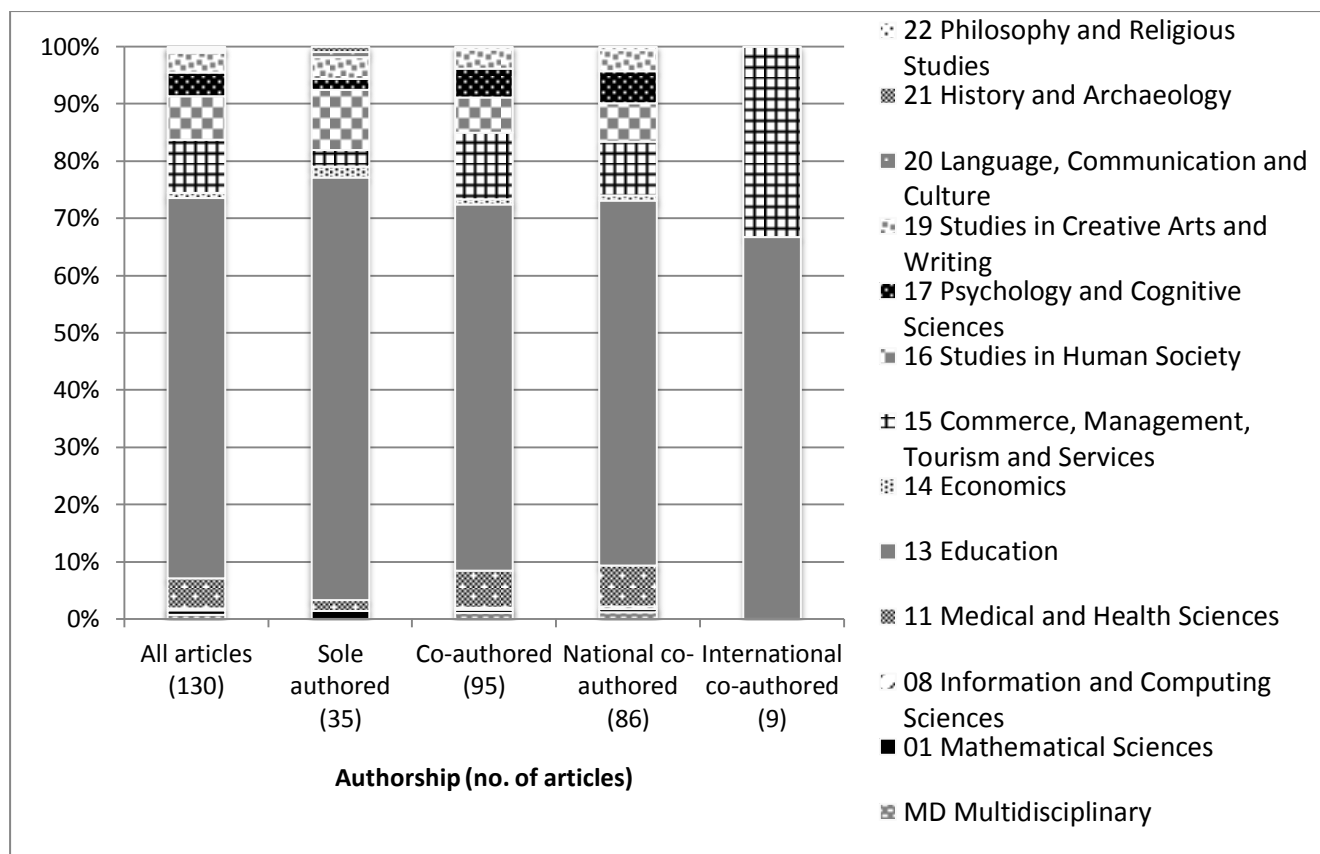


Figure 3. Institution 3: Research classification distribution of Education-affiliated author articles.

Across the three institutions, journal articles have been distributed into 12 different classification codes. The number of codes for each institution is presented in Table 2. Also noted in the table is the percentage of the distribution into the organisational units’ affiliation code – education. Described as ‘in area’, these numbers have been calculated by adding the ‘Multidisciplinary’ classification to the ‘Education’ classification, on the assumption that the ERA allows authors to select an FoR code for ‘Multidisciplinary’-classified outputs and that researchers associated with an education unit would select a 13 FoR code.

