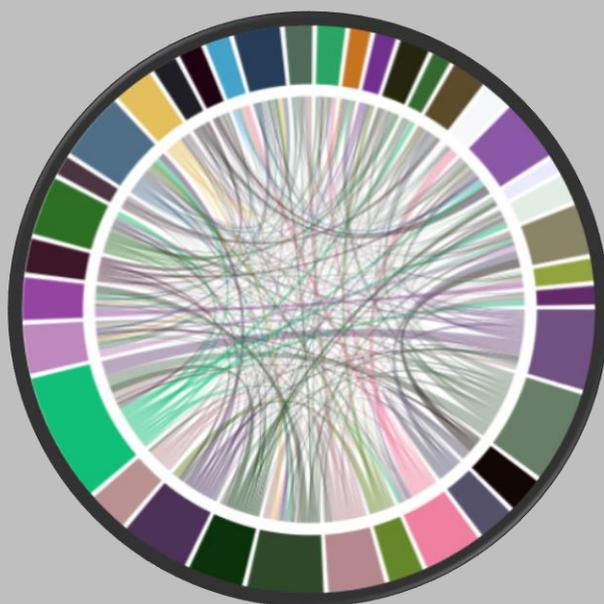


The Landscape of Educational Research in the UK (Compulsory and Post-compulsory)

Report to the British Academy and Royal Society

January 2021



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Executive summary	6
1. The study	11
1.1. Introduction	11
1.2. Research questions	11
1.3. Design and ethics	12
1.4. Bibliometric analysis	13
Journal articles - search strategy and dataset	13
Books and book chapters: search strategy and dataset	14
Data validation, cleaning, and analysis	15
1.5. Grant analysis	16
Dimensions data	16
Funders' websites	18
Data on UKRI-funded projects (Gateway to Research).....	19
Data on European Commission funded projects (CORDIS).....	19
Final dataset.....	20
Data analysis	22
1.6. Text mining methodology	22
Data retrieval	22
Data pre-processing	23
Clustering	25
Topic modelling.....	25
Methods and disciplines	29
Bibliographic information exploration.....	31
Limitations	31
1.7. Expert interviews and stakeholder workshops	33
Expert interviews	33
Stakeholder workshops	33
Analysis of interview and workshop data	34
1.8. Systematic review	36
Search strategy	36
Pre-processing	37
Inclusion and exclusion criteria.....	37
Piloting and calibration	38
Screening and final selection of studies.....	38

Coding and data extraction.....	40
Quality assessment	40
Narrative integration	40
2. Research funding	41
2.1. Volume of funding	41
2.2. Grant duration	45
2.3. Funding bodies	46
All research projects with UK participation (PI, CI, collaborator)	46
Co-funding	48
Research projects with UK-based PIs.....	50
Countries of funding bodies.....	52
2.4. Institutions in receipt of research grants.....	53
Number of grants per institution	53
Volume of funding per institution	56
Collaborations between institutions in receipt of grants	56
2.5. Grant funding amount for different topics.....	58
2.6. Quality-related funding allocation	62
2.7. UKRI Funding vignette (research).....	63
UKRI funding for research projects wholly or partially in the field of education, 2010-20	63
2.8. EC/ERC Funding vignette (research).....	66
EC/ERC funding for research projects wholly or partially in the field of education, 2010-20	66
3. Research outputs	69
3.1. Publication volume	69
Journal articles	71
Books and book chapters.....	72
3.2. Open access	73
Journal articles	75
Books and chapters.....	77
3.3. Citations	78
Journal articles	80
Books and book chapters.....	82
3.4. Institutional affiliations of authors	85
Journal articles	86
Books and book chapters.....	87
Comparison across different types of publications	88
3.5. Co-authorship patterns among countries/regions	88
Journal articles	89

Books and book chapters.....	91
Comparison across different types of publications	94
3.6. Co-authorship patterns among institutions	95
Journal articles	96
Books and book chapters.....	98
3.7. Individual authors and their collaborations (journal articles).....	100
3.8. Funding bodies and collaborations	101
3.9. Doctoral theses	103
Number of theses by year of completion	103
Doctoral theses by awarding institution.....	103
4. Focus of educational research.....	105
4.1. Topic modelling: publications corpus.....	105
4.2. Topic modelling: doctoral theses	111
4.3. Topic modelling: grants awarded.....	117
4.4. Disciplinary terms	120
Publications – prevalence of disciplinary terms.....	120
Doctoral Theses – prevalence of disciplinary terms	121
Grants awarded – prevalence of disciplinary terms	122
4.5. Keyword analysis (journal articles)	123
5. Methods and designs	127
5.1. Publications – prevalence of methodological terms.....	127
5.2. Doctoral theses – prevalence of methodological terms	128
5.3. Grants awarded – prevalence of methodological terms.....	129
6. Knowledge exchange, engagement and impact	130
6.1. KEI grants (all funders).....	130
Volume of funding	130
Grant duration	134
Funding bodies and collaborations.....	135
Institutions in receipt of KEI grants.....	138
Focus of KEI grants (topic modelling).....	142
KEI funding amount for different topics	146
Prevalence of methodological terms in KEI grants	149
Prevalence of disciplinary terms in KEI grants	150
6.2. Outcomes of UKRI-funded KEI grants.....	151
Engagement Activities	151
Impact Sectors	153
Policy Influence.....	157

6.3. Outcomes of UKRI research grants	160
Engagement Activities	160
Impact Sectors	163
Policy Influence.....	166
6.4. UKRI Funding vignette (KEI)	169
UKRI funding for KEI projects wholly/partially in the field of education, 2010-20.....	169
6.5. EC Funding vignette (KEI)	172
EC funding for KEI projects wholly/partially in the field of education, 2010-20.....	172
7. State of the field and future prospects.....	175
7.1. The complex space of educational research.....	175
7.2. Disciplines and methodologies	177
7.3. Underrepresented areas of research.....	179
7.4. Knowledge exchange and dissemination.....	181
7.5. Future issues; future agendas	181
Funding	181
Sustainable, accessible networking	182
Research capacity and HE structures.....	182
8. Research on educational research	184
8.1. Scoping the field	184
8.2. Gaps in research on educational research.....	186
8.3. Agenda and priorities	187
Adopting a principled view on what matters in educational research	187
Learning from past experience and models.....	188
Balancing priorities and approaches.....	188
Cultivating (inter/multi)disciplinarity.....	188
Improving dissemination and impact and raising the profile of educational research	189
Developing and sustaining ‘capacity’	190
REFERENCES.....	191
APPENDICES.....	195
Interviews and workshops.....	195
Appendix 1: Interview Schedule	195
Appendix 2: Workshop schedule	196
Systematic review	197
Appendix 3: Template for systematic review data extraction	197
Appendix 4: Quality assessment template for the systematic review.....	200
Bibliometric analysis.....	201
Appendix 5: Density of keywords, by year (Journal Articles, Yearly Maps)	201

Text mining.....	206
Appendix 6: Proportion of research outputs within each topic indicating funding.....	206
Appendix 7: 2-dimensional scatterplot visualising HDBSCAN clustering of documents (71 clusters) in the publications corpus.....	207
Appendix 8: Number of published research output documents identified as primarily addressing each of the generated topics.....	208
Appendix 9: Relative prevalence of topics throughout published research output corpus	211
Appendix 10: LDA topic labels and associated terms in the publications corpus.....	212
Appendix 11: 2-dimensional scatterplot visualising HDBSCAN clustering of documents (65 clusters) in the doctoral theses corpus.....	216
Appendix 12: Number of doctoral theses identified as primarily addressing each of the generated topics	217
Appendix 13: Relative prevalence of topics throughout the doctoral theses' corpus.....	219
Appendix 14: LDA topic labels and associated terms in the doctoral theses corpus.....	220
Appendix 15: 2-dimensional scatterplot visualising HDBSCAN clustering of documents (19 clusters) in the research grants corpus.....	224
Appendix 16: Relative prevalence of topics throughout research grants' corpus.....	225
Appendix 17: LDA topic labels and associated terms in the research grants corpus.....	226
Appendix 18: 2-dimensional scatterplot visualising HDBSCAN clustering of documents (25 clusters) in the KEI Grants corpus.....	227
Appendix 19: Relative prevalence of topics throughout the KEI grants' corpus	228
Appendix 20: LDA topic labels and associated terms in the KEI Grants corpus.....	229

EXECUTIVE SUMMARY

This study was commissioned through competitive tendering by the British Academy and the Royal Society to examine the landscape of educational research undertaken within the UK in the period 2010-2020 and focused on school-based compulsory education, VET, and post-18 education, including professional learning. The study, conducted between July 2020 and January 2021, maps research production, funding patterns, key topics, approaches and dissemination.

The academies will draw upon the study to shape their ongoing commitment to support and promote the role that educational research can play in developing and informing education policy and practice.

The mixed-method approach combines bibliometric analysis of publications, text mining of publications and doctoral theses, analysis of grant information, a systematic review of research on educational research, telephone/ online expert interviews and stakeholder workshops.

SUMMARY OF KEY FINDINGS:

- The total research funding fluctuated, with an overall increase in nominal value over the period 2010-20, and with the largest proportion of grants being of short and medium duration.
- Around half of the research funding for UK-led projects over the period came from the ESRC and EEF. Other major funders have included the AHRC, MRC, Nuffield Foundation and European Commission.
- STEM Education and School-Based Intervention research are the two topics associated with the largest amount of funding.
- There are dense collaboration networks nationally and internationally, across different types of institutions.
- The period has seen 2,440 (on average) publications and 739 (average for full years) doctoral theses per year, all covering a very wide range of topics, some of which are multi- and interdisciplinary.
- Publications most frequently focus on education policy; learning outcomes; and teacher education; while theses most commonly address technology and education, language education, and philosophical and conceptual issues.
- Interventions and evaluations, interviews, case studies and surveys are the most commonly referenced methodological terms across outputs, theses and projects.
- Among the types of impact reported, societal impacts, particularly in the education sector, were most prevalent. Economic impacts were least frequently mentioned.
- There is intensive impact and engagement activity across research projects, as well as a high number of knowledge exchange, public engagement, innovation and edtech projects—the latter often led by non-education departments in universities and by commercial providers.
- Stakeholders highlighted risks for the field in relation to fluctuations in funding, increased competition for funding, dominance of short-term research projects, networking and communication across stakeholder groups, and sustaining research capacity.
- Stakeholders identified gaps in research in the following areas: curriculum design, delivery and evaluation; artificial intelligence and educational technology; initial teacher education; young people's voices; and longitudinal work.
- In terms of setting the agenda and priorities for the future of educational research, the literature about educational research in the UK clustered around the following themes: adopting a principled view on what matters in educational research; learning from past experience and models; balancing priorities and approaches; cultivating (inter/multi)disciplinarity; improving dissemination and impact and raising the profile of educational research; and developing and sustaining 'capacity' for engagement with and in research.

RESEARCH FUNDING - KEY FINDINGS

- The dataset used in the study combined a subset extracted via Digital Science’s Dimensions with manually curated sub-sets from individual funders. It amounts to 995 research grants, totalling £407m (of which £315m had UK-based Principal Investigators), plus 749 KEI (knowledge exchange/ KE, impact, public engagement/ PER, innovation & enterprise), totalling £354m (£125m with UK PIs).
- Total research funding (excluding KEI) for the period 2010-20 was £407m, to which the greatest contributors (over £10m) were the ESRC (£124; 31%), Education Endowment Foundation (including collaborative funding: £77m; 19%), European Commission (EC) (£71m; 17%); Australian Research Council (£32m; 8%); MRC (£24m; 6%); AHRC (£22m; 6%); Nuffield Foundation (£19m; 5%).
- Total funding for research grants with UK PIs for the period 2010-20 was £315m, to which the greatest contributors (over £10m) were the ESRC (£122m; 39%), EEF (including collaborative funding: £75m; 24%), AHRC (£22m; 7%), MRC (£22m; 7%), Nuffield Foundation (£19m; 5%), and EC (£18m; 6%).
- Total annual funding for the period 2010-20 increased, with some year-to-year fluctuation, from £18m in 2010 to £58m in 2020. However, the mean and median funding amount for grants have remained relatively consistent over this period.
- The identified areas of research which received greatest funding over the period are STEM Education (£65m; 16%), School-based Interventions (£54m; 13%), Policy and Multiculturalism (£35m; 9%), and (Mental) Health and Wellbeing (£32m; 8%).
- 1,021 institutions participated in the 991 research grants for which we had institutional affiliation information. Of these, 19 institutions hosted (as PI) ten grants and over, including UCL (including the IoE) (102), University of Oxford (52), University of Cambridge (41), University of Bristol (36), King’s College London (21), University of York (21) and University of Exeter (20). All institutions in receipt of ten grants or more were pre-1992 institutions, with the largest proportion of grants going to institutions established in the 19thC—turn of the 20thC.
- Collaborations on research grants are spread across all types of institutions, with the highest number of collaborative links in the dataset being associated with UCL, and the Universities of Oxford, York, and Durham. Relatively high frequency of collaborative links is also associated with producers of education research that are not part of the HE sector, in particular National Foundation for Educational Research and National Institute of Economic and Social Research.
- At least two-thirds of research grants are shorter than 3 years in duration.

RESEARCH OUTPUTS - KEY FINDINGS:

- The dataset of this study, obtained through Elsevier’s Scopus®, contains 19,583 journal articles, 1,396 books, and 5,860 book chapters (5,659 chapters from individual books and 201 chapters from book series).
- The average number of publications per year is 2,440 (all), 1,780 (journal articles only), 127 (books), and 533 (book chapters).
- The top 100 journals (by number of outputs) account for 62% of total journal articles (n=19,583) but only for 10% of total number of journals (n=955). These journals most commonly focus on HE; subject education; and general educational research.
- On average, 739 doctoral theses were completed each year (2010-17). The 6593 theses were

completed in 120 institutions. Of these, 19% (n=23) institutions have at least 100 theses each and together account for 67% of the total of theses. All of these are pre-1992 institutions (7% ancient, 45% each are 19thC/turn of century, and 20thC)

- Authors affiliated with University College London, University of Oxford, University of Cambridge, University of Edinburgh, and University of Nottingham produced the greatest number of outputs, with authors from these institutions frequently collaborating with each other, as well as other institutions.
- Internationally, the most frequent co-authorships are with Australia (1,148), and the USA (1,106), followed by Canada (447), the Netherlands, Ireland, Germany, Spain, China, South Africa, New Zealand, Sweden, and Norway.
- The number and proportion of Open Access publications increased for journal articles over the decade (from 5% to 26%), but not for books or chapters, with the exception of growth in OA chapters in 2020.
- Citation counts, both median and average show a natural decrease over time. Overall, journal articles have a higher average citation count (9.90), as compared to books (9.32) and chapters (2.24); but older books (published 2010-11) have higher average citations than any other outputs.

FOCUS OF EDUCATIONAL RESEARCH - KEY FINDINGS:

- Research outputs in Scopus were found to address 80 topics, with the most prevalent of these (based on the number of documents in which the topic was identified as the primary, or most prominent, topic addressed) being Education Policy (556 outputs; 3%), Learning Outcomes (543; 2%), and Initial Teacher Education (518; 2%)
- Doctoral theses were found to cluster around 61 primary topics, with the most prevalent of these (based on the number of documents in which the topic was identified as the primary, or most prominent, topic addressed) being Online, Mobile, and Games-Based Learning (177; 3%), Language Education (incl. EFL; 177; 3%), and Philosophy of Education (175; 3%).
- Research grants were found to address 15 primary topics, with the most prevalent of these (based on the number of documents in which the topic was identified as the primary, or most prominent, topic addressed) being School-Based Interventions (132 grants; 13%), STEM Education (75; 8%), and Applied Linguistics (70; 7%).
- Research outputs in Scopus were found to most frequently refer to the disciplines of Business and Management (2186; 8%), Healthcare Education (1423; 5%), and History (895; 3%). Doctoral theses most frequently referred to the disciplines of Business and Management (483; 7%), History (232; 4%), and Psychology (193; 3%).
- Across all journal articles, 'higher education' is the author-defined keyword with the highest (yearly) density and frequency in journal articles included in the dataset, followed by 'education' and 'pedagogy' - with 'assessment' also becoming a high-frequency/ high-density keyword since 2014.

METHODS AND DESIGNS – KEY FINDINGS:

- Research outputs were dominated by the methodological terms of interview(s), survey(s), focus group(s), intervention(s) and observation(s). The most commonly mentioned designs are evaluative, case study, longitudinal, comparative, mixed-method and experimental. Relatively few outputs indicated action research, practice-based, reflective practice, participatory designs, or research syntheses.

- Reference to interviews was very frequent throughout research outputs and doctoral theses, both by themselves and in combinations with other methodological terms, particularly observation, focus groups, and surveys.
- A greater proportion of doctoral theses (than research outputs) made reference to methodological terms, with interviews being particularly prevalent amongst theses (38%). A greater proportion of theses indicated longitudinal qualitative approaches than longitudinal quantitative approach, whereas the reverse was the case for research outputs. A similar situation appears for 'ethnography' and 'comparative' designs.
- Amongst research projects, 'intervention(s)' was the most common methodological term, appearing in 16% of research projects (as compared to 6% of research outputs).

DISSEMINATION AND ENGAGEMENT - KEY FINDINGS:

- Research projects funded by the UK Research Councils most commonly undertook engagement activities (n=8,984) in the form of participation in activities, workshops or similar (34%), talks or presentations (30%), formal working groups, expert panels or dialogue (17%).
- Among forms of policy influence, training was the most frequently reported, followed by formal advisory roles, and citations in policy documents.
- The reported impacts from research grants funded by the UK Research Councils most frequently concerned the sector of education (28%), followed at some distance by heritage, museums and collections (7%) and culture (7%).
- Where impact types were indicated among the above (n=629), societal impact was most prevalent (41.5%), followed by impact in policy and public services (25%), cultural impact (24%); and economic impact (9%).
- National and international engagement reported were more prevalent than local and regional.
- A dataset on KEI (knowledge exchange and impact, see above) projects was constructed in the same way as that on research grants, and consisted of 749 projects (£354 in total), of which 648 (£125m in total) had a UK-based PI.
- Among KEI projects, the greatest number were funded by Innovate UK (171), STFC (129), European Commission (117), AHRC (115), ESRC (69), and Wellcome Trust (66). In terms of total funding, the European Commission contributed the vast majority (£259m; 73%); followed by Innovate UK (£27m), AHRC (£15m), ESRC (£13m), Wellcome Trust (£6m), EPSRC (£6m), and John Templeton Foundation (£6m).
- At least half of the KE grants are shorter than 2 years, with a large proportion of these being shorter than one year in duration.

STAKEHOLDER VIEWS ON THE EDUCATIONAL RESEARCH 'ECOSYSTEM'

- The educational research 'ecosystem' has become increasingly complex over the last decade with traditional boundaries between the roles of research funder, research producer, and political advocate getting increasingly blurred with a growing number of organisations straddling all these activities.
- There has been rapid growth in the number of commercial research organisations undertaking educational research. This has led to significant competition for research funding with university-based researchers feeling unable to compete with cheaper and more agile commercial organisations.

- The funding landscape has changed significantly in the last decade with an increasing number of charities funding educational research often in accordance with specific agendas tied to their charitable objectives. Concerns were raised that, in this funding landscape, educational research has become increasingly responsive to funder agendas rather than emerging from needs or ideas raised by academics or practitioners.
- Educational research is made up of a wide range of disciplines using a wide range of methodologies. However, concerns were raised that true interdisciplinary working is rare, and the field is often fragmented and often dominated by the social sciences. Several participants emphasized the need for more research questions and approaches rooted in the arts and humanities and emerging from specific taught subjects.
- There has been a rapid growth in quantitative work, experimental design, and RCTs, in part driven by the Educational Endowment Foundation. This was generally seen positively as raising capacity in this area and improving conceptualisations of rigour in qualitative and interpretivist research.
- The range of areas researched is wide and impressive, but participants felt there were gaps in the following key areas: curriculum design, delivery and evaluation; artificial intelligence – educational affordances and implications for the future of work and skills formation; educational technology; initial teacher education; young people’s voices particularly in relation to climate change education; and longitudinal work.