Table 2. Distribution of education-affiliated articles to FoR codes

Org. unit	All articles	Sole authored articles	Co-authored articles	Nat. co-authored articles	Int. co-authored articles
	# codes / % ‘in area’*	# codes / % ‘in area’	# codes / % ‘in area’	# codes / % ‘in area’	# codes / % ‘in area’
ED1	11 62%	8 68%	11 61%	9 59%	8 66%
ED2	10 46%	5 56%	9 42%	8 57%	7 18%
ED3	13 68%	10 74%	11 65%	11 65%	2 67%

* ‘in area’ combines ‘Education’ and ‘MD’ classification

The data for all three institutions’ outputs were aggregated and analysed to determine whether authorship types, co-, national and international, was associated with publishing in or out of area.

These statistical analyses, cross tabulations and Chi-squared tests, were conducted using Stata 12 (StataCorp LP 2014) and used to compare the categorical variables ‘in’ or ‘out’ of area, and authorship type, with differences considered statistically significant when the p value was <0.05 . Due to the relatively low numbers in the cells, the results of the analysis should be treated with some caution. Although not emphatic, significant differences were found for the likelihood of publishing out of area in relation to sole authorship, national and international co-authorship. At $p=0.048$ (Pearson $\chi^2=6.0766$), the results suggest that publishing out of area is more likely with national co-authorship and to a lesser extent international co-authorship. When the categorical variables in or out of area and with or without an international co-author were tested, statistically significant results were found ($p=0.037$, Pearson $\chi^2=4.3431$), showing publishing in area is more likely without an international co-author. Although not statistically significant, at $p=0.073$ (Pearson $\chi^2=3.2224$), the analysis suggested the reverse is associated with sole authorship; that publishing in area is more likely for articles that are sole-authored.

Language, communication and culture organisational affiliation publications

The same analysis was performed for the language, communication and culture organisational units. At university 1, a sizeable proportion of publications were classified by the ‘Multidisciplinary’ code, as well as their own classification of ‘Language, Communication and Culture’. Publications have also been distributed into the ‘Studies in Human Society’ and ‘Education’ classifications, with the latter comprising the largest proportion of classifications for international co-authored articles. For all co-authored publication sets, there is less distribution into the classification associated with their organisational unit than to ‘Studies in Human Society’ or ‘Education’.