VIEWS ON THE FUTURE OF EDUCATIONAL RESEARCH IN THE UK

Participants highlighted the following issues as crucial to a future agenda for educational research and issues the BA and RS should lead discussion on:

- Funding – with funding likely to become increasingly stretched in the COVID-19 context, there is an urgent need for co-ordination of stakeholders (funders, researchers, practitioners and policy makers) to determine the key issues for educational research based on need and ensure research is funded appropriately.
- Sustainable and accessible networking – more work should be done to use the affordances of technology to develop sustainable and accessible networks that bring together funders, researchers, practitioners and policy makers together in a meaningful way, an issue highlighted by COVID-19 and made all the more urgent by the climate crisis.
- Research capacity and HE structures – educational research is increasingly dominated by short term projects, staffed with researchers on casual contracts. This short-termism leads to a lack of systematic growth in knowledge, fragile and fractured research capacity, and human costs. Participants therefore emphasized the importance of universities and funders actively opposing increased reliance on precarious employment and ensuring more funding opportunities emphasise the development of long-term research agendas, cumulative knowledge generation within research teams, and the development of early and mid-career academic and research staff.
- The literature about educational research in the UK identified the following priorities for the future: adopting a principled view on what matters in educational research; learning from past experience and models; balance of priorities and approaches; cultivating (inter/multi) disciplinarity; improving dissemination and impact and raising the profile of educational research; and develop and sustaining ‘capacity’ for engagement with and in research.

1. THE STUDY

Introduction

Bibliometric analysis

Grant analysis

Text mining

Interviews and workshops

Systematic review

1.1. INTRODUCTION

This study was commissioned through competitive tendering by the British Academy and Royal Society (“the Academies”) as part of their ongoing commitment to work together to take forward analysis and thinking and contribute to the advancement of educational research, building on the preparation and publication of the *Harnessing Educational Research* report in October 2018 (to which members of the team contributed an evidence report – Mills, Oancea and Robson, 2017).

The study aimed to deliver information and analysis by identifying, quantifying and mapping the production of research about school-related compulsory education, including vocational education and training, and post-18 education, including professional learning (undertaken within the UK in the period 2010-2020), and by reviewing the body of research about educational research in the four countries of the UK.

The study was conducted between 23 July 2020 and 15 January 2021 and included an extension for supplementary work on updating information on quality-related research funding and on developing and curating as comprehensive as possible datasets of European Commission/ European Research Council and UKRI-funded projects relevant to the study, which were then integrated in the grant analysis reported below.

1.2. RESEARCH QUESTIONS

The research questions were developed in collaboration with the Academies and were confirmed at the interim report meeting with the Programme Board of the Academies’ educational research project. Each of the questions was explored within the limitations of the data sources available and within the constraints of the small-scale funding. Note that while the questions on funding and funded research were not fully part of the original brief, we conducted additional research to explore these questions and extend the dataset to incorporate a comprehensive set of EU-funded projects and information on quality-related funding for educational research over the period.

The questions are as follows:

- **RQ 1: Funding:** What are the funding patterns for educational research in the UK?
- **RQ 2: Investigators and host institutions:** Who has conducted funded educational research in the UK and with which types of organisations are they affiliated?
- **RQ 3: Publications:** What is the volume of outputs (journal articles, books/ book chapters and doctoral theses) produced in the UK in the period 2010-20? What are the citation patterns? What are the open access patterns?
- **RQ 4: Authorship:** Who has produced published educational research in the UK and with

which types of organisations are they affiliated?

- **RQ 5: Collaboration:** What patterns of collaboration (among institutions, individuals, countries) emerge involving educational researchers based in the UK?
- **RQ 6: Focus:** What research domains or areas are apparent in UK educational research published during the past decade? What research domains or areas are apparent in UK doctoral educational research during the past decade? With which identified research areas or domains within educational research are funding bodies most associated?
- **RQ 7: Dissemination, impact and engagement:** What channels have been used to engage educational research with policy makers and practitioners? What patterns emerge from funded knowledge exchange, impact, innovation and public engagement projects?
- **RQ 8: Research on educational research:** What evidence is there about the scope, capacity, methodologies, quality, drivers and priorities, assessment and governance, dissemination and uptake of educational research in the UK? How comprehensive and rigorous is this body of research? What are the gaps?
- **RQ 9: Stakeholder perspectives:** What are key stakeholders' views on the state of the field of educational research in the United Kingdom (scope, capacity, methodologies, quality, drivers and priorities, dissemination and uptake, gaps) and of knowledge about educational research as a field? What are their projections for the future of educational research?

1.3. DESIGN AND ETHICS

To address these questions, the study combined bibliometric analysis of publications, analysis of grants, text mining of publications, doctoral theses and grant engagement information, a systematic review of research on educational research, and telephone/ online expert interviews, concluding with stakeholder workshops (summarized in Figure 1.3.1).

The study has ethical approval from obtained from the University of Oxford. Given the fact that the study was conducted in its entirety during the COVID pandemic and overlapped with two periods of lockdown, the ethical clearance included specific provision for secondary and online research.

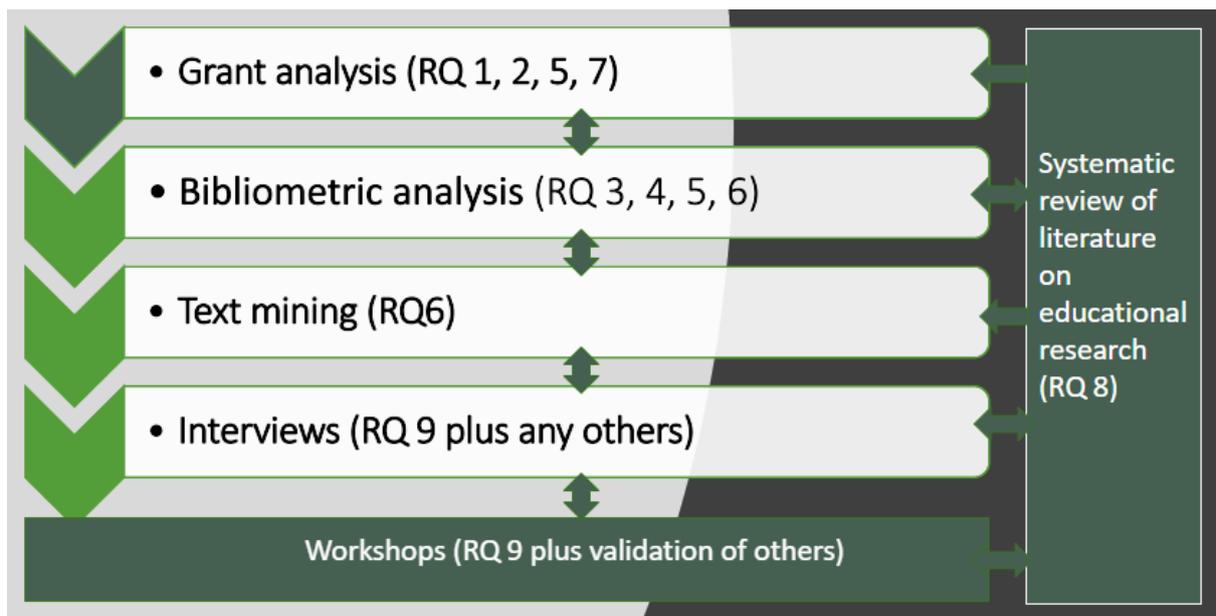


Figure 1.3.1. Design of the study

1.4. BIBLIOMETRIC ANALYSIS

JOURNAL ARTICLES - SEARCH STRATEGY AND DATASET

The Scopus database, owned by Elsevier, covers around 1.4 billion cited references from over 5,000 publishers (Elsevier, 2020). It was used in this study to search for journal articles, books, and book chapters published with at least one UK author between 2010 and 2020.

For the search of journal articles, we applied the 'All Science Journal Classification' (ASJC) codes assigned internally by Scopus to more than 35,000 journals, conference proceedings, and book series in Scopus at the moment the serial title is set up for Scopus coverage (Scopus, 2020a). 'Education' is classified as under 'Social Sciences', with its ASJC code as 3304 (Scopus, 2020b). As of August 2020, there were 1,397 journals classified under the 'Education' subject area in Scopus (Scopus, 2020c).

The rationale for using ASJC codes in this study is that they are pre-compiled and standardised, and that they have been used as an established inclusion or exclusion criterion by the scientific community. For instance, the Scopus database and ASJC codes were used by the Research Excellence Framework (REF) 2014 team to sort out contextual citation data in line with the assignment of Units of Assessment (UOAs) (Research Excellence Framework, 2014), although their use (and the database coverage) in the social sciences is more limited (see below). The ASJC codes were also used in research on scientific publications (e.g. OECD, 2015; Hardwicke, et al., 2020; Wilhite & Fong, 2012; Zhu, et al., 2013).

Limitations of using ASJC codes in this research include:

1. Using ASJC codes might exclude publications in journals outside the 'education' subject area as designated by Scopus, such as articles published in multidisciplinary journals like *Nature* or *Science*. This limitation was acknowledged in previous studies that applied ASJC codes to limit the scope of bibliometric searches, such as in Hardwicke, T. et al, 2020.
2. ASJC codes are only attributed to serial publications that have an ISSN, such as journals and book series. Therefore, using ASJC code as one search criterion cannot capture stand-alone books, conferences, and reports. This is particularly problematic in fields in which monographs are a widely used publication format, education included.
3. There is no specific explanation about the inclusion and exclusion of the ASJC code attributed to 'Education' by Elsevier.

The search was run on September 8th in Scopus with the following search query resulting in 20,145 journal articles:

```
TITLE-ABS-KEY ( ( educat* OR teach* OR school* OR learn* OR curricul* OR pedag* )  
AND (primary OR secondary OR higher OR tertiary OR special OR policy OR home OR  
compulsory OR post-compulsory OR "post compulsory" OR special OR further OR  
professional OR workbased OR work-based OR "work based" OR FE OR ITE OR VET OR  
ITT OR medical OR legal OR "chemistry ed*" OR "physics ed*" OR "engineering ed*"  
OR "statistics ed*" ) )
```

AND

```
SUBJTERMS (3304)
```

AND

```
AFFILCOUNTRY (United AND Kingdom )
```

AND

PUBYEAR > 2009
AND
(LIMIT-TO (DOCTYPE , "ar")) AND (LIMIT-TO (SRCTYPE , "j"))

Explanation of the search query

- TITLE-ABS-KEY ((educat* OR teach* OR school* OR learn* OR curricul* OR pedagog*) AND (primary OR secondary OR higher OR tertiary OR special OR policy OR home OR compulsory OR post-compulsory OR "post compulsory" OR special OR further OR professional OR workbased OR work-based OR "work based" OR FE OR ITE OR VET OR ITT OR medical OR legal OR "chemistry ed*" OR "physics ed*" OR "engineering ed*" OR "statistics ed*")): search for publications with inclusion of the defined search terms in title, abstract, or keywords
- SUBJTERMS (3304): search for publications in serials as classified as in 'Education' subject area.
- AFFILCOUNTRY (United AND Kingdom): search for publications with one or more authors with their affiliation identified as the United Kingdom (including England, Wales, Scotland, and Northern Ireland).
- PUBYEAR > 2009: Search for publications with a publication year after 2009, namely publications from 2010 onwards.
- LIMIT-TO (DOCTYPE , "ar")) AND (LIMIT-TO (SRCTYPE , "j")): publication type is limited to articles published in journals.

BOOKS AND BOOK CHAPTERS: SEARCH STRATEGY AND DATASET

The search for books and book chapters was run on September 8th with Scopus. The search applied the following search query and resulted in 7,408 results, including 1,434 books and 5974 book chapters:

```
TITLE ((educat* OR teach* OR student* OR school* OR curricul* OR pedagog*) AND NOT  
(early AND year*) AND NOT (early-year*) AND NOT (pre-school*) AND NOT (pre AND  
school* )  
AND  
AFFILCOUNTRY (united AND kingdom)  
AND  
PUBYEAR > 2009  
AND  
(LIMIT-TO ( SRCTYPE , "b" ) OR LIMIT-TO (SRCTYPE , "k" ) ) AND (LIMIT-  
TO (DOCTYPE , "ch" ) OR LIMIT-TO (DOCTYPE , "bk" ) )  
AND  
(LIMIT-TO (SUBJAREA , "SOCI" ) )
```

Explanation of the search query

- TITLE ((educat* OR teach* OR student* OR school* OR curricul* OR pedagog*) AND NOT (early AND year*) AND NOT (early-year*) AND NOT (pre-school*) AND NOT (pre AND school*)): search for publications with the inclusion and exclusion of defined search terms in the title. Compared to the search for journal articles, the search is limited to searching the

title and the search term 'learn*' is removed, as otherwise they will generate irrelevant results, which for instance fall in the area of 'machine learning'.

- AFFILCOUNTRY (United AND Kingdom): search for publications with one or more authors with their affiliation identified as the United Kingdom (including England, Wales, Scotland, and Northern Ireland).
- PUBYEAR > 2009: Search for publications with a publication year after 2009, namely publications from 2010 onwards.
- LIMIT-TO (LIMIT-TO (SRCTYPE , "b") OR LIMIT-TO (SRCTYPE , "k")) AND (LIMIT-TO (DOCTYPE , "ch") OR LIMIT-TO (DOCTYPE , "bk")): publication type is limited to books and book chapters published in book formats.
- LIMIT-TO (SUBJAREA , "SOCI"): search for publications as classified in the Social Sciences category, which include the following subjects: -Social Sciences(all), Social Sciences (miscellaneous), Archaeology, Development, Education, Geography, Planning, and Development, Health(social science), Human Factors and Ergonomics, Law, Library and Information Sciences, Linguistics and Language, Safety Research, Sociology and Political Science, Transportation, Anthropology, Communication, Demography, Gender Studies, Life-span and Life-course Studies, Political Science and International Relations, Public Administration, Urban Studies. Unlike journal articles, books do not have an ASJC code. Therefore, the search cannot be further refined under the category of Social Sciences.

DATA VALIDATION, CLEANING, AND ANALYSIS

Two researchers conducted two spot checks of the validity of the datasets extracted from Scopus. The two datasets (one for journal articles and one for books and chapters) were merged as one table. Two sets of 50 items were drawn from the combined dataset, based on two sets of 50 random numbers generated on www.random.org. Two researchers checked each item's information independently and compared results. The agreement rate between the two researchers were 100% and 100%. The relevance rates were 94% and 98% for each of the two randomly extracted samples.

The datasets were then manually curated to remove items out of the scope of this study (as well as items identified in the validity checking). After examining the preliminary text mining results and publications' relevance to educational research, we have conducted another round of curation to remove publications identified through text mining as out of the remit of this study.

The final curated datasets contain:

- 19,583 journal articles
- 1,396 books
- 5,860 book chapters (5,659 chapters from individual books and 201 chapters from book series).

Limitations of the final dataset include:

- (1) Books and book chapters originally published before 2010 may be included in the dataset, if they were reprinted or published an eBook version during 2010-2020.
- (2) Journal articles, books, and book chapters that focus on education outside the compulsory/ post-compulsory/ professional sectors are not included in the datasets.
- (3) Abstracts were unavailable, and thus not retrieved, for some of the items.

The datasets were sorted and analysed for frequencies in Microsoft Excel. Information of co-authorship and bibliometric coupling was imported to VOSviewer for the bibliometric analysis and visualisation.

1.5. GRANT ANALYSIS

The dataset of grants comprises five parts: one generated from a search in the Dimensions database (Digital Science); one generated through searches and filtering on the Gateway to Research portal; one generated through searches and manual filtering on the European Commission's CORDIS database; and one harvested manually from funders' websites. Note that we use the term 'grant' to refer to any research or knowledge exchange and impact project (including research centres and project-based fellowships, but excluding degree scholarships) that is funded from a source external to the organization that is producing the research.

DIMENSIONS DATA

Dimensions database is owned by Digital Science. It covers around 110 million publications and a wide range of resources, including 5.3 million grants, 134 million Altmetric data points, 0.56 million clinical trials, 1.5 million datasets, 0.49 million policy documents, and 40 million patents (Dimensions, 2020a).

In August 2020, Dimensions database contained information retrieved from 548 funders worldwide, 114 of which are from the United Kingdom. A list of funders is available on Dimensions' user interface once logged in. It is stated that 'Dimensions checks all sources of grant data for new data each month. Individual funders may have individual update dates over the year' (Dimensions, 2020b).

It should be noted that for the educational research area, Dimension's inclusion of funders is not exhaustive. While it covers major funders like national research councils and Wellcome Trust, at the time of the research, it does not include some other funding organisations like the Leverhulme Trust or learned societies like British Educational Research Association (BERA) or Society for Research into Higher Education (SRHE).

Disciplinary categories in Dimensions

Dimensions applies several categorisation criteria for disciplinary areas, which are developed and used by funders and researchers around the world. The categorisation systems most relevant to this study are the Units of Assessment (UoA) from the United Kingdom and the Fields of Research (FOR) from Australia and New Zealand (Dimensions, 2020b).

Dimensions uses a combination of article-level and journal-level classification, in an effort to reduce the inaccuracies in journal-level classifications. All articles and grants are attributed to one or more UoA(s) and FOR(s) based on machine learning and Dimensions' algorithm; and when article-level categorisation is not possible, Dimensions classifies articles based on the categorisation of journals (Dimensions, 2020b).

Classification filter one: Units of Assessment

The Units of Assessment (UoA) classification is used in the Research Excellence Framework (REF) in the United Kingdom. It contains 34 categories under four major panels. Education is listed as one category without further sub-groups under it (REF 2021, n.d.).

Dimensions applies an algorithm-based model to classify publications and grants under the UoA categories, which is a process separate from the REF submission. Therefore, the UoA code(s) assigned to an output may not align with the actual REF submission (Dimensions, 2020e).

Classification filter two: Fields of Research

Fields of research (FOR) classification is from the Australian and New Zealand Standard Research Classification (ANZSRC) (2020a). It is a hierarchical system that divide major research fields into minor fields. ANZSRC is used to 'classify research projects, research outputs, staff skills and course content (including PhDs)' (Dimensions, 2020f).

There are 22 Divisions under the FOR classification, with 'Education' as a separate Division (Division 13). 'Education' Division includes 'education systems; curriculum and pedagogy; and specialist education studies', which are classified into four groups (Australian and New Zealand Standard Research Classification, 2020b):

- 1301 Education Systems.
- 1302 Curriculum and Pedagogy.
- 1303 Specialist Studies in Education.
- 1399 Other Education.

The following education-related research areas are excluded from 'Education Division' and thus the four groups (Australian and New Zealand Standard Research Classification, 2020b). Grants in those areas would be picked up by the search, if there are also assigned a code under 'Education' FOR:

- a) Economics of education are included in Group 1402 Applied Economics.
- b) Education policy is included in Group 1605 Policy and Administration.
- c) Sociology of education is included in Group 1608 Sociology.
- d) Educational psychology is included in Group 1701 Psychology.
- e) Educational linguistics is included in Group 2004 Linguistics.
- f) History and philosophy of education is included in Group 2202 History and Philosophy of Specific Fields.

Limitations of UoA/FOR

Since UoA does not distinguish sub-groups, using it alone may not be refined enough to identify outputs of interest to this study. Similarly, using ROF alone may not be context-sensitive, as FOR comes from the Australia and New Zealand contexts while UoA sits in the UK REF. Therefore, UoA and FOR can be combined to filter results with sensitivity of the UK context and of interest to the study.

Dimensions dataset

For the dataset from Dimensions, the search was run on September 3rd, searching for grants with a starting year from 2010 to 2020, in the Education ROF and UoA, with at least one PI, Co-I, collaborator, or partner institution based in the UK.

The following search query resulted in 1,012 grants:

Fields of Research (13 Education) AND Units of Assessment (C23 Education) AND Start Year (2010 OR 2010 OR 2011 OR 2012 OR 2013 OR 2014 OR 2015 OR 2016 OR 2017 OR 2018 OR 2019 OR 2020) AND Country/Territory (United Kingdom)

An examination of the Dimensions dataset identified a limited coverage of funders and grants from this search, as well as grants not closely aligned to the research scope of this study.

For instance, as Table 1.5.1 shows, the largest aggregated funding amount would be from Engineering and Physical Sciences Research Council (EPSRC), which is inconsistent with existing literature about the funding landscape in UK educational research.