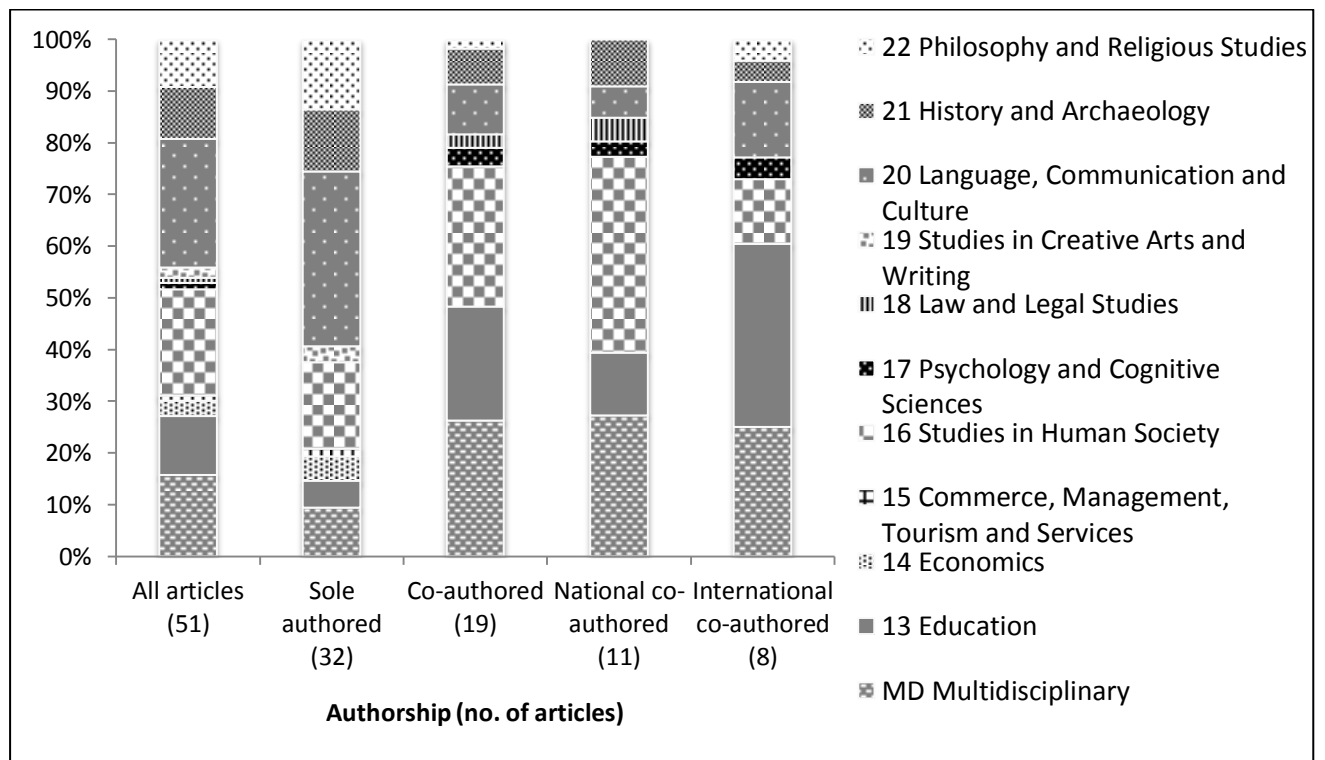


Figure 4. Institution 1: Research classification distribution of Language, Communication and Culture-affiliated author articles.

The associated classification, ‘Language, Communication and Culture’ is represented at higher proportions for the articles published by the second university. This is especially evident for the national co-authored papers, in which the only other classification is ‘Studies in Creative Arts and Writing’. However, these results are likely to be related to the very few articles (3) that had national co-authors. The distribution of classification codes for this organisational unit presents a quite different profile to that of university 1, with the inclusion of ‘Information and Computing Sciences’ and higher distribution to ‘Studies in Creative Arts and Writing’, but no ‘Multidisciplinary’ classification of publications. For the articles with international co-authorship, their own field is distributed to in a substantially smaller proportion than other classifications.

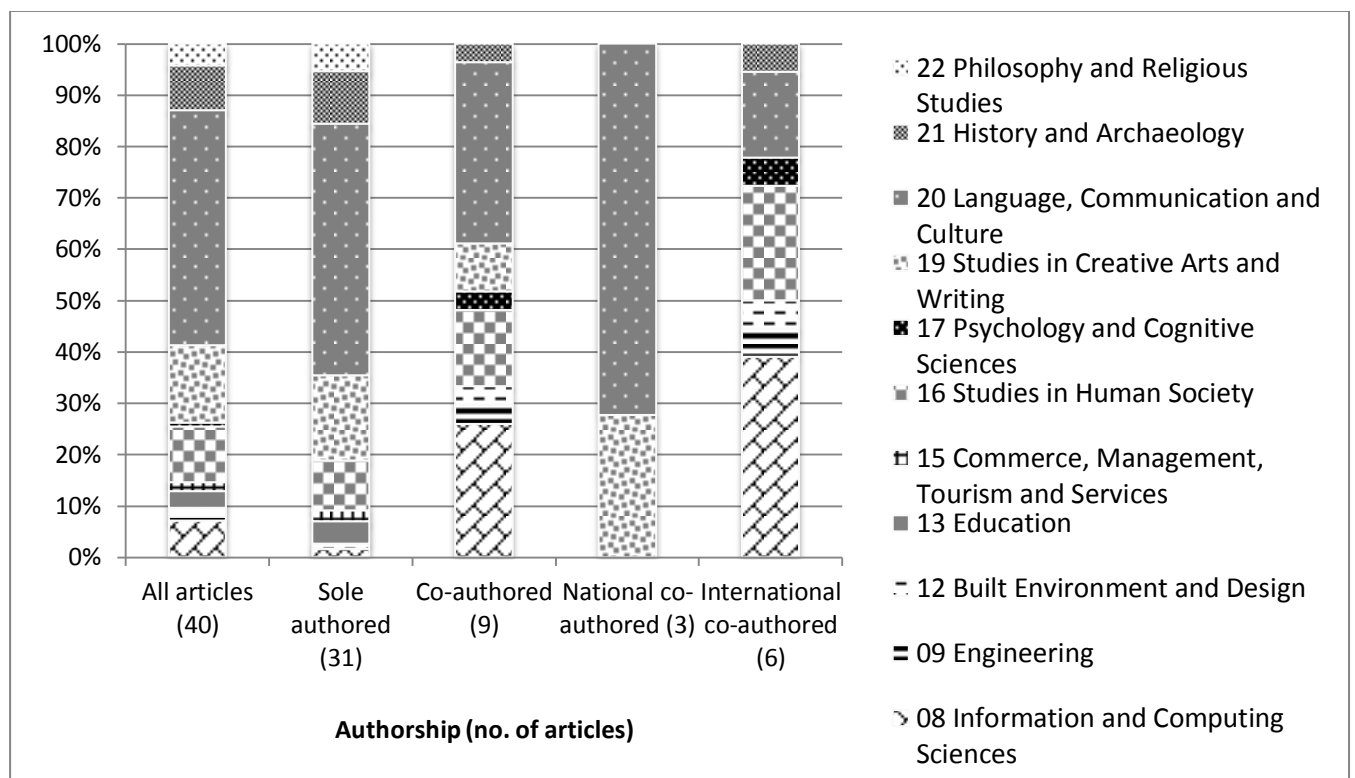


Figure 5. Institution 2: Research classification distribution of Language, Communication and Culture-affiliated author articles.

Like university 1, the research classification of articles by language, communication and culture authors at university 3 is distributed quite strongly, and uniformly, into their own classification. However, in these publication sets, the classification ‘Psychology and Cognitive Sciences’ is also represented, and for the sole-authored and national co-authored publications this distribution is in similar proportions (about 20%). On the other hand, ‘Studies in Human Society’ is represented in much lower distributions than either of the other universities. Only sole-authored publications are distributed into the ‘Law and Legal Studies’ classification, and co-authorship is associated with ‘Education’ classified publications, with no sole authored publications being classified in that field.