Table 1.5.1. The 10 funders with the highest total funding amount in the initial Dimensions dataset prior to cleaning and editing (search results on 3 September 2020)

Funders	No of Grants in Dimensions	Funding Amount (aggregated, in GBP)
Engineering and Physical Sciences Research Council (EPSRC)	121	323.6 M
European Commission (EC)	147	269.3 M
Economic and Social Research Council (ESRC)	337	76.4 M
Australian Research Council (ARC)	26	33.4 M
Wellcome Trust	98	29.2 M
Arts and Humanities Research Council (ARHC)	80	16.3 M
NIHR Evaluation Trails and Studies Coordinating Centre	12	11.0 M
John Templeton Foundation	5	8.7 M
Templeton World Charity Foundation	10	4.9 M
Biotechnology and Biological Sciences Research Council	5	4.8 M

To address this issue, 1,012 results were manually curated and categorised by two researchers through a two-round procedure. The first round excluded grants irrelevant to the educational research fields or focusing on early-year education. The second round categorised grants based on their funding type and scope. In each round, two researchers checked the title, abstract, and webpage of each grant individually and then compared their results. The final list was agreed by both researchers and included 696 grants.

The excluded 316 grants were: (1) grants irrelevant to educational research fields, (2) grants focusing on early-year education, and (3) grants outside the categories of either research grants, knowledge exchange and impact (KEI) funding, or fellowships. Studentships, travel bursaries or course proposals were excluded.

FUNDERS' WEBSITES

To improve the coverage of funding bodies, the researchers then checked the official websites of the following 11 funding bodies: Education Endowment Foundation (EEF), Nuffield Foundation, British Educational Research Association (BERA), British Association for International & Comparative Education (BAICE), Society for Research into Higher Education (SRHE), British Association for Applied Linguistics (BAAL), European Association for Research on Learning and Instruction (EARLI), Society for Educational Studies (SES), Philosophy of Education Society of Great Britain (PESGB), Association for Educational Assessment (AEA), and History of Education Society.

Information on another 397 grants, when available, was gathered manually from the funding bodies' websites or annual reports between September 14th and 17th. The selection criteria are: grants

funded by the above funders with a starting date between 2010 and 2020, with at least one UK-based investigators/collaborators/partner organisations, in the educational research area (excluding early-year education), and in the research grants categories used in this research.

DATA ON UKRI-FUNDED PROJECTS (GATEWAY TO RESEARCH)

Gateway to Research (GtR) is a portal that publicises information about UKRI-funded projects, drawn from a range of source systems including reports from principal investigators.

The database was queried manually on 15 Sep 2020 using the following search string:

school* OR educ* OR pedag* OR curric* OR teach* OR learn*

The fields searched were: ORCID, project abstract, project title, and project reference, and filters included:

- start year 2010-20;
- all research councils including Innovate UK and UKRI -wide;
- all grant types selected aside from studentships, study, training and vouchers.

The search generated 8547 entries, which were ordered by relevance (as determined by the GtR search function). The top 1000 entries by relevance were then manually curated to exclude grants that fall outside the scope of this research and to separate research grants from knowledge exchange/ impact/ public engagement with research/ innovation grants.

The manual filtering was done by two researchers, with reliability checks along the way on batches of 50 projects, revealing between 99-100% match. Any discrepancies were discussed and calibrated.

The resulting datasets were combined with the subsets of UKRI projects extracted from Dimensions and de-duplicated and checked for completeness of information. Where grants had missing information, such as abstract, funding size, end year, investigators, or research organisations, we conducted manual web searches to add this information to the dataset. All UKRI projects required such manual checks and edits.

DATA ON EUROPEAN COMMISSION FUNDED PROJECTS (CORDIS)

The Community Research and Development Information Service (CORDIS, cordis.europa.eu) is a database that contains information on European Commission -funded projects.

CORDIS (© European Union, 2014-2021) data were harvested on 15 September 2020 and filtered to retain projects with at least one UK-based investigators/collaborators/partner organisations (n=9016). These projects were filtered again using the search string below in their TITLE or OBJECTIVE columns (in sequence, first for title and then for objectives):

educat* OR teach* OR school* OR student* OR child* OR learn* OR youth OR young people OR pupil* OR curricul* OR pedag* OR train* or skill* or graduate* OR professional* OR vocation* OR qualificat* OR universit* OR academ* OR knowledge

The resulting 5151 projects were then manually curated to exclude grants that fell outside the scope of this research and to separate research grants from knowledge exchange/ impact/ public engagement with research/ innovation grants. 126 grants were thus identified (a smaller number than the 177 identified by Technopolis for the period 2009-2016, but in line with the current scheme's funding priorities and arrangements) (Davé *et al*, 2017).

The manual filtering was done by two researchers, with reliability checks along the way on batches of 50 projects, revealing between 99-100% match. Any discrepancies were discussed and calibrated.

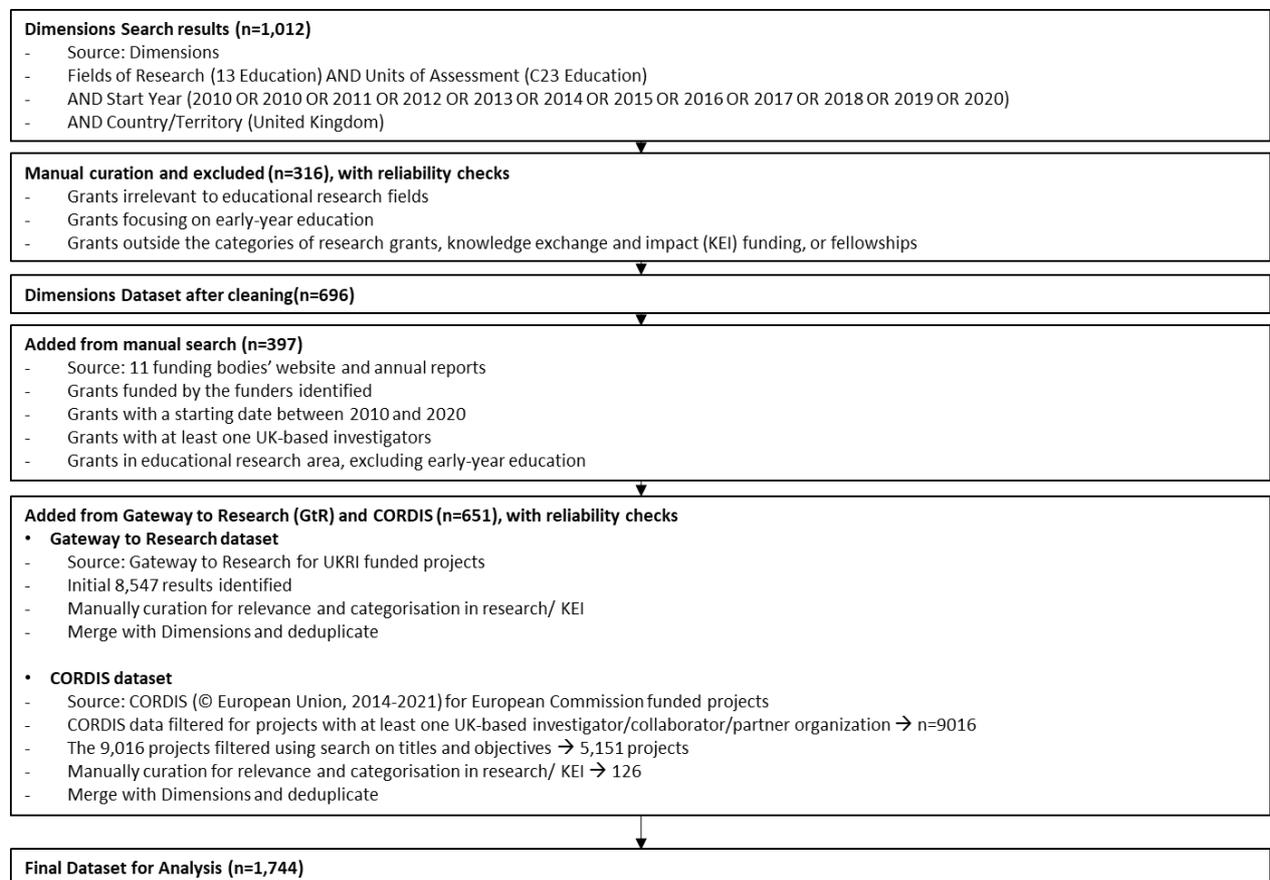
The resulting datasets were combined with those identified from the Dimensions search, de-duplicated and checked for completeness of information. Where grants had missing information, such as names of researchers etc., conducted manual web searches were conducted to add this information to the dataset when available.

FINAL DATASET

In total, 651 unique grants from GtR and CORDIS were added to those from Dimensions and from additional funders' website to form the final dataset.

Figure 1.5.1 shows the process of data collection and cleaning. The combined final dataset includes 1,744 grants.

Figure 1.5.1. Flowchart for data collection and cleaning (grants information)



Grants in the final dataset were classified into two categories based on their aims and scope: research grants and knowledge exchange and impact (KEI) funding. Among the 1,744 grants identified, 995 are research grants (including 111 fellowships), 749 are funding for KEI (including 2 fellowships).

We categorised grants based on the following definitions:

- **Research grants:** funding awarded to focused research projects or individual researchers (as fellowships). The funded projects may include KEI elements, but the major focus is on conducting research. Note that projects funded by Education Endowment Foundation

(EEF) were all categorised as research grants, as those projects involved both research activities and scientific evaluation.

- **Knowledge exchange and impact, including public engagement with research (PER) and enterprise and innovation funding:** funding awarded to projects or researchers (as fellowships) with the major aim of knowledge exchange, public engagement, entrepreneurship and innovation, or capacity building. We further classified KEI funding into the following sub-categories:

(1) Public Engagement with Research, Knowledge Transfer (KT), Knowledge Exchange (KE), and Outreach (427 projects). Examples of activities included organising exhibitions and other public events, creating films, documentaries, comedy, plays, and training materials.

(2) (Ed)tech and technology innovation (236 projects). Examples of activities included developing websites, software, or apps.

(3) Academic networks and events (86 projects). Examples of activities included holding seminar series.

The categorisation of “fellowships” was in line with the information provided on the funders’ website. However, the categorisation of “research grants” or “KEI funding” was decided by the researchers based on the evaluation of the funding scope, which can be different from the categories shown on funders’ website.

Findings on the research grants subset are reported in Chapter 2 – Research Funding, while findings on the KEI grants subset are reported in Chapter 6 – Dissemination and Engagement.

Limitations of the final dataset include:

- The inclusion of funders is extensive but not exhaustive of every funding body.
- Information about abstract, funding size, end year, investigators, or research organisations was missing from some grants. There were two reasons: one is due to the lack of such information on the original funders’ websites. For instance, some major funders like European Commission and EEF only provided information of the research organisations, rather than researchers. We supplemented this information through manual searches wherever possible. The other reason was that Dimensions only extract research organisations’ information if the organisation is registered in the Global Research Identifier Database (GRID), an open database of 98,332 educational and research organizations worldwide, created and maintained by Digital Science (GRID, 2020). Therefore, for grants extracted from the Dimensions search, some research organisations may be missing from the dataset if they cannot be matched to a GRID record.
- Grants with titles or abstracts in English or with official English translations can be searched with Dimensions and by hand, but grants whose information was not listed on the funders’ websites in English or with English translations may have been omitted from this study.
- Grants not classified as under Education UoA or FOR may be relevant but were excluded from the Dimension’s search.
- Institutional funding, internal grants within higher education and other research organisations, or grants commissioned by funders without public information have been omitted.

- Grants transferred, provided with additional funding, or funded by the same funder in different years with the same title were recorded as different items, and thus regarded as different grants for the analysis.

DATA ANALYSIS

All information on grants was logged in and categorised in Microsoft Excel. The analysis of statistical information was conducted in Microsoft Excel, and the analysis of institutions was conducted in VOSviewer.

1.6. TEXT MINING METHODOLOGY

The text mining and topic modelling process utilised commonly employed and recommended text and data mining practices in order to obtain, extract, and process document data (see, for example Banks, Woznyj, Wesslen, & Ross, 2018, and Kwartler, 2017). These text mining processes, which were repeated for each of the datasets of interest individually, were performed through R (R Core Team, 2020), employing various packages therein, and proceeded as follows (see Figure 1.6.1 for a graphical representation of the text mining procedure):

DATA RETRIEVAL

Publications

Relevant published educational research outputs, published during the period 2010 to (August) 2020, were identified through conducting a search in Elsevier's Scopus®, the "*largest abstract and citation database of peer-reviewed literature*" (Elsevier, 2020), utilising custom search queries. Bibliographic information, including relevant metadata and abstract information, were retrieved using the *RScopus* R package (Muschelli, 2018), which facilitates interfacing with the Scopus® Application Programming Interface (API) and subsequent information retrieval. As explained earlier in this chapter, separate search queries were used in order to obtain both relevant research articles and relevant books and chapters.

Scopus, queried with the previously discussed search strings on the 8th September 2020, returned 20,145 journal articles, 1,434 books, and 5,974 chapters. Following manual curation of documents in order to remove non-relevant research outputs, facilitated through review of random samples of documents (n = 150 documents) and those documents identified to contain keywords related to content not relevant to the current analysis, 19,583 journal articles, 1,396 books, and 5,860 book chapters were retained for further analysis.

Doctoral Theses

Relevant educational doctoral theses were obtained from the British Library's e-theses online service (EThOS), a nationally aggregated database of doctoral theses awarded by UK Higher Education institutions. Bibliographic information, including relevant metadata and abstract information, for doctoral theses completed between 2010 and (August) 2020 and classified within the subject area of education (as classified by discipline by the British Library, utilising the Dewey Decimal Classification System) were extracted from the EThOS database (provided by the British Library).

The EThOS dataset, provided by the British Library on the 21st August 2020, contained 6,593 theses completed between 2010 and (August) 2020 which were classified in the subject area of education.

Research Grants and Funding

As explained earlier in this chapter, datasets of relevant educational research grants and grants related to knowledge exchange and impact (KEI) (the latter including knowledge transfer, public engagement, and innovation) were manually compiled through inspection of various sources, including Digital Science’s Dimensions database, the UKRI and EC grant portals, and the respective websites of relevant research funding bodies. Manual searches (described above), prior to 1st November 2020, yielded a dataset detailing 995 research grants and 749 other (KE, KEI, KT, PER, Innovation) grants awarded during the period 2010 to (October) 2020 to projects which involved a principal investigator (PI), co-principal investigator (Co-PI) or co-investigator (Co-I) with a UK institutional affiliation.

UKRI Grant Outcomes and Impacts

Outcomes and impacts (including impact summaries, engagement activities, and policy influence) associated with UKRI grants for educational research were obtained from the UKRI Gateway to Research (GtR) portal, which provides information about publicly funded research. Unrefined data sets – that is, no search string was specified, but rather all available entries in the GtR database regardless of relevance – for each research outcome or impact of interest (namely impact summaries; engagement activities; policy influence; intellectual property; software and technical products; products, interventions and clinical trials; and spinouts) were obtained from the GtR portal. Relevant entries within the obtained datasets extracted based on the project or grant identification numbers of the research grants and other (KE, KEI, KT, PER, Innovation) grants included in the manually compiled datasets which were UKRI-funded.

Based on 1,091 UKRI-funded research grants and other (KE, KEI, KT, PER, Innovation) grants identified, associated outcomes and impacts were extracted from the GtR database (as accessed on September 15th 2020), resulting in identification of 350 impact summaries, 8,984 engagement activities, 845 policy influences, 13 intellectual properties, 109 software and technologies, 12 products, interventions and clinical trials, and 3 spinouts.

DATA PRE-PROCESSING

Structured data were extracted from obtained documents in a machine-readable form through several pre-processing methods. Noninformative features of text documents, which are of negligible value in clustering documents or distinguishing topics in documents, were removed. These features included the following:

- Punctuation, special characters, and numeric digits;
- Copyright information, with commonly occurring copyright information patterns being identified and subsequently filtered through searching for, and removing, “regular expression” (or “regex”) patterns devised to capture variations of common copyright information strings;
- “Stopwords”, which are commonly repeated features in text, including certain conjunctions, pronouns, and high-frequency articles. Three stopword lexicons were utilised - Snowball (<http://snowball.tartarus.org/algorithms/english/stop.txt>), SMART (Lewis, Yang, Rose, & Li, 2004), and Onix (<http://www.lextek.com/manuals/onix/stopwords1.html>) – within the *tidytext* R package (Silge & Robinson, 2016);
- Custom stopwords or phrases, consisting of commonly occurring, domain general terms which were determined as unlikely to be associated with any one, specific topic.

Custom stopword lists were derived specifically for each dataset based on inspection of commonly occurring terms across documents (identified based on the proportion of documents in which the terms appeared). A selection of the determined stopwords were removed following the extraction of bigrams in order to avoid the preclusion of bigrams (word pairs) which include these terms, which may offer unique value in distinguishing topics, from the corpus. The custom stopword lists utilised were as follows:

Scopus dataset:

Prior to bigram extraction:

“abstract”, “introduction”, “conclusion”, “conclusions”, “results”, “result”, “purpose”, “significance”, “significant”, “thesis”, “investigation”, “investigate”, “investigates”, “investigating”, “purpose”, “na”, “journal”, “article”, “volume”, “book”, “chapter”, “author”, “explore”, “focuses”, “discusses”, “argue”, “argues”, “conclude”, “concludes”, “draws”, “draw”, “propose”, “proposes”

Following bigram extraction:

“aim”, “aims”, “data”, “objective”, “objectives”, “approach”, “research”, “paper”, “study”, “studies”, “education”, “background”, “backgrounds”, “method”, “methods”, “methodology”, “methodologies”, “materials”, “issues”, “issue”, “field”, “educ_research”

ETHOS dataset:

Prior to bigram extraction:

“abstract”, “introduction”, “conclusion”, “conclusions”, “results”, “result”, “purpose”, “significance”, “significant”, “thesis”, “investigation”, “investigate”, “investigates”, “investigating”, “focus”, “focusing”, “focuses”, “na”, “article”, “explore”, “discusses”, “argue”, “argues”, “conclude”, “concludes”, “draws”, “draw”, “hong”, “kong”, “saudi”, “arabia”

Following bigram extraction:

“background”, “backgrounds”, “method”, “methods”, “methodology”, “materials”, “educational”, “research”, “study”, “studies”, “aim”, “aims”, “education”, “approach”, “data”, “objective”, “objectives”, “issues”, “issue”, “field”, “research_question”

Research and other grants datasets:

Prior to bigram extraction:

“abstract”, “introduction”, “conclusion”, “conclusions”, “results”, “result”, “purpose”, “significance”, “significant”, “thesis”, “investigation”, “investigate”, “investigates”, “investigating”, “focus”, “focusing”, “focuses”, “na”, “article”, “explore”, “discusses”, “argue”, “argues”, “conclude”, “concludes”, “draws”, “draw”, “objective”, “objectives”, “education”, “research”, “project”, “study”, “educational”, “studies”, “findings”, “approach”, “specific”, “kingston”, “nottingham”

Following bigram extraction: “background”, “backgrounds”,

“method”, “methods”, “methodology”, “materials”, “educational”, “research”, “study”, “studies”, “aim”, “aims”, “education”, “approach”, “data”, “objective”, “objectives”, “issues”, “issue”, “field”

The remaining text was then tokenized – that is, separated into smaller units, or tokens (hereafter referred to as *terms*), consisting in the current analysis of single words (unigrams, e.g. “school”) and word pairs (bigrams; e.g. “secondari_school”). Tokenized terms were subsequently “stemmed”,

through application of the standard Porter Stemming Algorithm (Porter, 1980), in order to identify and map differing forms of the same word (e.g. “reading” “read”, “reads”) to a consistent, basic form (e.g. “read”). It should be noted that stemming may generate outputs of terms which do not necessarily contain a real form of the original terms (e.g. the stemmed form of “secondary” is “secondari”).

CLUSTERING

Clustering, an unsupervised machine learning approach applied iteratively in order to group documents into coherent clusters based on similarities in prominent features (in this instance, words weighted by importance within documents), was employed in order to obtain an initial indication of the number of distinct educational research topic areas and the content therein for each corpus. The number of topics identified through clustering subsequently served as an initial basis upon which plausible numbers of topics for use in topic modelling were estimated and tested.

Documents were clustered using hierarchical density-based spatial clustering of applications with noise (HDBSCAN; Campello, Moulavi, Zimek, & Sander, 2015), an unsupervised machine learning method which clusters areas of high density (here, documents which are similar based on their constituent terms, weighted by importance), as implemented in the dbSCAN R package (Hahsler, Piekenbrock & Doran, 2019).

Documents were clustered based on the similarity – or inversely, distance – between documents (computed as cosine distance) as positioned in vector space based on the term frequency-inverse document frequency (tf-idf) weightings of terms (i.e. the relative importance of terms) within documents (Baralis, Cerquitelli, Chiusano, Grimaudo, & Xiao, 2013; Larsen & Aone, 1999; Mustakim et al., 2019). The resultant high-dimensional distance matrix was simplified and denoised through application of dimensionality reduction techniques - classical multidimensional scaling (CMDS; Mead, 1992), Kruskal’s non-metric multidimensional scaling (NMDS, *ibid*), and t-distributed stochastic neighbour embedding (t-SNE; van der Maaten & Hinton, 2008), in order to produce low dimensional, interpretable representations of data and avoid reduction of power of statistical methods due to “the curse of dimensionality” (Holmes & Huber, 2019). The most appropriate dimensionality reduction technique was selected based on evaluation of visualisations and quality criteria measuring preservation of local and global neighbourhoods (Lee & Verleysen, 2010).

This clustering process yielded groupings of documents (i.e. clusters) which were considered similar based on the content therein - here, terms weighted by their apparent relative importance (tf-idf) to a given document – with such groupings likely indicative of shared, latent semantic topics. Therefore, the number of distinct groupings of documents identified within the corpus through this clustering process was considered an initial estimate of the number of latent semantic topics present within the corpus and served as a starting point for investigation of the optimal number of topics for use in the topic modelling process.

TOPIC MODELLING

Topic modelling – a type of probabilistic generative modelling widely utilised in text-mining - was applied to the respective corpora in order to derive latent semantic groups of documents – i.e. topics – which best describe the text content of documents within the corpora. Topic models - predicated on the dual assertions that particular words are likely to appear more or less frequently in documents concerning a given topic and that documents, in turn, concern multiple latent semantic topics to varying degrees - describe a set of topics to which the word content of

documents, as a whole, may be related. In topic modelling, therefore, a “topic” is conceived as a mixture of words in a vocabulary which are considered related on the basis of likelihood of co-occurrence, with documents a mixture of these “topics” (Liu et al., 2016).

Latent Dirichlet Allocation (LDA), an unsupervised machine learning topic model which assumes the number of topics within the corpus is known and, through a generative process, learns the topic probability distribution for each document in the corpus, was applied, through use of the topicmodels R package (Grün & Hornik, 2011), in order to conduct topic modelling. Models were fitted using Gibbs Sampling (Griffiths & Steyvers, 2004) – which has been argued as producing, in principle, more accurate and stable models than a variational approach (Layman, Nikora, Meek, & Menzies, 2016; Porteous et al., 2008).

As the numbers of topics present within the respective corpora was not known a priori, several approaches were applied in order to deduce optimal numbers of topics. The number of clusters identified through the HDBSCAN clustering process served as an initial, indicative estimate of the number of topics which may be present within the corpus. Plausible ranges of numbers of topics, based on the number of clusters identified (range between ± 10 or ± 20 around the number of clusters), were subsequently examined through use of the ldatuning R package (Nikita, 2020), which accommodates the evaluation of LDA models for a range of numbers of topics based on several proposed metrics intended to identify the natural number of latent concepts or topics (Arun, Suresh, Veni Madhavan, & Narasimha Murthy, 2010; Juan, Tian, Jintao, Yongdon, & Sheng, 2009; Deveaud, SanJuan, & Bellot, 2014; Griffiths & Steyvers, 2004). Auspicious ranges of numbers of topics, as identified based on the metrics calculated through ldatuning R package, were examined further through fitting multiple LDA models across the range of plausible numbers of topics and evaluation of resultant mean topic coherence scores for the fitted models. Topic coherence measures the degree of semantic similarity – that is, association - between words loading within topics, and thereby seeks to reflect the interpretability or internal consistency of topics generated by the model (AlSumait, Barbará, Gentle & Domeniconi, 2009; Newman, Lau, Grieser & Baldwin, 2010).

LDA models were subsequently applied for several of numbers of topics identified as optimal through the above delineated methods. Resultant models were evaluated based on several diagnostic measures, which were calculated, plotted, and inspected, in order to identify potentially problematic or ‘junk’ topics which may have been generated (AlSumait, Barbará, Gentle & Domeniconi, 2009). The diagnostic measures generated consisted of the following:

- *Topic coherence*, which measures the semantic similarity of terms loading within a topic and thereby indicates the internal consistency and interpretability of topics. In the current study, probabilistic coherence, as implemented by Jones (2019), was utilised.
- *Distance from corpus*, which reflects the distinctiveness of terms within a topic relative to the rest of the corpus (Boyd-Graber, Mimno, & Newman, 2014).
- *Document prominence*, which measures the number of unique documents for which the estimated probability of a topic is above a threshold (0.2; Boyd-Graber, Mimno, & Newman, 2014).
- *Topic Exclusivity*, which measures the uniqueness of top-loading terms within topics, as measured by a terms-usage rate within a topic relative to that of within other topics (Bischof & Airoldi, 2012).

Furthermore, the substantive content of topics was evaluated for internal consistency, coherence, and plausibility – that is, the extent to which terms associated with topics generated appeared semantically consistent, as well as the extent to which documents demonstrating these topics indicated a consistent underlying topic – through visual inspection of the top-loading terms (i.e., terms with the greatest probability of occurring within a given topic) and top-loading documents

(i.e., documents with the greatest probability of addressing a given topic) for each topic. In the current study, the twenty top-loading terms and thirty top-loading documents were inspected for each topic for this purpose.

Using this process (see Figure 1.6.1), topic models with a number of topics judged to be optimal were generated for each corpus. Given that topic models do not indicate the “theme” or “topic” based upon which words or documents are clustered (that is, the model does not explicitly label topics generated), topic labels were manually assigned to clusters (or topics) generated by the LDA models. Topics labels were assigned based on assessment of topic content, based on the twenty terms with the greatest probability of occurring in each topic and the thirty documents with the greatest likelihood of addressing each topic, proceeding through several iterations based on internal review, deliberation, and further inspection of topic content. Therefore, topic labels reflect subjective judgements of topic content. Furthermore, it should be noted that within-document content may vary and that documents may simultaneously address several topics to varying degrees (a fundamental assertion of topic models). As such, topic labels were conceived as a “best fit”, intended to broadly capture the thematic content of words and documents therein.

It should be noted that the topics generated through topic modelling are presented and discussed in this report both in terms of the relative prevalence of topics throughout the corpus, as well as the number of documents allocated to topics. As previously indicated, LDA models do not identify a singular topic addressed by a given document, but rather identify a number of topics addressed to varying extents within a document. Thus, the relative prevalence of topics here represents the extent to which the entire corpus addressed given topics, including instances in which the topic was not identified as the primary or dominant topic within a document – that is, the average extent, in percentage terms, to which documents within the corpus addressed topics. Relative prevalence of topics therefore acts as a more nuanced representation of topics generated by the LDA model. However, for purposes of clarity and in order to facilitate answering research questions (for example, those concerning patterns of funding), topics generated by the LDA model were at times presented in a simplified, less nuanced fashion through assignment of a singular topic to each document – or, inversely, allocation of each document to a singular topic - based on the dominant topic (or, alternately, the most likely topic) therein. This technical distinction ought to be kept in mind when considering discussion of topic modelling outputs, as it is a broad simplification of both the LDA model output and the reality of the education research field itself to assume that research publications, theses, and grants concern a single topic exclusively rather than complex combination of topics to differing extents.

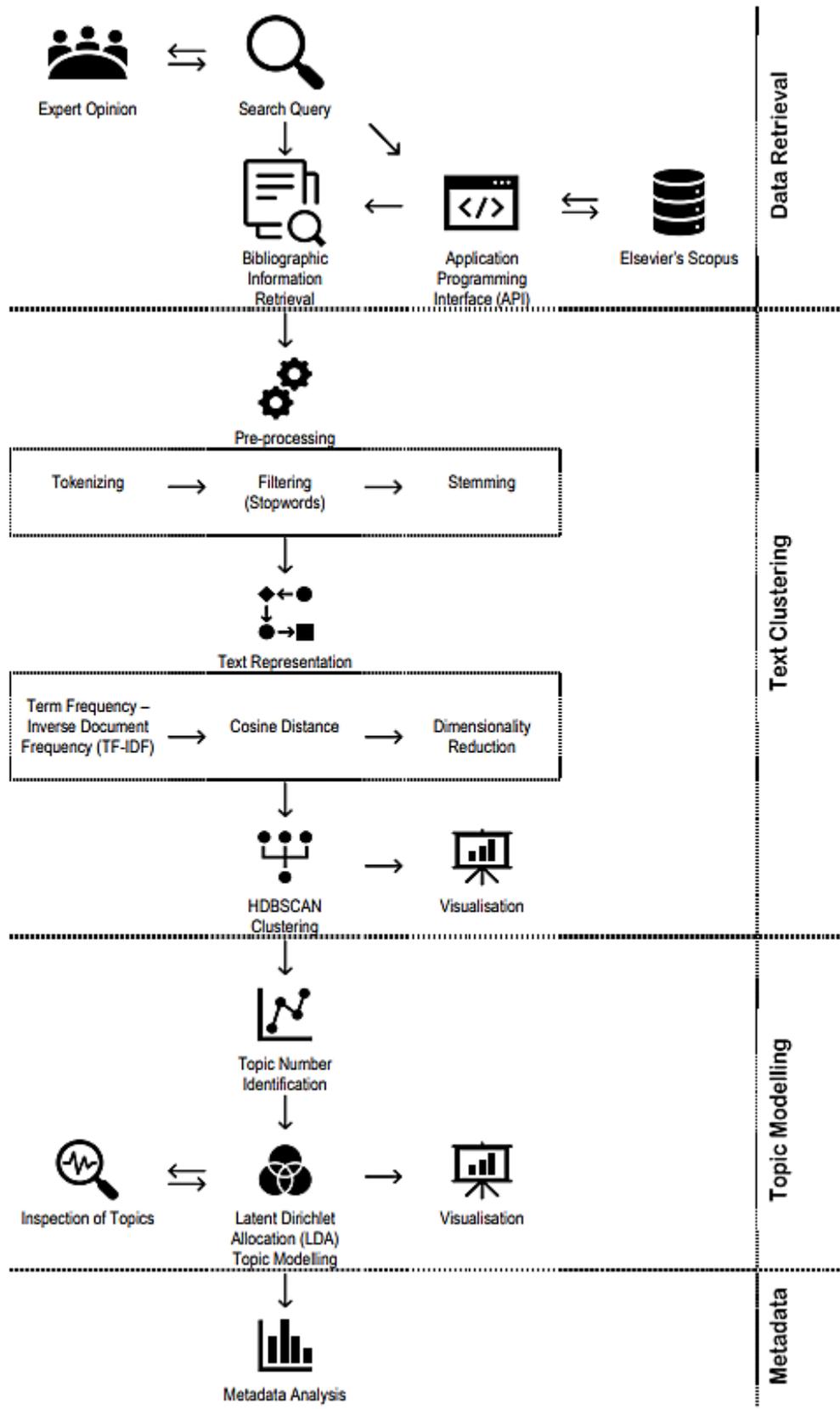


Figure 1.6.1. A graphical representation of the topic modelling process

METHODS AND DISCIPLINES

In order to identify the prevalence and co-occurrence of methodological and disciplinary terms within the respective corpora, systematic searches of documents for text strings contrived to capture these terms and their associated variations (see Table 1.6.1 for methodological term search strings and Table 1.6.2 for disciplinary term search strings) were undertaken.

Table 1.6.1. Standardized methodological terms and their associated search string patterns.

Standardized Methodological Term	Search String Patterns
Interview(s)	"^interview*"
Focus Group(s)	"^focus group* ^focusgroup* ^focus-group*"
Experiment(al)	"^experiment*"
Quasi-Experiment(al)	"^quasi-experiment* ^quasi experiment* ^quasiexperiment*"
RCT	"^control trial ^controlled trial ^rct\$"
Intervention	"^intervention*"
Observation(s)	"^observation*"
Ethnography	"^ethnograph*"
Survey(s)	"^survey*"
Questionnaire(s)	"^questionnaire*"
Action Research	"^action research"
Practitioner/Practice-based	"^practitioner research* ^practice-based research ^practicebased\$"
Secondary Analysis	"^secondary data\$ ^administrative data\$"
Longitudinal	"^longitudinal"
Case Study	"^case stud*"
Comparative	"^comparative\$"
Design-Based	"^design-based ^designbased ^design based"
Research Synthesis	"^systematic review* ^meta-analys* ^meta analys* ^metaanalys* ^qualitative research synthes* ^meta-ethnogra* ^metaethnogra*"
Documentary	"^documentary\$"
Discourse Analysis	"^discourse analysis\$ ^analysis of discourse\$"
Evaluation	"^evaluat*"
Mixed Methods	"^mixed meth* ^mixed-meth* ^mixedmeth*"
Philosophical/Conceptual	"^philosophical\$ ^conceptual anal*"
Grounded Theory	"^grounded theor*"
Reflective Practice	"^reflective practice"
Corpus Research	"^corpus\$ ^corpuses\$ ^corpora\$"
Biographical	"^biographic* ^autobiographic* ^auto-biographic*"
Historical	"^historical anal* ^historical inq* ^historical res* ^historical stud* ^historiogr*"

Network Analysis	"^network anal*"
Policy Analysis	"^policy anal*"
Delphi	"^delphi\$"
Visual and Creative	"^visual meth* ^visual-meth* ^photo elicitation\$ ^photovoice\$ ^arts-based\$ ^creative meth* ^creative-meth* ^visualmeth* ^creativemeth* ^artsbased\$"
Text Analysis	"^text anal* ^textual anal*"
Conversation Analysis	"^conversation anal*"
Participatory	"^participatory meth* ^participatory research"
Narrative	"^narrative meth* ^narrative research narrative stud*"

Table 1.6.2. Standardized disciplinary terms and their associated search string patterns.

Standardized Disciplinary Term	Search String Patterns
Economics	"^economics\$"
Sociology	"^sociology\$"
Anthropology	"^anthropology\$"
Philosophy	"^philosophy\$"
Psychology	"^psychology\$"
History	"^history\$"
Linguistics	"^linguistics\$"
Geography	"^geography\$"
Organisational Theory	"^organisational theory\$"
Interdisciplinary	"^interdisciplinary\$ ^inter disciplinary\$ ^inter-disciplinary\$"
Multidisciplinary	"^multidisciplinary\$ ^multi disciplinary\$ ^multi-disciplinary\$"
Engineering	"^engineering\$"
Chemistry Education	"^chemistry\$"
Physics Education	"^physics\$"
Healthcare Education	"^medical education\$ ^healthcare education\$ ^healthcare training\$ ^nursing\$ ^midwifery\$ ^midwife ^dentist\$ ^dental ^dentistry\$"
Computer Science	"^computer science\$"
Mathematics	"^mathematics\$"
Statistics	"^statistics\$"
Legal Education	"^law\$ ^legal education\$ ^legal training\$"
Business and Management	"business\$ ^management\$"
International Development	"^international development\$"

Searches produced matrices indicating the presence of terms (or an associated variation, which were subsequently standardized) within documents, facilitating further analysis of term frequencies and co-occurrence throughout corpora. It must be noted, however, that resulting data were not construed as necessarily representative of the use of specific methods or the academic discipline with which a document is concerned or aligned, but were instead understood as reflective of the use of terms which are likely to be related to a method or discipline, and, therefore, merely indicative of the potential use of specific methods or the relevant academic disciplines.

BIBLIOGRAPHIC INFORMATION EXPLORATION

Document bibliographic information – including publication year (or year of completion or start year, as appropriate for the dataset), citation counts (where relevant), institutional affiliation of author(s), country of institutional affiliation of author(s), funding bodies (where available) - was analysed through simple descriptive statistics (such as frequency counts, proportions, pairwise counts, and measures of central tendency) in order to identify frequencies, trends, and relationships within the corpora.

LIMITATIONS

There were a number of noteworthy challenges and associated limitations which ought to be considered whilst reading the current report. Limitations here pertain both to limitations in the datasets analysed, as well as the analysis itself.

Regarding limitations in the datasets analysed, there are four noteworthy considerations. Firstly, the datasets compiled for use in the current analysis – that is, a published research outputs corpus obtained from Elsevier’s Scopus®, a doctoral theses corpus obtained from the British Library’s EThOS, and research grants and other (KE, KEI, KT, PER, Innovation) grants corpora compiled from Digital Science’s Dimensions and research funding body websites – whilst extensive, cannot be considered entirely comprehensive. It is likely that search strings and data filtering methods erroneously excluded a number of documents which would be considered relevant and included irrelevant documents. However, through iterative testing of multiple search queries and refinement methods, it is hoped that such errors have been minimised.

Furthermore, it ought to be noted that data sources utilised in compiling datasets for analysis are reliant upon manual entry of information (i.e., an author or database administrator must submit relevant information for the addition of each new entry to the database). Consequently, there was an apparent lag in the addition of new entries, such that, depending on the data source, there were notably fewer recent data entries (that is, entries in more recent years, such as 2019 and 2020) than would be anticipated based on the number of entries in previous years. Data for more recent years (2018, 2019, and 2020) in some of the analysed datasets (e.g. doctoral theses) may therefore be less representative of the reality of educational research during that period.

Moreover, amongst those documents successfully identified by respective search methods there remained a number of documents missing pertinent information – for instance, abstract information was not available for all documents obtained from Elsevier’s Scopus®. As a result of the limited document text available for analysis in relation to these documents (for example, only title text and keywords may be available), the efficacy of clustering methods and topic models in accurately allocating such documents would be hindered and would diminish the accuracy of the model as a whole. These documents, therefore, were excluded from clustering and topic modelling processes.

Finally, with regard to the data used in analysis, the analysed text content of documents within corpora consisted of document title, abstract, and – where available – keywords. Text mining involving the analysis of such text content inherently assumes that the available text for each document contains sufficient, relevant information for the analysis purposes, with the extent to which such relevant information is available dictating the accuracy of such analysis. For instance, topic modelling of documents based on title, abstract and keyword content is contingent upon the extent to which authors conveyed the topic - either overtly or through the use of relatively distinct, domain-specific language – in these text fields. Therefore, given the reduced likelihood and prevalence of such information appearing within these limited text fields, the accuracy of text mining processes such as topic modelling is diminished relative to such analysis involving the whole document text (see Westergaard et al., 2018). The broad availability of Open Access publications would overcome such a limitation, allowing the full text of documents to be retrieved and subsequently analysed. However, of those documents retrieved from querying Scopus®, only 10.1% were Open Access, whilst full text content was not available for those doctoral theses and grants obtained.

Concerning limitations in the analysis itself, there are three further points to consider. Firstly, although widely used and successful machine learning techniques applied in text mining and well-suited to the current analysis, there are inherent limitations in the application and efficacy of both density-based clustering and LDA modelling approaches. Both methods are sensitive to data changes and adjustments in processing, with the quality of models contingent upon input parameters such as number of topics (LDA) and minimal number of points in a cluster (hdbscan). Furthermore, LDA is a probabilistic model, and may therefore produce differing outputs upon each run of the analysis. Such limitations were minimised through application of several methods in deriving appropriate parameters, as well as subsequent iterative application and evaluation of techniques (King's College London and Digital Science, 2015).

Additionally, the topics derived from such methods may be overly suggestive and susceptible to misinterpretation, an issue compounded by the fact that, in contrast to supervised machine learning techniques, there is no natural means or objective measure by which the quality or accuracy of outputs may be measured (Kraemer, Reichstein & Mahecha, 2019). Consequently, model outputs were scrupulously reviewed based on topic diagnostic measures and through human evaluation of topic content (as indicated by top-loading terms and documents). Notwithstanding this process of rigorous, critical evaluation, however, it is accepted that there will be instances of erroneous topic allocation whereby documents have been wrongly identified as addressing a specific topic or identified as addressing a certain topic to a greater extent than is the reality. See also the points noted above in relation to the relative prevalence of topics and the presentation of the findings in this report.

Lastly, an inherent limitation to the current analysis was the limited time period during which analysis was completed – the text mining and text modelling was completed in a three-month period, during which time three separate corpora from different sources were compiled and cleaned, and subsequently analysed. Given this brief timeframe, the extent to which models for each corpus could proceed through multiple revisions and iterations to improve specificity and accuracy was limited. With further time in which to refine models it is believed that text-mining approaches, and their associated outcomes, would have been improved.