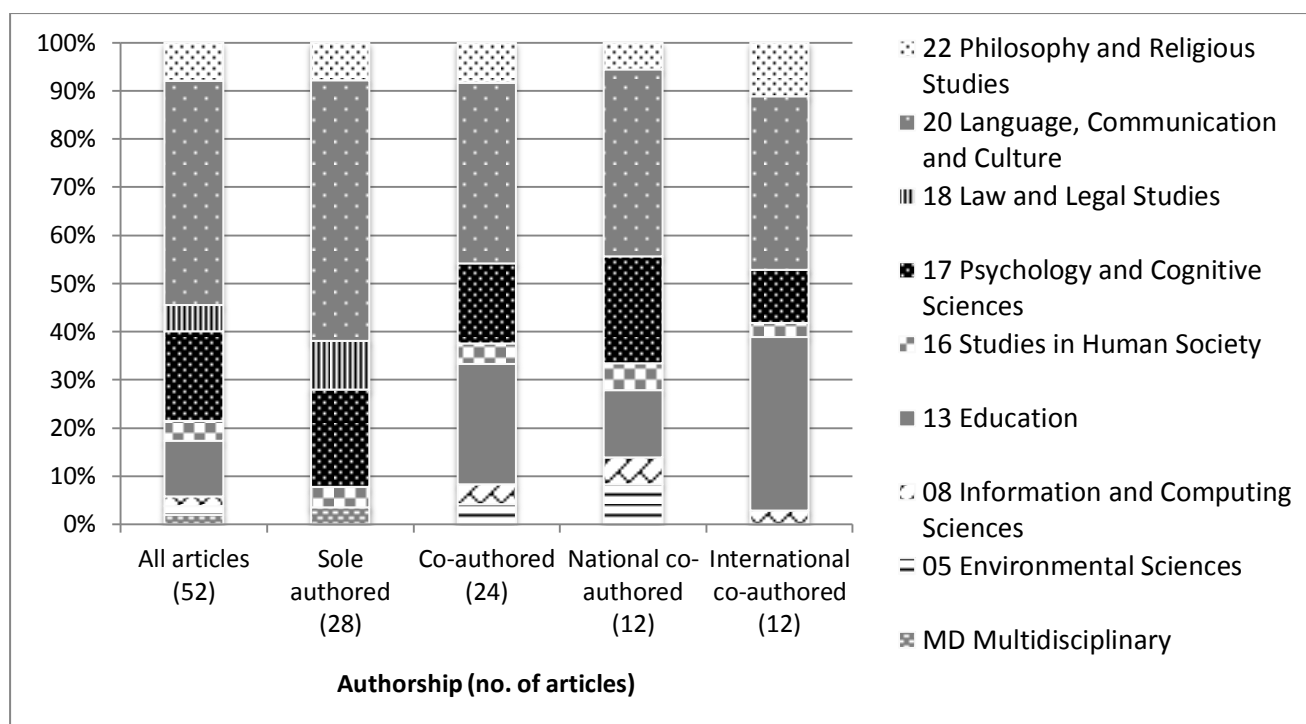


Figure 6. Institution 3: Research classification distribution of Language, Communication and Culture-affiliated author articles.

The figures presenting the findings for the language, communication and culture publications differ in an important way from the education publications, and that is the much lower level of agreement in terms of the distribution of classification codes to their affiliated organisational unit. Across the three universities' publications, there was distribution to 15 different classification codes. While this is only one code higher than the total distributed across the education publications, the number of article outputs by the language, communication and culture authors is almost half that of the education outputs (143 compared with 277). The number of codes to which publications were distributed is presented in Table 3, as well as the percentage of distribution to their own classification (20) combined with the 'Multidisciplinary' classification.

Table 3. Distribution of language, communication and culture-affiliated articles to FoR codes

Org. unit	All articles	Sole authored articles	Co-authored articles	Nat. co-authored articles	Int. co-authored articles
	# codes / % 'in area'*	# codes / % 'in area'	# codes / % 'in area'	# codes / % 'in area'	# codes / % 'in area'
LCC1	11 41%	9 43%	8 36%	7 33%	7 40%
LCC2	11 46%	9 49%	8 35%	2 72%	7 17%
LCC3	9 48%	6 58%	7 37%	7 39%	6 36%

* 'in area' combines 'Language, Communication and Culture' and 'MD' classification

The same statistical tests, cross tabulations and Chi-squared tests, were performed on the aggregated data for the language, communication and culture publications. There were no significant findings for

these publications when ‘in area’ and ‘out of area’ were tested against sole authorship, co-authorship, and national and international co-authorship. In relation to publishing in or out of area in relation to sole authorship, national and international co-authorship, the results found $p=0.368$ (Pearson $\chi^2=2.00$). The test for publishing in or out of area and with/out an international co-author found $p=0.211$ (Pearson $\chi^2=1.567$) and the results of the test for publishing in or out of area and sole authorship found $p=0.195$ (Pearson $\chi^2=1.6772$).

Discussion

The range of fields to which articles are distributed by the ERA mechanism varies between institutions and by affiliation unit, but overall the scatter of articles across different FoR codes was substantial. Articles by the education affiliated authors were distributed to between 10 and 13 codes and up to 54% of their work was classified in fields outside the ‘Education’ FoR. This is a marked difference to the findings of Bobis *et al.* (2013), who reported that about 16% of education authors’ work was distributed to fields outside their own. Slightly fewer codes were distributed to by the language, communication and culture articles, between 9 and 11, but a higher proportion (59%) was classified outside their FoR.

When all articles from the three universities’ language, communication and culture authors were examined, there was distribution to 15 different classification codes, compared with 14 codes for all the education authors’ articles. Given that the total number of articles by language, communication and culture authors was only 143, in contrast to 277 articles for education authors, the findings suggest that the ERA mechanism of allocating FoR codes to journals will result in varying classification distributions across different SSH fields.