1.7. EXPERT INTERVIEWS AND STAKEHOLDER WORKSHOPS

EXPERT INTERVIEWS

Semi-structured interviews were conducted with a purposive selection of experts highlighted in the Systematic Review of studies on the educational research ecosystem. These experts were invited to be interviewed to examine their up-to-date views and their future projections of the field.

20 key researchers were identified as experts in the field based on the frequency of their names occurring in the dataset of outputs in the Systematic Review component. This included two members of the research team for this project, but they were removed from the final list. We supplemented this approach with several names based on our knowledge of the field. From this list, a purposive selection of ten participants was made taking into account substantive expertise (in sub-fields of education research and different research traditions and designs), experience in different parts of the education research ecosystem over the past decade, and diversity of voice. We were also mindful of the need to cover all the home countries. In order to preserve the anonymity of the participants, the lists used in the sampling have deliberately not been provided here. These participants were invited to participate in the project, resulting in five online interviews.

The interviews were conducted online, through Microsoft Teams, recorded, and transcribed. They were semi-structured and an interview schedule (see Appendix 1) was developed based on the narrative critical synthesis of studies found in the systematic review with an initial section tailored to each participant's individual research publications and areas of focus. The schedule was used as a starting point with follow up questions based on participants' own specific interests and answers.

A participant information sheet and consent form were provided by email and participants were asked to return a digitally signed form or to provide consent orally at the beginning of the interviews. Given that many participants explicitly discussed their research, they were offered the option to be named in this report and have their views directly attributed to them. However, all the participants opted to be anonymous and so the information provided has been treated confidentially and their anonymity has been preserved.

STAKEHOLDER WORKSHOPS

Three online stakeholder workshops (recorded and transcribed) were undertaken in October 2020 to discuss, validate and refine the emerging findings from strands I-V, and to provide additional insight into key issues related to the educational research landscape. The workshops also provided additional qualitative expert views on the questions explored in the project, particularly in relation to issues of research dissemination and drivers/priorities. This meant that the focus and data overlapped substantially with the expert interviews.

The three workshops brought together the following specific groups, enabling in depth discussion of core issues from the perspective these different stakeholders:

- 1. Researchers Workshop:** 10 participants representing educational research areas including primary education, secondary education, further education, higher education, STEM education, educational policy and governance, and teacher education.
- 2. Practitioners Workshop:** 12 participants, including practitioners working in primary, secondary, further and higher education and covering a wide range of STEM, social science, and arts and humanities subject areas, as well as individuals involved in Continuing

Professional Development for teaching, particularly several prominent practitioner-oriented organisations.

3. Funders and Policy Makers: 12 participants including representatives from the major public and charitable funders highlighted in this research project and policy maker representatives from England, Scotland and Wales.

Additionally, each workshop included representatives from the British Academy (BA) and Royal Society (RS) and the five members of the research team. The final participant lists for each workshop were agreed in consultation with the BA and RS steering group and were drawn from the Academies and research team’s networks.

The workshops were recorded and the discussions transcribed to aid analysis. Participants consented to being recorded when they actively signed up to the workshop following an emailed invitation and were reminded that they were being recorded at the beginning of the workshop. The email invitation and sign-up website contained detailed information on the project and a participant information sheet. The experts agreed to participate on the basis of confidentiality and anonymity and so the final list of participants has not been included here and no personal information that might reveal their identities has been included in the report.

The workshops were structured around a series of prompt and discussion points (see Appendix 2). The workshop lasted 1.5 hours each, were held online, were jointly hosted with the two Academies (including joint invitation) and chaired by a member of the Oxford research team. They were conducted on Zoom with technical support provided by the Royal Society’s IT team. A briefing document with key findings arising from the study was shared with the participants in advance of the sessions. Each workshop commenced with a presentation of emerging findings by the project team. Participants discussed key issues raised in the initial presentation and briefing document, and then went into breakout rooms (for about 45 minutes) for more in-depth discussion structured by questions. A team member was present in each room to facilitate conversation and aid reporting. A final plenary explored prospects for the future of the field. All plenaries and breakout group discussions were recorded with consent.

ANALYSIS OF INTERVIEW AND WORKSHOP DATA

Given the significant overlap in foci and data, the expert interviews and stakeholder workshops were analysed together, holistically. The transcripts from the interviews and workshops were analysed thematically through a cyclical and iterative process of reduction, synthesis, and conclusion drawing based on Miles, Huberman, and Saldana’s (2018) analytical framework.

Deductive themes, derived from the literature review and our knowledge of the field of educational research and aligned with the research questions were used initially to structure the data and the analytical approach. At a more fine-grained level, inductive codes and code families, emerging directly from the data, were used to determine the key issues highlighted by the participants. This led to the development of the following coding frame, which was iteratively refined through the analytical process. While a number of sub-themes and codes were used operationally, these have been combined into larger codes for the sake of clarity and coherence (Table 1.7.1).

Table 1.7.1. Coding scheme for analysing interview and workshop data

Themes (Deductive)	Codes (Inductive)
Educational Research ‘Ecosystem’	Complexity
	Tensions between research and practice
	Tensions within academic community (reluctant divergence)

	Accountability measures
	Growth in 'third space organisations'
	Growth in practitioner-led organisations
	Growth in non-university-based research providers
	Shift in patterns of dissemination
Funding	Increase in responsive research
	Embedded funder agendas
	Lack of capacity building
Core Disciplines	Interdisciplinarity
	'Tribalism'
	Prominence of Social Sciences
	Prominence of sociology
	Siloed by REF
Core Methodologies	Synergies and tensions between quantitative and qualitative
	Shaped by 'what works agenda'
	Improved rigour
	Growth in quantitative expertise
Gaps in the field	Curriculum
	AI
	Educational technology
	ITE
	Youth voice
	Longitudinal research
	Disconnect between societal needs and research
Dissemination and Knowledge Exchange	Diversification of dissemination mechanisms
	Growth in practitioner focused pathways
	Weaknesses in engaging with policy
Future agendas	Research driven funding
	Researcher careers
	HE structures
	Sustainability

1.8. SYSTEMATIC REVIEW

The review of research on educational research aimed to:

- Map descriptively the available research evidence about educational research
- Synthesise narratively relevant findings extracted from this literature.

The scoping review process followed existing general criteria for the good conduct and reporting of systematic reviews (e.g. the EPPI Centre guidelines; Centre for Reviews and Dissemination guidelines; Quality of Reporting of Meta analyses guidelines).

SEARCH STRATEGY

The following databases were searched in August- September 2020: ERIC - Education Resources Information Center (ERIC), British Education Index (BEI), Web of Science (WoS), Scopus. Scopus and Web of Science are the 2 largest multidisciplinary databases indexing all the most commonly used journals in the field of education (as judged by the top 100 most frequently cited journals in the REF 2014). The coverage in Scopus goes back further for many of these journals than in Web of Science, where some coverage starts in 2015. ERIC and the British Education Index are the main databases focussed on journal articles in the field of education, with some inclusion of publication types beyond journal articles.

Limitation:

Much research output in this area is in the form of reports published directly online by relevant bodies. We supplemented the dataset through: a) following up references from selected studies; b) using our prior knowledge to manually add studies sponsored by key organisations; and c) Google searches. These items were largely reports which were not listed on the four platforms searched (such as the 2018 British Academy/ Royal Society ‘Harnessing Educational Research’ report).

The type of studies we were looking for were unlikely to be reliably identifiable using the controlled vocabularies of the databases available. We thus ran searches that used multiple natural language phrases, as explained below.

Search strings for the systematic review:

ABSTRACT: “education* PROXIMITY research” (find words in any order)

AND

ABSTRACT: assessment OR quality OR policy OR impact* OR output* OR publication*
OR practi* OR applied OR capacity OR ecosystem OR observatory OR
“systematic review” or meta-analysis OR “state of” OR forum OR inquiry OR
enquiry

AND

ABSTRACT: “Great Britain” OR “United Kingdom” OR UK OR England OR Scotland OR Wales
OR “Northern Ireland” OR NI

Pilot searches were conducted on 13 August 2020 and full searches were conducted on 1 September 2020.

The searches generated 2,552 entries (1,172 Scopus, 479 WoS, 639 ERIC, 262 BEI). We also added manually 22 further outputs to the dataset (see details above).

PRE-PROCESSING

Bibliographic information about these outputs, including abstracts where available, was extracted to an Excel sheet, cleaned and de-duplicated. Deduplication prioritized the databases in this order: Scopus, WoS, ERIC, BEI. Following this process, 785 entries were removed, leaving 1,767 entries that moved to the initial screening phase.

INCLUSION AND EXCLUSION CRITERIA

We used the following inclusion criteria to select publications:

1. Topic:
 - studies that address (aspects of) the research ecosystem as a topic in its own right (i.e. in their title and abstract, and in keywords where available; or if not clear, in their research questions or objectives as stated in the full text)
 - studies of the research ecosystem in any area of research that is directly relevant to school-related compulsory education and post-18 education in the UK. As agreed with the Academies, this will include studies that report on the ecosystem for: compulsory schooling, vocational education, further education, higher education, home schooling, professional education, work-based education.
2. Geographical focus:
 - studies that focus on the UK or any of the home countries. These can include international comparisons featuring the UK or any of the home countries.
3. Type of report:
 - any reports that aim to offer new findings and arguments from e.g. empirical, historical or conceptual inquiry, including findings from systematic review or other research synthesis approaches.
4. Format: any format of publication of studies
5. Publication date: published between 2010 and 2020
6. Language: English

We excluded the following:

1a. Topic:

- Studies that address specific issues of methodology but not at system level, for example arguments about the validity of a particular test, or about ethics in a participatory research project.
- Studies that report exclusively on research on: early years; informal education; and wider disciplinary research that does not engage prominently with the scope of this project (such as social mobility, developmental psychology, etc).

2a. Geographical focus:

- Studies that do not have a specific focus on the UK research ecosystem and context.

3a. Type of report: editorial, polemic or opinion pieces that do not offer new findings and arguments from e.g. empirical, historical or conceptual inquiry, including findings from systematic review or other research synthesis approaches.

5a. Publication date: any studies published outside the period 1 Jan 2010-31 Dec 2020.

6a. Language: any publications entirely in languages other than English.

PILOTING AND CALIBRATION

To calibrate and pilot the criteria and coding, two reviewers sifted batches of the same studies and compared results after each batch; consistency was achieved in two initial batches (disparities in less than 5% of the studies in a batch). At that point, detailed notes were shared among the team, a briefing meeting was held, and screening was conducted individually by three reviewers (see below). Checks and coding meetings were also conducted at data extraction stage.

SCREENING AND FINAL SELECTION OF STUDIES

A screening worksheet was used to apply inclusion and exclusion criteria in order to sift studies for coding and data extraction. The initial screening used information from titles, abstracts and bibliographic information to apply the inclusion/exclusion criteria. The screening was conducted by hand by three reviewers. All entries marked 'unclear' were double reviewed. 101 studies were categorised 'unclear' after initial screening. Of these on second review, 16 were marked 'included', 3 were excluded as their focus was not UK, and 3 were excluded because their format was not in scope. The remaining 79 studies were deemed 'not relevant' (those still marked 'unclear' below). Tables 1.8.1 and 1.8.2 summarise the outcomes of the screening and inclusion decisions.

Table 1.8.1. Decision path for inclusion in the screening phase (abstract and title)	
Screening of search results	125
Double review of 'unclear'	15
Screening of manual additions	23
TOTAL	163

Table 1.8.2. Source of outputs retained after the screening phase	
Scopus	95
WoS	24
ERIC	16
Known to team	15
BEI	5
Reference in the main dataset	5
Google search	3
Total	163

During the full-text eligibility checks performed at the content extraction stage A further 39 were excluded: 30 were judged to be out of scope on close reading; six items were not available (these were: three books, two conference proceedings and an abstract for a book review); one non-English

language full text was also excluded; two items were published prior to 2010. As a result, the final corpus includes the following types of items:

Table 1.8.3. Types of publications in the final corpus

Type of item	Frequency
Article	95
Book	3
Chapter	8
Other	3
Report	15
Total	124

A diagram of the workflow above, adapted in line with the recommendations of Moher et al/PRISMA group (2009) is presented in Figure 1.8.1.

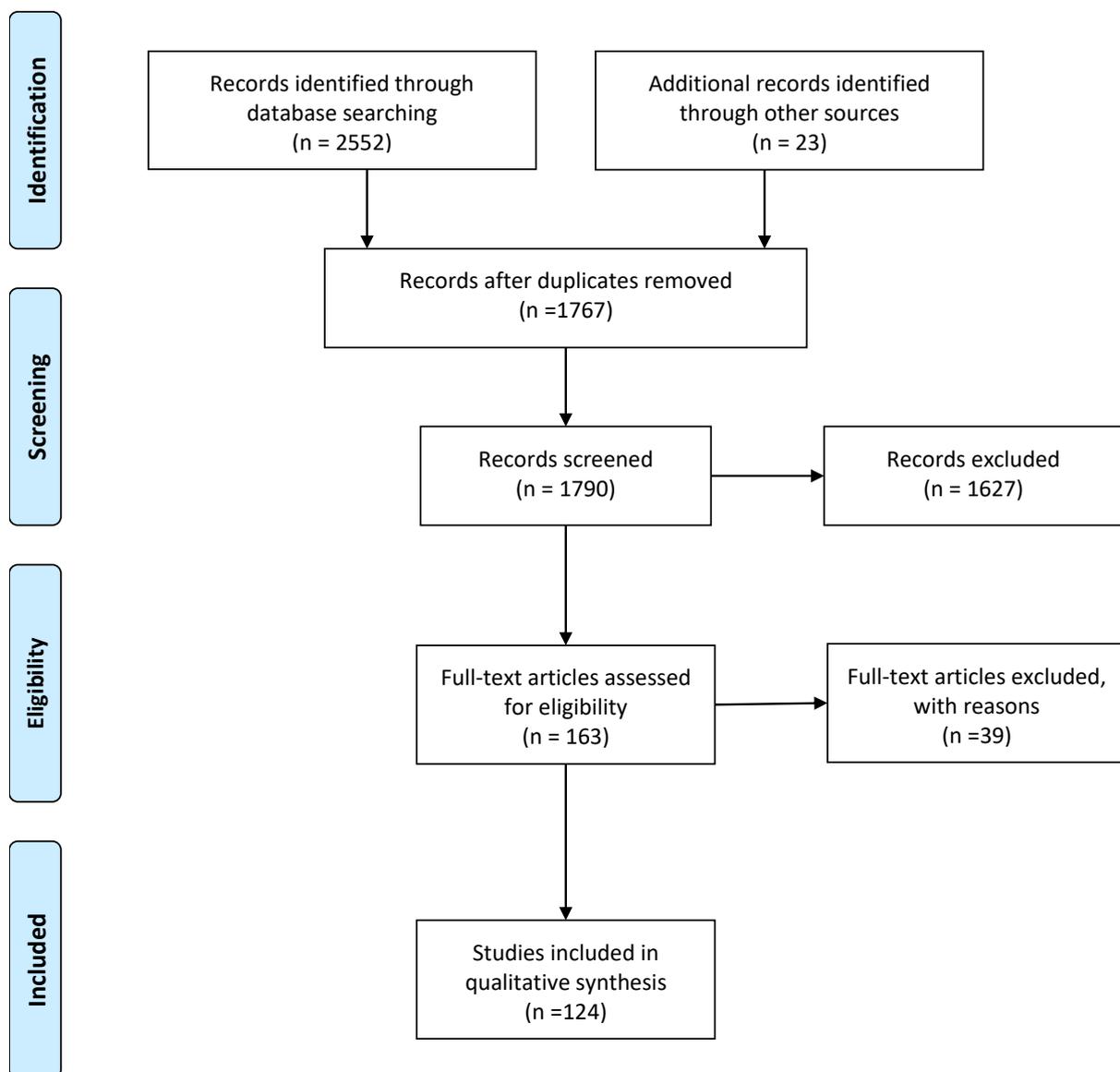


Figure 1.8.1. PRISMA diagram of selection workflow in the systematic review (credit: Moher et al, 2009)

CODING AND DATA EXTRACTION

Data were coded and extracted manually to a workbook using an established template, and cross-checked for reliability. The template was designed on the basis of the research questions of the study, with dedicated space for each.

The data extraction template is in Appendix 3. Basic frequencies were calculated on tabulated data.

QUALITY ASSESSMENT

All studies included were scored by the researchers performing the data extraction for quality on five criteria using a four-point scale. Spot checks were conducted on the reliability of quality judgements. Where a disagreement of at list two scale points arose, the discrepancy was discussed and moderated. The five criteria are below, and full details on their definition and the scale are in Appendix 4.

- Strength of conceptualisation/theory
- Rigour in argument/ empirical study
- Appropriateness of approach
- Well-grounded conclusions and recommendations
- Thoughtful discussion/ insight of experiential account

NARRATIVE INTEGRATION

The scoping review maps out research on educational research, and also (where available) on the state of sub-fields of educational research. To complement the other data gathered for this report, it also focused in more detail on key messages from the literature reviewed about agenda-setting processes and priorities for the future of educational research.

The review led to a narrative report supported by frequencies. The integration of evidence was done separately for each of the categories below:

- types of publications
- distribution of publications over the period
- approach and methods
- overall quality scores types of research published on the topic
- key themes pertaining to priorities for the future of educational research
- gaps in research.

In addition, we scoped the extent of research on:

- 1) the state of research on different areas of professional education, including: teacher education; medical/nurse/dentistry/allied health professions education; other professional education e.g. science and engineering fields, law, social work;
- 2) the state of sub-disciplines of educational research such as geography of education, history of education, philosophy of education, sociology of education etc.).

Following discussion with the Project Board and in the stakeholder workshops, we also sought to identify evidence on: research on curriculum, curriculum design and subject pedagogy research; and research on education and technology research. However, the corpus included insufficient entries on these fields, and more targeted review may be necessary to explore them adequately.

2. RESEARCH FUNDING

Volume of project funding

Grant duration

Funding bodies

Funding recipients

Funding topics

QR funding

Funding vignettes: UKRI; EC/ ERC

2.1. VOLUME OF FUNDING

This chapter reports findings on the research project grants part of our dataset (n=995). Findings on KEI/PER/Innovation grants will be presented in *Chapter 3 – Dissemination and Engagement*. As explained in the previous chapter, grants were classified into two categories based on their aims and scope: research (project) grants; and knowledge exchange and impact funding. Among the 1,744 grants identified, 995 are research grants (including 111 fellowships), while 749 are funding for KEI (including 2 fellowships).

Information about the exact funding size was available for 878 research grants. The total funding amount of the 878 grants is £406,601,979.4 (averaging £36.9m per year) for the period 2010-20. Among all research projects, 921 projects were led by Principal Investigators (PI) based in the UK, with a total funding size as £314,975,327.6 (averaging £28.9m per year)¹. The total funding for KEI projects is 353.7 million in GBP (£32.1m per year on average), among which projects with UK PIs account for 125.4 million in GBP (avg. £11.4m per year). Table 2.1.1 outlines the funding scale for the two types of projects.

Table 2.1.1 Funding scale of research and KEI grants in our dataset (UK and Non-UK PI)

	Research Grants 2010-20		KEI Funding 2010-20	
	Number of grants	Total Funding Size (£)	Number of Grants	Total Funding Amount (£)
All (UK institutions as PI or collaborations)	995	406,601,979.4	749	353,665,425.2
UK PI only	921	314,975,327.6	648	125,359,515.2

We also compiled a separate time series using Higher Education Statistics Agency data (Table 2.1.2) on research income attributed to the Education cost centre in the yearly reports submitted by Higher Education Institutions. The total for the field over the period 2010-19 (data for 2020 were not yet available at the time of preparing this report) is £455m, averaging £50.6 million/year. Note that this total may include Knowledge Exchange and Impact (KEI) projects, which we are analysing separately from research grants in this report, as well as projects from funders who are not

¹ For grants extracted from the Dimensions search, funding amount in currency other than GBP has been converted automatically into GBP, based on the exchange rate of the grant's starting year (Dimensions, 2020b). All grants harvested manually had information about the funding amount in either GBP or in EUR. Funding size in EUR were converted into GBP based on the average exchange rate from the Bank of England of the starting year of the grant.

registered with GRID nor included in our manual searches, while it does not include funding awarded to any educational research providers other than university departments coded to the HESA education cost centre, nor funding awarded after the financial year 2018-19. Our dataset includes providers of educational research that may be situated outside university departments of education as well as projects with a start date in the financial years 2009-10, 2019-20, and 2020-21, which overlap with our period of interest. Thus the HESA figures cannot be directly compared to our findings. Nonetheless, the overall volume indicated by the HESA data suggests that our dataset is likely to have captured a very significant proportion of externally funded research projects in the field for the period in question.

Table 2.1.2. Total research income (000s) in the HESA education cost centre, by source of funding (2010-19) (compiled from HESA data)*

	BIS RC/RS/BA/RSE (000s)	EU government (000s)	Other sources (000s)	Total (000s)
2010-11	11180	3899	38156	53235
2011-12	9921	4493	31368	45782
2012-13	11207	5346	32599	49152
2013-14	12934	5242	27837	46013
2014-15	13970	5575	35137	54682
2015-16	13586	4552	31577	49715
2016-17	10083	4402	30970	45455
2017-18	19495	4683	33508	57686
2018-19	15639	5562	32487	53688
2019-20	na	na	na	na
		Total over period		455408

Notes: "BIS RC/RS/BA/RSE" includes all research grants and contracts income from Research Councils sponsored by the Department for Business, Innovation and Skills (BIS), The Royal Society, British Academy and The Royal Society of Edinburgh. "EU government bodies" includes all research grants and contracts income from all government bodies operating in the EU, which includes the European Commission, but excludes bodies in the UK (Source: HESA data)

Research grants awarded to research projects which involved a principal investigator (PI), co-principal investigator (Co-PI) or co-investigator (Co-I) with a UK institutional affiliation during the period 2010 to 2020 fluctuated over the period, with an overall general increase – although it should be noted that the total funding amount per year varied considerably, largely due to outliers in the dataset (see below). The average grant size over the period was £463,100 (for grants where size of funding information was available – Table 2.1.3 and Figures 2.1.1 and 2.1.2). However, note that this figure is heavily skewed by outlying research grants, which received considerably greater funding amounts than typical during this period and tended to be led from outside the UK (with a strong likelihood for the actual share of funding coming to UK institutions being much lower). For example, the apparent dramatic increase in 2020 is explained by an Australian Research Council centre grant, which had four UK collaborators but no UK PI, and the total of which was over £18m (the only grant in the dataset with a value over £10m). Across the dataset, four grants received between £5m and £10m funding (three funded by ESRC with UK-based PIs, one by the Australian Research Council and including one UK collaborator); 31 grants received between £2m and £5m funding; and 52 had between £1m and £2m funding. The median funding amount received – £193,961 per project across the entire period – may therefore better reflect the typical amount of funding educational research projects were awarded during the period of interest.

Table 2.1.3. Total and mean amount of funding for educational research grants awarded to research projects which involved a principal investigator (PI), co-principal investigator (Co-PI) or co-investigator (Co-I) with a UK institutional affiliation by year, for the period 2010 to 2020.

Year	Total Funding Amount (GBP)	Mean Funding Amount (GBP)
2010	18,000,215	382,983
2011	13,726,334	217,878
2012	39,241,238	426,535
2013	45,415,913	432,533
2014	26,723,371	438,088
2015	39,754,535	473,268
2016	56,153,571	645,443
2017	37,715,395	419,060
2018	37,928,333	399,246
2019	33,941,548	399,312
2020	58,001,526	840,602

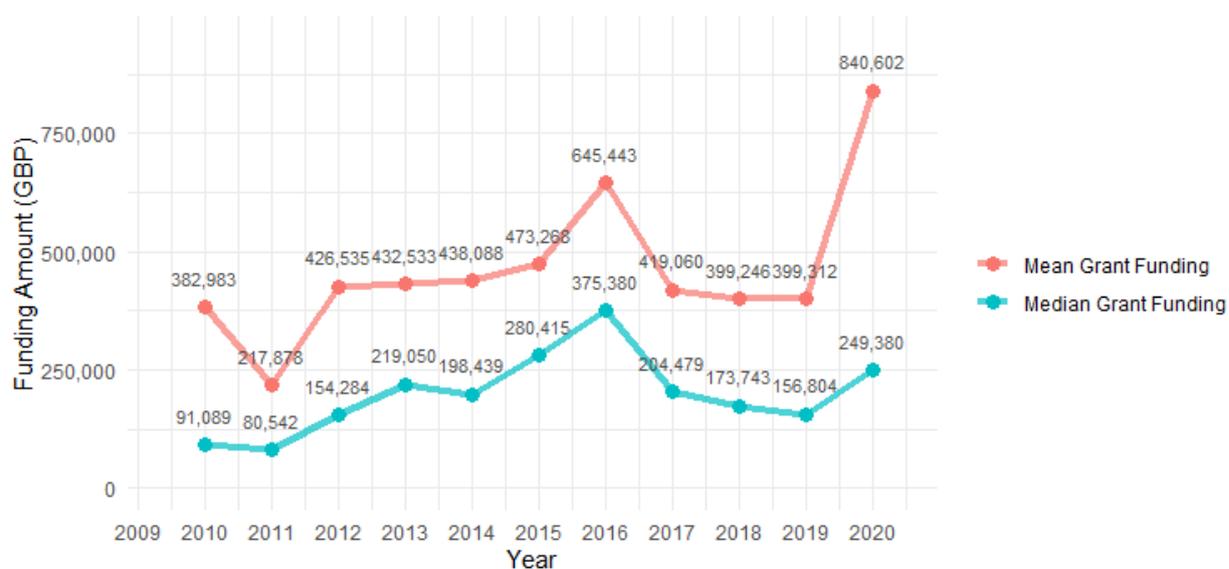


Figure 2.1.1. Total and mean amount of funding for educational research grants awarded to research projects which involved a principal investigator (PI), co-principal investigator (Co-PI) or co-investigator (Co-I) with a UK institutional affiliation by year, for the period 2010 to 2020.

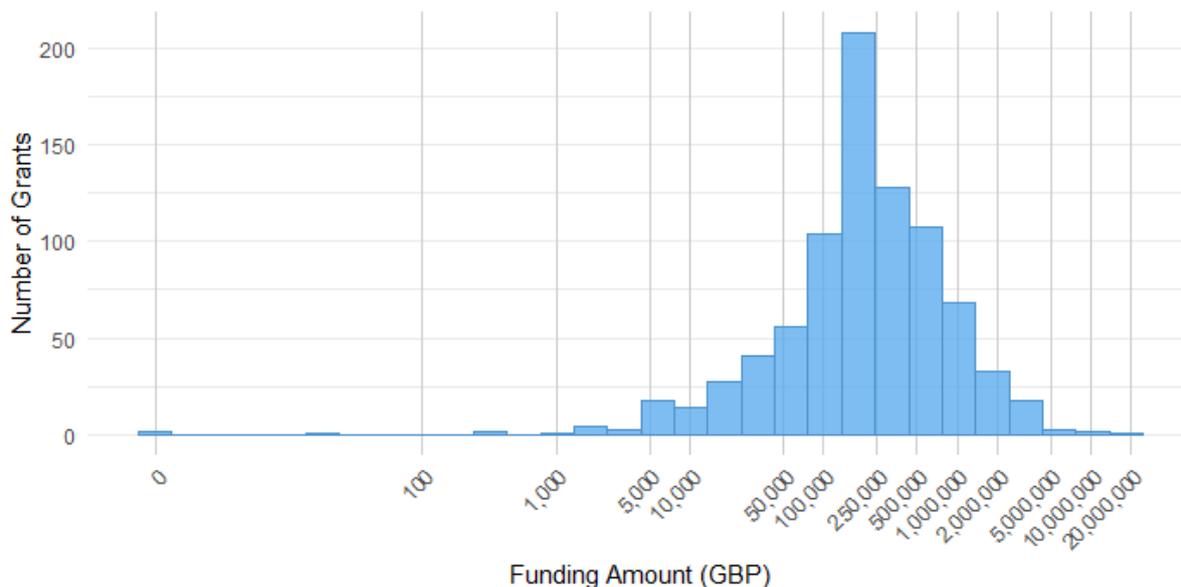


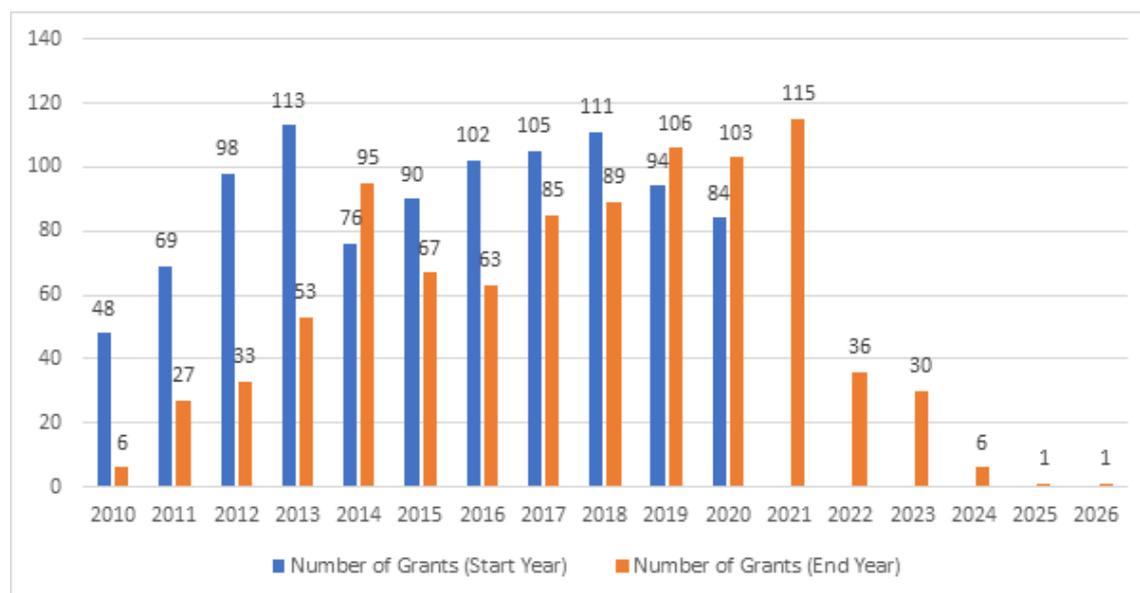
Figure 2.1.2. Histogram of the funding amount of research grants wholly or partly relevant to education awarded to research projects which involved a principal investigator (PI), co-principal investigator (Co-PI) or co-investigator (Co-I) with a UK institutional affiliation between the years 2010 to 2020. Note, the x-axis, funding amount, has been log₁₀ transformed.²

The number of educational research grants awarded to research projects which involved a principal investigator (PI), co-principal investigator (Co-PI) or co-investigator (Co-I) with a UK institutional affiliation increased over the first half of the past decade and remained relatively stable thereafter, with 94 research grants awarded throughout 2019 (the most recently completed calendar year; see Figure 2.1.3). On average, 90 funded research projects involving an investigator (PI, Co-PI, or Co-I) with a UK institutional affiliation started each year.

Figure 2.1.3 summarises the number of research grants with a starting or ending date in each year. The number of starting research grants peaked in 2013 and 2018, with respectively 113 and 111 grants. 2021 and 2020 are the years in which the largest number of research grants in the dataset end.

² Note that the figure above does not include six grants that were borderline research/KEI.

Figure 2.1.3 Number of grants start and ending per year (All Research Grants)



2.2. GRANT DURATION

Information on funding duration was either provided in our data sources as an exact number of months, or calculated by us based on the start date/year and the end date/year of the grants. If calculated based on the number of months granted, the start year was coded as the year the grants were awarded, but note that the actual start date could be different. The actual end year of grants could also differ from the one stated on funders' website due to funding extensions.

In our dataset, 76% of both research grants and KEI funding with UK and non-UK PIs lasted between one year and four years. Research grants have a higher proportion of grants lasting more than 4 years (11%) than KEI grants (4%). KEI funding contains a higher proportion of less-than-one-year grants (18%) than do research grants (5%) (Table 2.2.1).

Table 2.2.1. Funding duration (Research Grants and KEI Funding)

All Research Grants			All KEI Funding		
Duration (D)	Number of Grants	Ratio	Duration (D)	Number of Grants	Ratio
D < 1 year	46	5%	D < 1 year	132	18%
1 ≤ D < 2 years	291	29%	1 ≤ D < 2 years	270	36%
2 ≤ D < 3 years	277	28%	2 ≤ D < 3 years	155	21%
3 ≤ D < 4 years	188	19%	3 ≤ D < 4 years	143	19%
4 ≤ D < 5 years	83	8%	4 ≤ D < 5 years	29	4%
5 ≤ D < 6 years	20	2%	5 ≤ D < 6 years	2	0%
6 ≤ D < 7 years	11	1%	7 ≤ D < 8 years	2	0%
Info not available	79	8%	Info not available	16	2%

2.3. FUNDING BODIES

The research grants in our dataset were funded by 60 funding sources, including both sole funders and co-funders. The total funding size is £406,601,979.4.

ALL RESEARCH PROJECTS WITH UK PARTICIPATION (PI, CI, COLLABORATOR)

Table 2.3.1 lists the funding bodies responsible for the largest number of grants awarded. The five funding sources with the highest number grants per source include the Economic and Social Research Council (273 grants, 27%), Nuffield Foundation (152 grants, 15%), Education Endowment Foundation (99 grants, 10%), Society for Research into Higher Education (70 grants, 7%), and European Commission (68 grants, 7%) (see Figure 2.3.1).

Table 2.3.1. Top funders for research grants (UK and non-UK PI) [By number of grants]

No.	Funding bodies	Number of Grants	Percentage (n=995)
1	Economic and Social Research Council	273	27%
2	Nuffield Foundation	152	15%
3	Education Endowment Foundation	99	10%
4	Society for Research into Higher Education	70	7%
5	European Commission	68	7%
6	Arts and Humanities Research Council	59	6%
7	Leverhulme Trust	43	4%
8	Education Endowment Foundation and partner funders*	40	4%
9	Medical Research Council	34	3%
10	Australian Research Council	21	2%
11	British Educational Research Association	16	2%
12	Wellcome Trust	13	1%
13	British Council	11	1%
14	NIHR Evaluation Trials and Studies Coordinating Centre	10	1%
15	Engineering and Physical Sciences Research Council	9	1%
16	Japan Society for the Promotion of Science	8	1%
17	British Association for Applied Linguistics (BAAL)	6	1%
17	European Research Council	6	1%
19	British Academy	5	1%
19	Science and Technology Facilities Council	5	1%
19	Society for Educational Studies	5	1%

* Note: Co-funders with EEF are aggregated as a single entry in the funding bodies list.



Figure 2.3.1. Number of research grants awarded to research projects which involved an investigator (PI, Co-PI, Co-I) with a UK institutional affiliation by funding bodies with more than 10 research grants awarded during the period 2010 to 2020

Table 2.3.2 shows the largest funders in terms of the total funding amount, each with a total funding over one million in GBP. The five largest portfolios in the dataset are those of the Economic and Social Research Council, European Commission, Education Endowment Foundation, Australian Research Council, and Medical Research Council (see Figure 2.3.2).

Table 2.3.2. Top funders for research grants (UK and Non-UK PI) [by total funding amount above £1m]

No.	Funding bodies	Total funding size (£) **	Percentage (n= £406,601,979.4)
1	Economic and Social Research Council	124,455,034	31%
2	European Commission	70,643,057	17%
3	Education Endowment Foundation	54,886,724	13%
4	Australian Research Council	32,254,108	8%
5	Medical Research Council	23,689,337	6%
6	Arts and Humanities Research Council	22,445,588	6%
7	Education Endowment Foundation and partner funders*	21,677,450	5%
8	Nuffield Foundation	19,291,543	5%
9	European Research Council	8,439,066	2%
10	NIHR Evaluation Trials and Studies Coordinating Centre	7,693,935	2%
11	Wellcome Trust	3,208,504	1%

12	Engineering and Physical Sciences Research Council	2,965,995	1%
13	John Templeton Foundation	2,843,480	1%
14	Leverhulme Trust	2,537,782	1%
15	UK Research and Innovation	1,567,346	0%
16	Templeton World Charity Foundation	1,446,693	0%
17	Biotechnology and Biological Sciences	1,181,126	0%
18	Swiss National Science Foundation	1,105,590	0%

* Note: Co-funders with EEF are aggregated as a single entry in the funding bodies list.

** Note: Not all grants have information about the exact funding size. When funders stated the maximum value of the funding but not the specific amount for each grant, we coded the grants as 'funding information not available', rather than using the maximum amount.

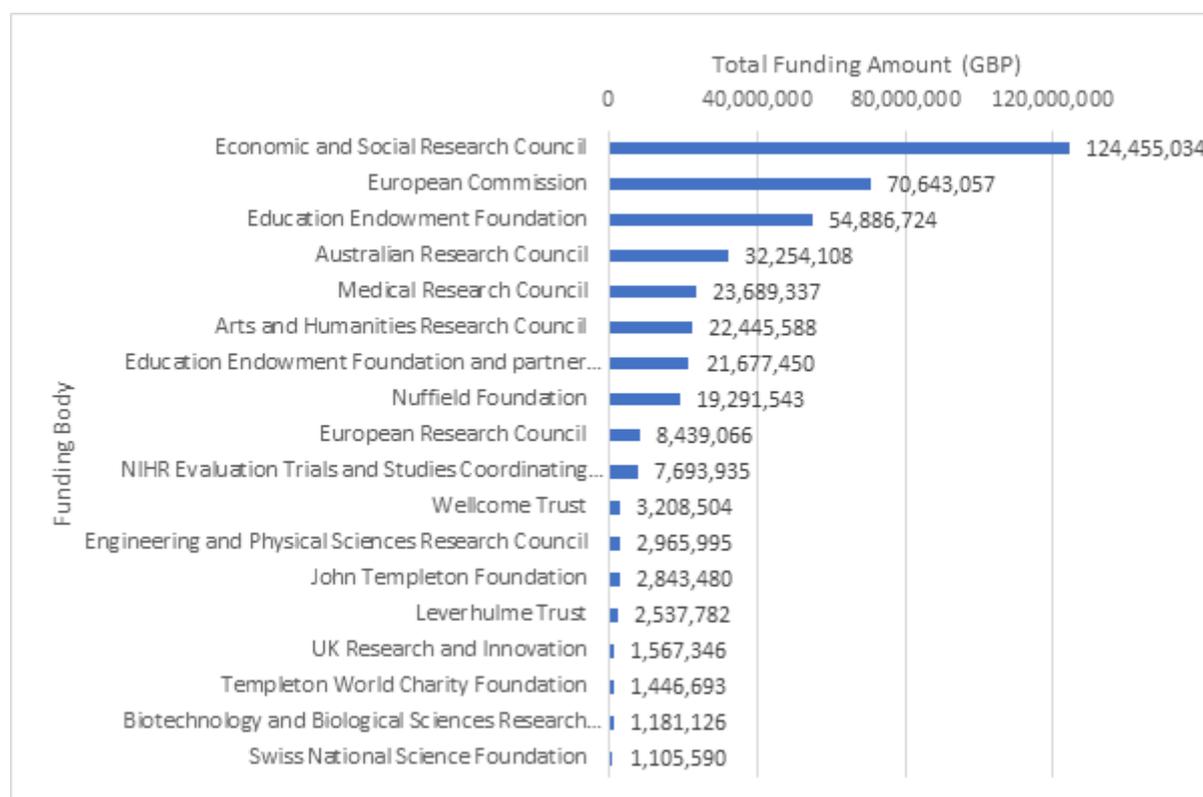


Figure 2.3.2. Total funding awarded to educational research projects which involved an investigator (PI, Co-PI, Co-I) with a UK institutional affiliation during the period 2010 to 2020 through research grants by funding bodies (funding bodies which awarded over one million funding in GBP).

CO-FUNDING

Co-funding only occurred in the dataset in relation to Education Endowment Foundation (EEF)-funded grants. Out of the 139 grants identified as funded by EEF, 40 (29%) were co-funded with other funding bodies. Co-funders with EEF with more than one co-funded grants are: the

Department for Education (DfE) (11 grants), Nominet Trust (7 grants), Wellcome Trust (6 grants), Mayor of London (4 grants), J.P. Morgan (3 grants), Bell Foundation (3 grants), Unbound Philanthropy (3 grants), Careers & Enterprise Company (2 grants), Bank of America Merrill Lynch (2 grants) and Cabinet Office (2 grants). In terms of the total funding amount, the top co-funders with EEF in the dataset were Wellcome Trust, Nominet Trust, Department for Education, Bell Foundation, Unbound Philanthropy, and J. P. Morgan. A detailed breakdown of partner funders with EEF is displayed in Table 2.3.3.