It is reasonable to assume that, due to individual’s research interests, organisational units with the same or similar names will differ in research focus. This is clear in the findings, which show that education authors’ articles are distributed in sizeable proportions to the FoRs for ‘Psychology and Cognitive Sciences’, ‘Language, Literature and Culture’, ‘Studies in Human Society’ and ‘Commerce, Management, Tourism and Services’. For language, communication and culture publications, the distribution to other FoRs includes ‘Studies in Human Society’, ‘Studies in Creative Arts and Writing’, ‘Psychology and Cognitive Sciences’, and in lesser proportions to ‘Education’, ‘History and Archaeology’, and ‘Philosophy and Religious Studies’. The individual and organisational unit specialisations that may exist in the different institutions are likely to have influenced the findings of the study in relation to the extent and subject of publishing outside the unit’s affiliated field. However, the diverse set of classification codes to which articles are distributed and the degree to which they relate to other fields, potentially other organisational units, indicate that the ERA’s classification mechanism is unsuited to providing reliable data relating to the article outputs attributable to an organisational unit.

The pattern of FoR distribution differs again when the results for sole and co-authored articles are examined. Demonstrating what has been found in previous research (Hoekman, Frenken and Tijssen 2010; Larivière, Gingras and Archambault 2006; Puuska, Muhonen and Leino 2014), authors in the humanities (to which language, literature and culture aligns closely), are more likely to publish as sole authors than their peers in a social sciences field (education). On average, less than 24% of the articles by education authors were sole-authored compared with nearly 65% of the language, literature and culture articles. The initial selection of language, literature and culture to represent humanities is

supported in these findings. Education articles involving national collaborations comprised over twice the proportion of sole authored papers (56.4%), whereas language, communication and culture articles produced by national collaborations were, on average, 17.4%. Although the proportion of international collaborations by language, communication and culture authors was only marginally higher at 17.9%, it is notable that education articles involving international collaborations formed the smallest proportion, at 19.6%, within this field. It is possible that these results reflect one of Hicks' (2005) characteristics of social sciences; a focus on local, in this case national, issues. Due to common approaches to education in Australia, collaboration at a national level is more likely than working with authors from different education systems. The findings for international collaboration within the education field is considerably less than the 49.4% of Australian educational researchers that reported involvement in international collaboration in the study by Bennett *et al.* (2013), although this may be explained by the potentially broader interpretation of collaboration in that study. In general however, neither SSH field was involved in international collaboration at the same level as the sciences, as reported by the Office of Chief Scientist (2012).

For two of the education organisational units the classification 'Psychology and Cognitive Sciences' represented a substantial proportion of co-authored articles. At Institution 1 it was the national collaborations that produced the highest distribution (around 15%) to this FoR, whereas international collaborations were responsible for the highest proportion of 'Psychology and Cognitive Sciences' classification in the articles from Institution 2. With 37% of the classification codes from international collaborations being distributed to this field, it exceeded the classification distributed to the authors' own field of 'Education'. For Institution 2 the authors' own field, 'Education', comprised the third highest proportion of classifications in the international collaborations after Psychology and Cognitive Sciences' and 'Language, Literature and Culture'. However, the majority of national collaborations were distributed to the 'Education' code. The number of national and international collaborations at Institution 3 was vastly different (66.2% national and 6.9% international). For this institution the distribution to the 'Education' code was strong across all authorship types, with 'Commerce, Management, Tourism and Services' the only other code to which international collaborations were distributed.

Although collaboration for the language, literature and culture authors was found to be lower than education, the number of classification codes to which articles were distributed is only slightly fewer. At Institution 1, a sizeable proportion of co-authored publications were classified in the 'Multidisciplinary' code. 'Studies in Human Society' represented the highest proportion of national collaborations and 'Education' comprised the largest proportion of international collaborations. These findings contrast with Institution 2, which, with a smaller set of articles, saw strong distribution of national collaborations to the authors' own field - 'Language, Communication and Culture'. There were seven classification codes to which the international collaborations were distributed and of these 'Information and Computing Sciences' formed the highest proportion. At Institution 3, there is almost uniformly strong distribution across all authorship types to the authors' field 'Language, Communication and Culture'. However, 'Psychology and Cognitive Sciences' is strongly represented in the national collaborations and 'Education' is distributed to in the same proportions as 'Language, Communication and Culture' in the international collaborations.