Table 2.3.3. Breakdown of funding from EEF and partner funders (Research grants for all)³

Funders	Total Funding Size (£)
Education Endowment Foundation; Wellcome Trust	4,882,199.00
Education Endowment Foundation; Nominet Trust	3,642,687.00
Education Endowment Foundation; Department for Education	2,307,779.00
Education Endowment Foundation; Bell Foundation; Unbound Philanthropy	2,295,253.00
Education Endowment Foundation; J.P. Morgan	1,453,073.00
Education Endowment Foundation; Department for Education; Mayor of London	1,191,792.00
Education Endowment Foundation; SHINE	1,020,350.00
Education Endowment Foundation; KPMG Foundation	991,400.00
Education Endowment Foundation; Careers & Enterprise Company; Bank of America Merrill Lynch	762,000.00
Education Endowment Foundation; Cabinet office; Pears Foundation; The Stone Family Foundation	676,142.00
Education Endowment Foundation; Money Advice Service	573,000.00
Education Endowment Foundation; Cabinet office	559,862.00
Education Endowment Foundation; Worshipful Company of Actuaries	534,613.00
Education Endowment Foundation; National Institute for Health Research	306,650.00
Education Endowment Foundation; Nominet Trust; KPMG Foundation	253,000.00
Education Endowment Foundation; Department for Education; local authorities, boarding schools, other educational trusts	206,250.00
Education Endowment Foundation; Nike inc.	21,400.00
Total	21,677,450.00

³ Note that we checked and added manually EEF grants as much as possible, using publicly available information such as the website and annual reports. However, it is likely that we only captured a proportion of these grants. Also, note that we coded jointly interventions with their evaluation – should they have been coded separately, the number of individual grants would be larger.

RESEARCH PROJECTS WITH UK-BASED PIS

As UK researchers can act as Principal Investigator (PI), Co-Investigator (Co-I), or collaborators, we separated research projects led by UK PIs and identified 921 research projects, with a total funding size as £314,975,327.6. The distribution of funders for research projects with UK PIs are slightly different from that for all projects (Table 2.3.4 and Table 2.3.5). Funders associated with the highest number of research grants with a UK PI in the dataset include the Economic and Social Research Council (268 projects, 29%), Nuffield Foundation (152, 17%), Education Endowment Foundation (98, 11%), Society for Research into Higher Education (68, 7%), and Arts and Humanities Research Council (59, 6%). The largest total values of funding for research projects led by UK PIs came from Economic and Social Research Council (39%), Education Endowment Foundation (17%), Medical Research Council (7%), Arts and Humanities Research Council (7%), and Education Endowment Foundation and partner funders (7%).

Table 2.3.4. Funders associated with the highest number of research grants with UK PI only

No.	Funders	Number of grants	Percentage (n=921)
1	Economic and Social Research Council	268	29%
2	Nuffield Foundation	152	17%
3	Education Endowment Foundation	98	11%
4	Society for Research into Higher Education	68	7%
5	Arts and Humanities Research Council	59	6%
6	Leverhulme Trust	43	5%
7	European Commission	41	4%
8	Education Endowment Foundation and partner funders*	39	4%
9	Medical Research Council	33	4%
10	British Educational Research Association	16	2%
11	Wellcome Trust	13	1%
12	British Council	11	1%
13	NIHR Evaluation Trials and Studies Coordinating Centre	10	1%
14	Engineering and Physical Sciences Research Council	9	1%
15	British Academy	5	1%
15	British Association for Applied Linguistics (BAAL)	5	1%
15	European Research Council	5	1%
15	Science and Technology Facilities Council	5	1%
15	Society for Educational Studies	5	1%
20	Spencer Foundation	3	<1%
20	Templeton World Charity Foundation	3	<1%

** Note: Co-funders with EEF are aggregated as a single entry in the funding bodies list.*

Table 2.3.5. Funders of research grants with UK PI only [by total funding above £1m]

No.	Funders	Sum of Funding Amount in GBP	Percentage (n=314,975,327.6)
1	Economic and Social Research Council	122,331,913	39%
2	Education Endowment Foundation	54,326,834	17%
3	Arts and Humanities Research Council	22,445,588	7%
4	Medical Research Council	21,820,533	7%
5	Education Endowment Foundation and partner funders*	21,311,420	7%
6	Nuffield Foundation	19,291,543	6%
7	European Commission	17,835,344	6%
8	NIHR Evaluation Trials and Studies Coordinating Centre	7,693,935	2%
9	European Research Council	7,180,858	2%
10	Wellcome Trust	3,208,504	1%
11	Engineering and Physical Sciences Research Council	2,965,995	1%
12	John Templeton Foundation	2,843,480	1%
13	Leverhulme Trust	2,537,782	1%
14	UK Research and Innovation	1,567,346	0%
15	Templeton World Charity Foundation	1,446,693	0%
16	Biotechnology and Biological Sciences Research Council	1,181,126	0%

* Note: Co-funders with EEF are aggregated as a single entry in the funding bodies list.

COUNTRIES OF FUNDING BODIES

As Table 2.3.6 and Table 2.3.7 show, funding bodies for educational research in the UK are largely based in the UK. For all-PI research projects, UK-based funders account for 87% of the number of research grants, and 71% of the total amount of funding for research grants. For UK PI-led research grants, UK-based funders account for 93% of the number of grants and 90% of the total funding amount. Funding bodies based in the EU, mainly EC and ERC, are the second largest funding source for both UK PI research projects and all-PI research projects, in terms of both the number of grants and the total funding size.

Table 2.3.6 Countries/region of funding bodies for research grants (UK and non-UK PIs)

Country/Region	Number of Grants	Percentage (n=995)	Total Funding Size (£)	Percentage (n=£406,601,979.4)
United Kingdom	868	87%	288,940,600	71%
EU*	78	8%	79,082,123	19%
Australia	21	2%	32,254,108	8%
Japan	8	1%	214,036	0%
United States	6	1%	3,357,272	1%
Bahamas	3	0%	1,446,693	0%
Qatar	3	0%	-	-
Canada	2	0%	60,451	0%
Germany	2	0%	-	-
Switzerland	2	0%	1,105,590	0%
Austria	1	0%	141,106	0%
Norway	1	0%	-	-

* We use EU for the location of European funders like EC and ERC.

Table 2.3.7. Countries/region of the funding bodies for research grants (UK PI only)

Country/Region	Number of Grants	Percentage (n=921)	Total Funding Size (£)	Percentage (n=£314,975,327.6)
United Kingdom	857	93%	284,021,755	90%
EU	48	5%	25,016,201	8%
United States	6	1%	3,357,272	1%
Bahamas	3	0%	1,446,693	0%
Canada	2	0%	60,451	0%
Qatar	2	0%	-	0%
Austria	1	0%	141,106	0%
Norway	1	0%	-	0%
Switzerland	1	0%	931,849	0%

2.4. INSTITUTIONS IN RECEIPT OF RESEARCH GRANTS

The definition of ‘research organisations’ varies by different funders. In this study, we used a broad definition of institutions that include the host organisation for a grant (normally the PI’s organisation), the organisation(s) being awarded collaborative funding (if specified), and the PI(s), Co-I(s), research partner(s), research collaborator(s), and research evaluators’ affiliation(s) if the information is provided on the funders’ website. The evaluation organisations only applied to EEF-funded projects. For some funders, only the PI’s institutional affiliation was provided and thereby recorded for analysis.

NUMBER OF GRANTS PER INSTITUTION

In total, 1,021 institutions⁴ participated in the 991 research grants with information about institutions. Table 2.4.1 summarises the institutions associated with the highest count of all-PI research grants in our dataset. The five institutions with the highest numbers of awarded grants in the dataset are University College London (136 grants, 14%), University of Oxford (69, 7%), University of Cambridge (50, 5%), University of Bristol (42, 4%), and University of York (40, 4%) (see Figure 2.4.1). Among the 31 institutions with more than 10 research grants, 28 are based in England, two are based in Scotland, and one in Northern Ireland.

Table 2.4.1. Top institutions in terms of the number of research grants in our dataset [both PI/non-PI; institutions with more than 10 research grants in the dataset]

No	Institution	Number of Research Grants (all)	Percentage (n=991)	Country
1	University College London	136	14%	England
2	University of Oxford	69	7%	England
3	University of Cambridge	50	5%	England
4	University of Bristol	42	4%	England
5	University of York	40	4%	England
6	Durham University	35	4%	England
7	The University of Manchester	28	3%	England
8	University of Exeter	26	3%	England
8	University of Nottingham	26	3%	England
10	The University of Edinburgh	25	3%	Scotland
11	University of Leeds	24	2%	England
12	National Foundation for Educational Research	22	2%	England
13	King's College London	21	2%	England

⁴ For our analysis of funding received by institutions, the funding size was calculated as the total grant for all institutions (not as the share of funding in each grant received by each institution). This is because for many grants, information about the distribution of funding across institutions was not available.

13	University of Warwick	21	2%	England
15	Lancaster University	19	2%	England
16	University of Glasgow	18	2%	Scotland
17	London School of Economics and Political Science	17	2%	England
18	Queen's University Belfast	16	2%	Northern
18	University of Birmingham	16	2%	England
20	The Open University	15	2%	England
20	University of Bath	15	2%	England
22	The University of Sheffield	14	1%	England
23	National Centre for Social Research	12	1%	England
23	University of Southampton	12	1%	England
25	Birkbeck, University of London	11	1%	England
25	National Institute of Economic and Social Research	11	1%	England
25	University of Essex	11	1%	England
28	Institute for Fiscal Studies	10	1%	England
28	Oxford Brookes University	10	1%	England
28	University of London	10	1%	England
28	University of Reading	10	1%	England
28	University of Surrey	10	1%	England
28	University of Sussex	10	1%	England

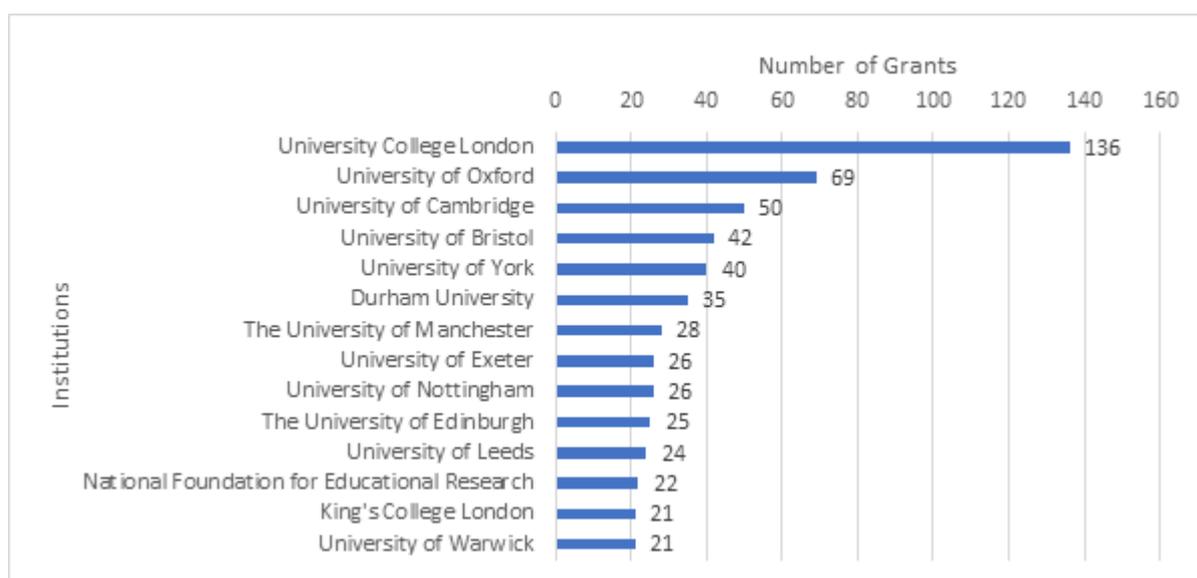


Figure 2.4.1. Number of educational research projects involving investigators (PI, Co-PI, Co-I) from institutions awarded research grants throughout the period of 2010 to 2020 (institutions with more than 20 research grants awarded to projects involving affiliated investigators)

For UK institutions as the PI institutions (Table 2.4.2), 21 UK institutions have more than 10 research grants. The most frequent UK PI institutions are: University College London (102 grants, 11%), University of Oxford (52, 6%), University of Cambridge (41, 4%), University of Bristol (36, 4%), King's College London (21 projects, 2%) University of York (21, 2%) and University of Exeter (20, 2%). Among the 21 institutions with more than 10 research grants, 18 are based in England, two are based in Scotland, and one in Northern Ireland.

Table 2.4.2. UK PI institutions with more than 10 research grants in the dataset

Institution	Number of Grants (as PI)	Percentage (n=921)	Country
University College London	102	11%	England
University of Oxford	52	6%	England
University of Cambridge	41	4%	England
University of Bristol	36	4%	England
King's College London	21	2%	England
University of York	21	2%	England
University of Exeter	20	2%	England
University of Nottingham	19	2%	England
University of Leeds	19	2%	England
The University of Edinburgh	18	2%	Scotland
The University of Manchester	17	2%	England
Durham University	17	2%	England
University of Warwick	15	2%	England
Lancaster University	14	2%	England
Queen's University Belfast	13	1%	Northern Ireland
University of Glasgow	12	1%	Scotland
London School of Hygiene & Tropical Medicine	12	1%	England
University of Bath	12	1%	England
The University of Sheffield	11	1%	England
University of Southampton	10	1%	England
University of Birmingham	10	1%	England

VOLUME OF FUNDING PER INSTITUTION

In terms of total funding awarded as PI institutions, 11 institutions received more than 5 million funding (shown in Table 2.4.3). Ten are from England and one from Scotland.

Table 2.4.3. UK PI institutions with more than £5m total grants in the dataset, ordered by total size of research grants

UK PI Institutions	Total Funding Amount in GBP	Country
University College London	51,424,857	England
University of Oxford	26,422,218	England
University of Cambridge	17,042,173	England
University of Glasgow	11,683,163	Scotland
The University of Manchester	10,049,253	England
King's College London	9,318,432	England
University of Bristol	9,275,443	England
University of York	7,192,096	England
University of Nottingham	7,149,799	England
University of Exeter	5,930,486	England
London School of Hygiene & Tropical Medicine	5,581,710	England

COLLABORATIONS BETWEEN INSTITUTIONS IN RECEIPT OF GRANTS

33% of the research grants awarded to research projects which involved an investigator (PI, Co-PI, Co-I) with a UK institutional affiliation during the period 2010 to 2020 indicated collaboration between investigators with different institutional affiliations. The most productive institutional collaborations, in terms of the number of collaborative research grants, was between investigators affiliated with University College London and University of Bristol (4 research grants). Several institutional collaborations (17 collaborations) indicated collaboration on 3 research grants. The chord diagram below (Figure 2.4.2) illustrates the collaborations between those institutions with which the greatest number of investigators involved in projects awarded research grants were affiliated.

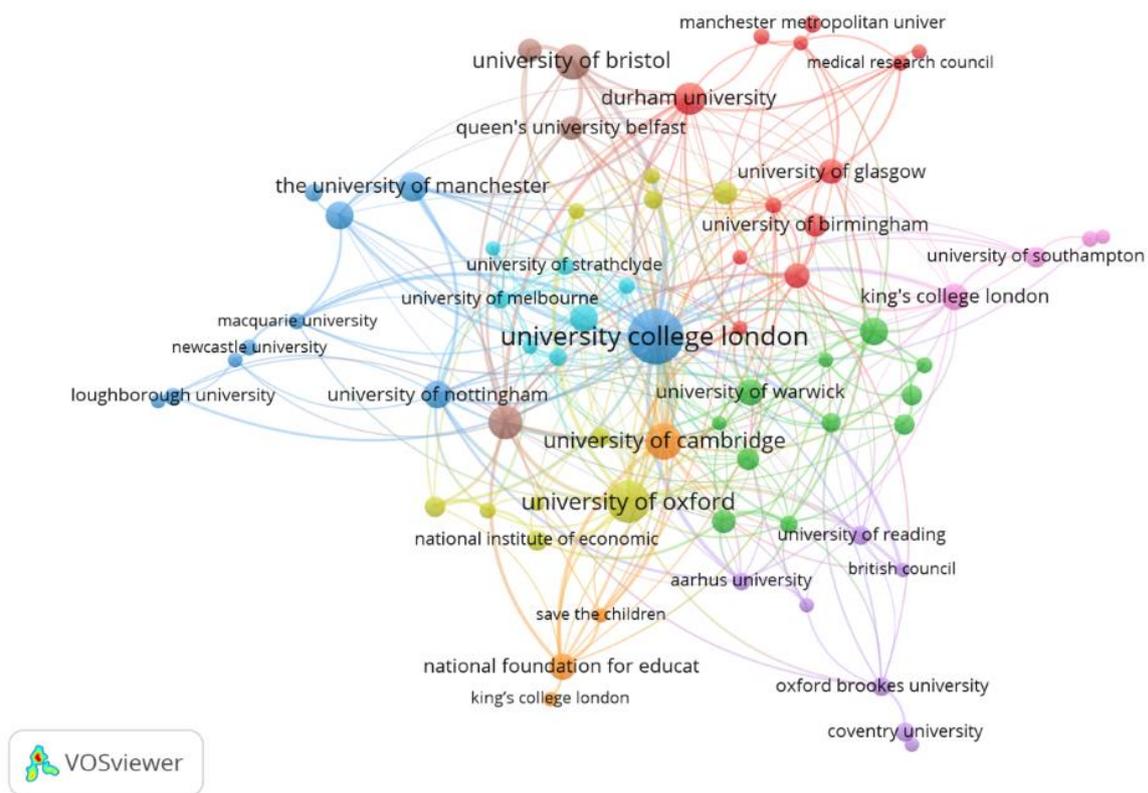


Figure 2.4.3. Collaboration networks among Institutions (research grants)

2.5. GRANT FUNDING AMOUNT FOR DIFFERENT TOPICS

The total funding amount awarded by funding bodies to research grants differed between the topics generated by topic modelling (with documents allocated to the topic most prominent or probable therein) (see Table 2.5.1). Notwithstanding the apparent tendency of funding bodies to prioritise certain research areas (here identified as topics), it is evident that they (and particularly the larger funding bodies) awarded funding to research grants addressing a diverse array of research areas to varying extents. For example, of the 15 topics identified throughout research grants, the ESRC funded grants were found to primarily address all 15 topics, the Nuffield Foundation funded grants addressing 14 of the identified topics, the European Commission funded grants addressing 13 topics, and the AHRC, Leverhulme, and Society for Research into Higher Education each funded grants addressing 12 topics (see Figure 2.5.1).

Table 2.5.1. Research grant topics to which funding bodies awarded the greatest amount of total funding during the period 2010 to 2020. Note, only those funding bodies which awarded total funding of more than £100k to a single topic are displayed. Note that the figures do not include six grants that were borderline research/KEI.