Given that the Australian government is encouraging research collaboration (Australian Research Council 2014b), from which article publication is a common output, the application of the classification mechanism creates further complexity in attribution of research strengths. In both SSH fields included in this study, collaboration influences the FoR codes to which articles are distributed and in many cases these classifications are not the field associated with the authors' organisational

unit affiliation. The results were particularly marked for education co-authored articles, with statistically significant findings for publishing 'out of area' when collaboration was involved.

There is potential for conflicting research strategies for organisational units and individuals. On the one hand Australian researchers are being encouraged to engage in research collaboration, but in doing so an organisational unit may 'lose' research to a field other than their affiliation in an ERA assessment. While the ERA does not assess research at the organisational unit, the instinct to make connections between units and assessments (based on FoR codes) is natural. There is nothing inherently wrong with the ANZSRC classification, other than minor issues with the structure and content of some divisions. The problem is in its assignment at a journal level and the way in which this was carried out. In the initial assigning of FoR codes to journals, no analysis of article content or affiliation to authors' organisational unit, such as the system in Flanders (Engels, Ossenblok and Spruyt 2012), was performed to ensure clear connections between the classification scheme and the research to which it was being assigned.

The ERA's classification mechanism results in both SSH fields appearing to be multidisciplinary, seen in the range of FoR codes to which the fields' articles are distributed and evident in articles with all types of authorship, sole or collaborative. It is possible that the level of multidisciplinary found in this study differs in practice when institutions make ERA submissions. That is, if articles are assigned larger or smaller percentages to the associated journals' FoR codes than the equal apportioning used here, the extent of distribution to different codes may be reduced.

The results of this study are indicative of how the ERA's research classification mechanism influences the distribution of articles to FoRs. While the findings clearly show that research will be widely distributed to FoRs outside those related to an author's affiliated organisational unit, several aspects of the study may have impacted on these results. As noted above, the equal apportioning of FoR codes to articles may not occur in an ERA submission. In addition, the institutions that were included in the study may not be representative of the Australian higher education sector as a whole. The number of institutions and SSH fields was limited for pragmatic reasons, primarily due to the extensive manual data collection methods required. To achieve a fully representative sample a similar study would need access to the data submitted by institutions in an ERA round. For practical purposes also, the study included article publications by professors and associate professors only. This parameter of the sample may have affected the results if the findings of Abramo, D'Angelo and Murgia (2014) were true of this study's authors - that full professors in the fields of 'pedagogy and psychology' are involved in more international collaboration than other positions. Further research using academic position as a variable would be required to determine if this was indeed the case for Australian education researchers.

Conclusion

A number of questions emerge from the findings of this study. Firstly, would the authors of the papers included in this research consider their work as belonging to their own field or attributable to another? The results of a previous study (Bennett, Genoni and Haddow 2011) suggest there would be substantial disagreement with the findings and that the authors, who are arguably the best judges of subject content, would consider a much larger proportion of their work as belonging to their own FoR. If institutional research priorities and support strategies are tied to ERA results, it could be expected that this disagreement would be strong. Secondly, will the classification of journals drive publication

behaviour? As authors become aware of the classification mechanism, there is likely to be an increase in submissions to journals that are classified with FoR codes aligned with the author's affiliated unit, as suggested by the quote: 'For every journal that they publish in outside of our department, it's not helping us' (Kwok 2013: 35). Again, this will be particularly important if institutions rely on ERA assessments to develop research management plans.

Returning to the research questions of this study, it is clear that for a sizeable proportion of the articles written by authors from two SSH fields the classification by FoR codes does not correspond with the authors' organisational unit name. In addition, co-authorship at national and international levels influences the distribution of articles to different classification fields. These findings are important in that they provide empirical evidence of the complexities involved when research strengths are identified in an ERA process and how these strengths relate to organisational units. For Australian higher education research managers, the study's results indicate that great care needs to be taken when aligning research strategies and support to fields identified as strong in the ERA because the ERA assessments can, as noted by Robinson-García and Calero-Medina (2014: 1956) result in 'misinterpretations by media and research policy makers'. On a broader level, the study calls into question the appropriateness of the classification mechanism as it is applied in the ERA. Its findings provide an opening for discussion and debate about alternative systems, of which there are a growing number, that will more accurately reflect research at individual and organisational unit level.

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