Funding Body	Research Grant Topic	Funding Amount (GBP)
Education Endowment Foundation	School-Based Interventions/ Effective Teaching	47,299,042
Australian Research Council	STEM Education	29,195,829
European Commission	STEM Education	27,815,604
ESRC	Inequalities, Trajectories and Outcomes (Large/longitudinal)	18,238,799
MRC	(Mental) Health and Wellbeing	15,757,444
AHRC	Conflict/Peace and Culture	9,091,791
NIHR Evaluation Trials and Studies Coordinating Centre	(Mental) Health and Wellbeing	7,473,102
European Research Council	Higher Education and Employment	2,951,146
Nuffield Foundation	School Improvement and Accountability	2,872,339
Templeton World Charity Foundation	STEM Education	1,288,682
BBSRC	Science of Learning	1,181,126
Wellcome Trust	School-Based Interventions/ Effective Teaching	1,148,027
National Institute for Health Research	Higher Education and Employment	951,290
Swiss National Science Foundation	Applied Linguistics	931,849
UKRI	Children's Cognition and Development	897,783
NIHR Trainees Coordinating Centre	Education in Developing Countries	608,145
EPSRC	STEM Education	533,151
British Academy	Applied Linguistics	478,936
James S. McDonnell Foundation	Children's Cognition and Development	413,824
STFC	STEM Education	213,585
FWF Austrian Science Fund	STEM Education	141,106

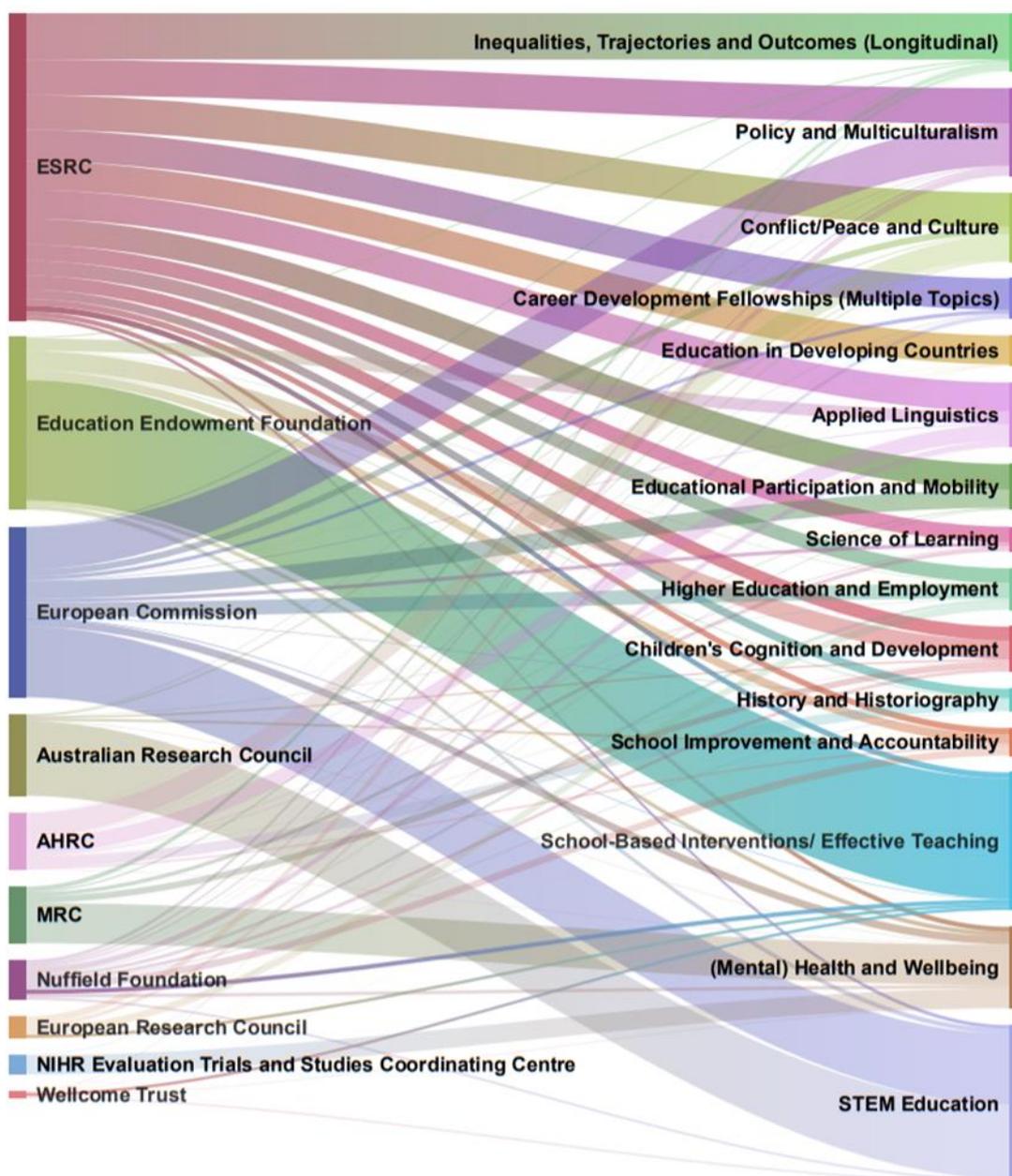


Figure 2.5.1. Total funding amount awarded by funding bodies for research grants by topic addressed. Nodes and links weighted by funding amount. Note, only the ten funding bodies which awarded the greatest amount of funding over the period of interest (see Figure) are included.

The total funding amount awarded to research projects associated with the different topics identified ranged from £65m total funding awarded across research grants addressing the topic of “STEM Education” (75 grants) to £9m awarded across research grants addressing the topic of “History and Historiography” (45 grants). Apart from “STEM Education”, the topics awarded the greatest amount of funding across research grants included “School-Based Interventions/ Effective Teaching” (£54m across 132 grants), “Policy and Multiculturalism” (£35m across 60

grants), “(Mental) Health and Wellbeing” (£32m across 66 grants), “Conflict/Peace and Culture” (£28m across 56 grants), and “Applied Linguistics” (£27m across 70 grants) (Figure 2.5.2)⁵.

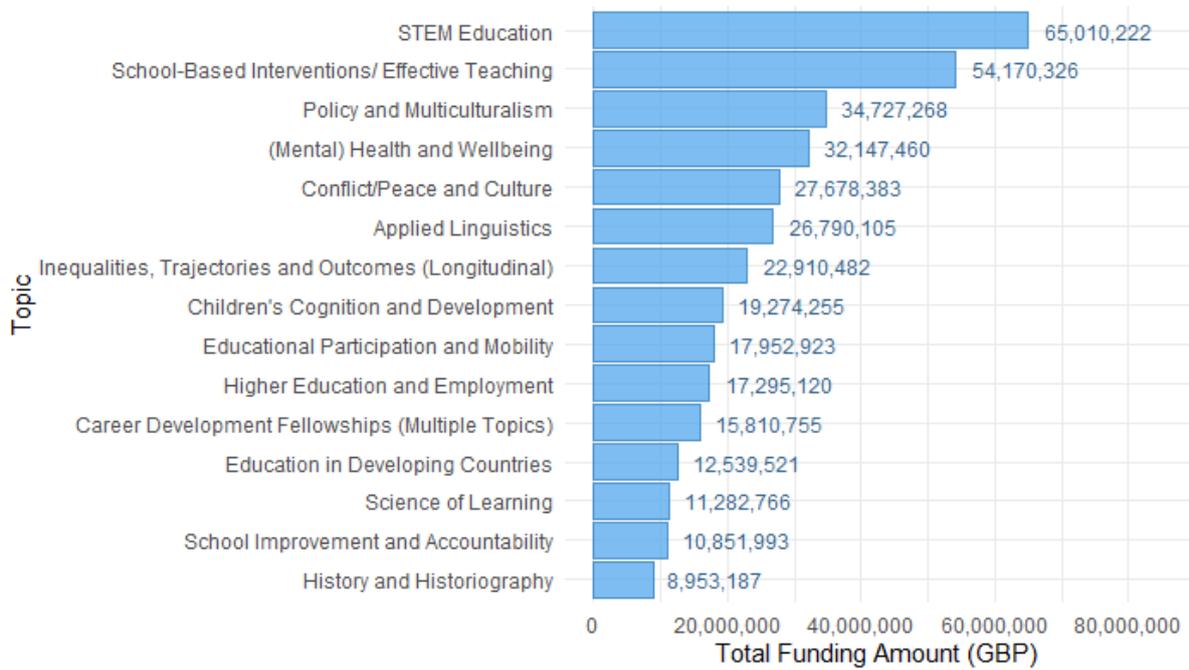


Figure 2.5.2. Total amount of funding awarded for research grants addressing each topic (based on allocation of documents to the most prominent topic therein) between 2010 and 2020.

⁵ Note that the figures above do not include six grants that were borderline research/KEI.

2.6. QUALITY-RELATED FUNDING ALLOCATION

We have used funding body data to calculate the QR allocated to educational research each year. We have also contacted funding body representatives to check or add to the data. As indicated in Table 2.6.1, we were able to compile full data for England and Wales but only partial data for Northern Ireland and Scotland; the total per year should thus be read in light of these missing parts of the data.

The data for England in Table 2.6.1 and Figure 2.6.1 were drawn from the HEFCE archive (2010-18) and from Research England grant tables (2018-2020); the figures in the table below are inclusive of London weighting. For Northern Ireland, we used data from the Department for the Economy website (which was only available for 2015-19). In Wales, data were sourced from the Higher Education Funding Council for Wales website. Scotland has its own funding model named the Research Excellence Grant (REG), managed by the Scottish Funding Council, but we were unable to locate REG tables by unit of assessment for the period prior to the current academic year.

Table 2.6.1. Quality-related funding allocation by year and country (£)

Year	England	Northern Ireland	Scotland (REG)	Wales	Total
2010-2011	24274835	na	3545363	223311	28043509
2011-2012	23726137	na	n.a.	0	23726137
2012-2013	20291824	na	na	0	20291824
2013-2014	20291824	na	na	0	20291824
2014-2015	20291824	na	na	0	20291824
2015-2016	21057329	718165	na	617309	22392803
2016-2017	21459769	718,165	na	617309	22795243
2017-2018	21523136	721046	na	617309	22861491
2018-2019	20780554	721046	na	617309	22118909
2019-2020	21521798	(721,046)	2738987	617309	25599140

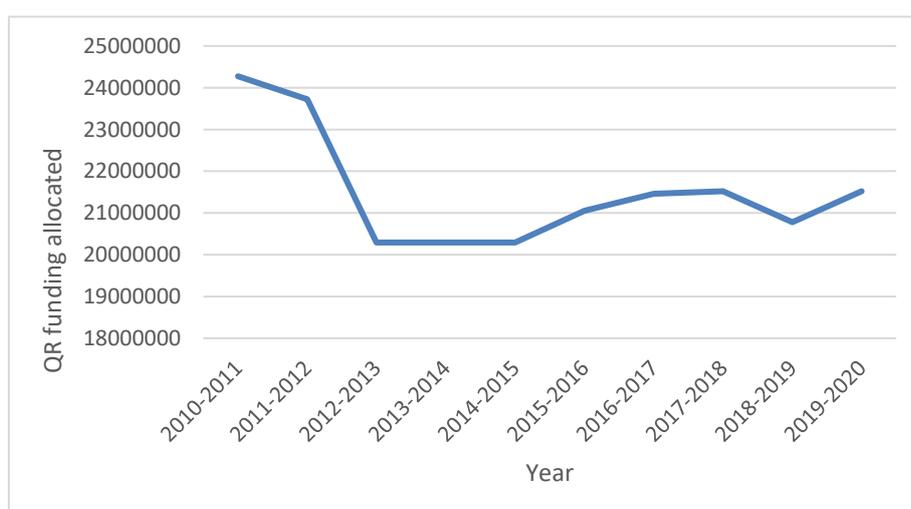


Figure 2.6.1. Quality related funding for education in England, 2010-20.

Source: HEFCE/ Research England

2.7. UKRI FUNDING VIGNETTE (RESEARCH)

UKRI FUNDING FOR RESEARCH PROJECTS WHOLLY OR PARTIALLY IN THE FIELD OF EDUCATION, 2010-20

UKRI councils funded 387 research grants⁶ included in our dataset, of which 381 have UK PIs (Table 2.7.1). For all UKRI-funded research projects, the total funding is £176.87 million. For all UK PI research projects, the total funding from UKRI is around £172.88 million, with the maximum and minimum funding per grant both being associated with the ESRC (£8,370,933 and £3,630).

Table 2.7.1. UKRI-funded research projects in our dataset

Research Projects	Total Number	Total Funding
All UKRI-funded research projects	387	£176.87 million
UKRI-funded research projects with UK PI	381	£172.88 million

Among all UKRI research councils, ESRC is associated with the largest number of grants (268) and the highest total funding amount for research grants (£122,331,913), awarded solely or collaboratively. For all UKRI-funded research projects, the average funding per grant is £462,252, with the highest average funding as £783,673 by UKRI-wide schemes (UKRI Future Leaders Fellowship). The average duration for all UKRI-funded projects is 2.2 years, with the longest average duration per funding source being four years by UKRI-wide Future Leaders Fellowships and the shortest being less than one year by Innovate UK (though note n=1) (Table 2.7.2).

Table 2.7.2. UKRI funding for research grants (UK PI only)

UKRI Councils	Number of Grants	Total Funding Amount in GBP	Max. of Funding Amount in GBP	Min. of Funding Amount in GBP	Average of Funding Amount in GBP	Average of Duration (years)
All UKRI Councils	381	172,882,275	8,370,933	3,630	462,252	2.2
ESRC	268	122,331,913	8,370,933	3,630	468,705	2.2
AHRC	59	22,445,588	3,230,977	15,360	380,434	1.9
MRC	33	21,820,533	2,635,762	96,340	661,228	2.6
EPSRC	9	2,965,995	716,108	46,654	329,555	1.9
STFC	5	499,690	120,612	68,481	99,938	2.6
UKRI-wide (FLF)	2	1,567,346	897,783	669,563	783,673	4.0
BBSRC	2	1,181,126	721,390	459,736	590,563	3.5
NERC	2	21,180	12,068	9,112	10,590	1.0
Innovate UK	1	48,904	48,904	48,904	48,904	less than one year

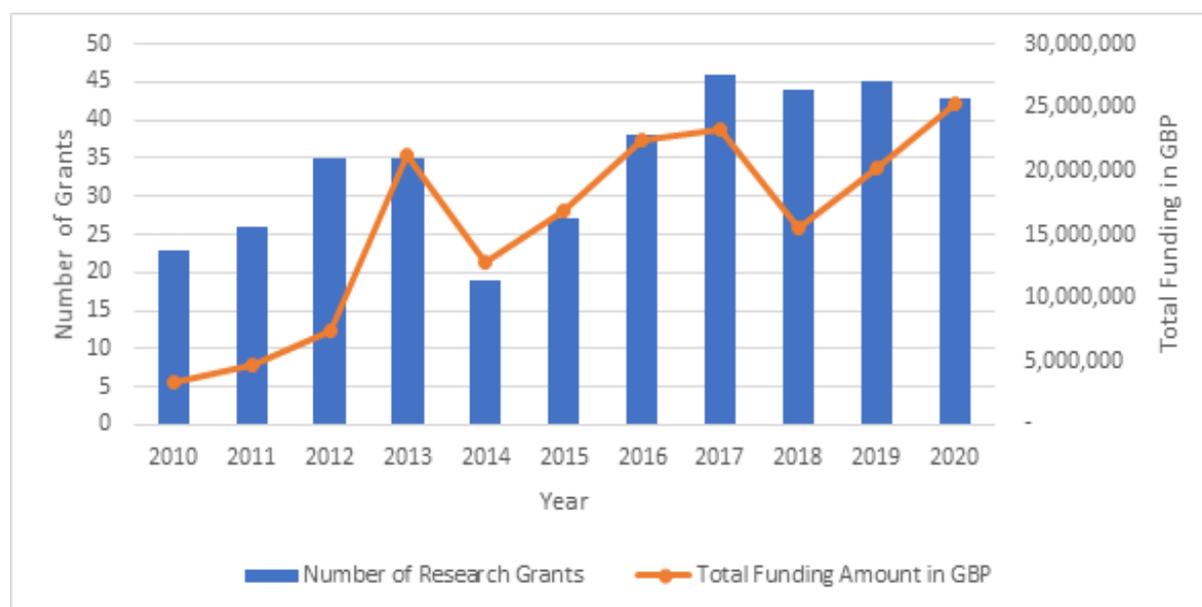
⁶ Information on KEI/PER/Innovation grants is reported in *Chapter 6 – Dissemination and Engagement*

Table 2.7.3 and Figure 2.7.1 display the trends of UKRI-funded research grants based on their starting years. They show a fluctuation between years, with an overall increase in the 2015-2020 period relative to the previous years, in terms of total number and funding value.

Table 2.7.3. UKRI funding for research grants by starting year (UK PI only)

Start Year	Number of Grants	Total Funding Amount in GBP	Average of Funding Amount in GBP	Average of Duration (years)
2010	23	3,379,465	146,933	1.48
2011	26	4,766,969	183,345	1.42
2012	35	7,380,108	210,860	1.80
2013	35	21,219,209	606,263	2.34
2014	19	12,755,835	671,360	2.37
2015	27	16,814,231	622,749	3.00
2016	38	22,403,056	605,488	2.84
2017	46	23,262,325	581,558	2.07
2018	44	15,433,936	350,771	2.39
2019	45	20,187,356	448,608	2.20
2020	43	25,279,785	587,902	2.16

Figure 2.7.1. UKRI funding for research grants by starting year (UK PI only)



Among the institutions hosting UKRI research grants as PI institutions, four institutions hosted grants worth more than 10 million in total: University College London, University of Oxford, University of Cambridge, and University of Glasgow. Institutions with more than 10 UKRI research grants are: University College London (47), University of Cambridge (22), University of Oxford (21), University of Bristol (19), King's College London (14), University of York (13), London School of Hygiene & Tropical Medicine (11), Durham University (11), The University of Edinburgh (11), and University of Leeds (10) (Table 2.7.4).

Table 2.7.4. Top recipients of UKRI research grant funding (UK PI only; total funding over £1 million)

No.	UK PI Institutions	Total Funding Amount (GBP)	Average Funding Amount (GBP)	Number of Research Grants	Average of Duration (years)
1	University College London	38,889,155	845,416	47	2.5
2	University of Oxford	16,233,006	811,650	21	2.3
3	University of Cambridge	11,084,187	503,827	22	2.8
4	University of Glasgow	10,177,809	1,130,868	9	2.6
5	The University of Manchester	8,518,281	1,216,897	7	2.1
6	King's College London	7,615,349	543,954	14	2.4
7	London School of Hygiene & Tropical Medicine	5,374,120	488,556	11	2.2
8	University of York	4,367,275	335,944	13	2.7
9	Queen Mary University of London	4,306,700	615,243	7	1.4
10	University of Bristol	4,002,121	235,419	19	2.0
11	University of Bath	3,971,778	496,472	8	2.4
12	University of Liverpool	3,792,630	758,526	5	2.4
13	The Open University	3,452,923	690,585	5	2.6
14	University of Leeds	3,156,909	315,691	10	2.2
15	Durham University	2,688,673	244,425	11	2.2
16	Liverpool School of Tropical Medicine	2,635,762	2,635,762	1	5.0
17	Cardiff University	2,453,627	490,725	5	2.6
18	The University of Edinburgh	1,996,599	199,660	11	1.6
19	Queen's University Belfast	1,971,238	219,026	9	1.9
20	University of Ulster	1,922,537	961,269	2	2.0
21	University of Nottingham	1,910,002	318,334	6	1.7
22	University of Sussex	1,867,472	466,868	4	2.5
23	University of Exeter	1,807,406	200,823	9	2.3

24	University of Southampton	1,752,828	350,566	5	2.6
25	University of Essex	1,700,220	425,055	4	3.3
26	University of East Anglia	1,570,624	392,656	4	3.0
27	Coventry University	1,452,426	726,213	2	2.5
28	Oxford Brookes University	1,424,782	474,927	3	2.3
29	Royal Holloway University of London	1,410,76	201,538	7	2.3
30	The University of Sheffield	1,201,242	200,207	6	2.2
30	University of Warwick	1,197,451	299,363	4	1.8
31	Lancaster University	1,183,633	169,090	9	1.2
32	University of Reading	1,145,856	572,928	2	2.0
33	University of Birmingham	1,018,946	254,737	4	2.5
34	University of Stirling	1,002,848	200,570	5	1.0

2.8. EC/ERC FUNDING VIGNETTE (RESEARCH)

EC/ERC FUNDING FOR RESEARCH PROJECTS WHOLLY OR PARTIALLY IN THE FIELD OF EDUCATION, 2010-20

European funding (including the European Commission and the European Research Council for the purposes of our analysis) accounted for 74 research grants in our dataset, of which 46 have UK PIs. For all research projects funded by EC/ERC, the total funding is £79.08 million, with £25.02 million for the 46 projects led by UK PIs.

Table 2.8.1. EC/ERC Research Projects

Research Projects	Total Number	Total Funding
All EC/ERC research projects	74	£79.08 million
EC/ERC council-funded research projects with UK PI	46	£25.02 million

For all EU-funded research projects with UK PIs, the total funding is £25.02 million, with the largest number and total funding coming from EC. The average funding per grant is higher in ERC projects than EC. The average funding duration for EU-funded projects led by UK PIs is 2.6 years, longer than the average duration for UKRI-funded projects (2.2 years) (Table 2.8.2).

Table 2.8.2. EC/ERC funding for research grants (UK PI only)

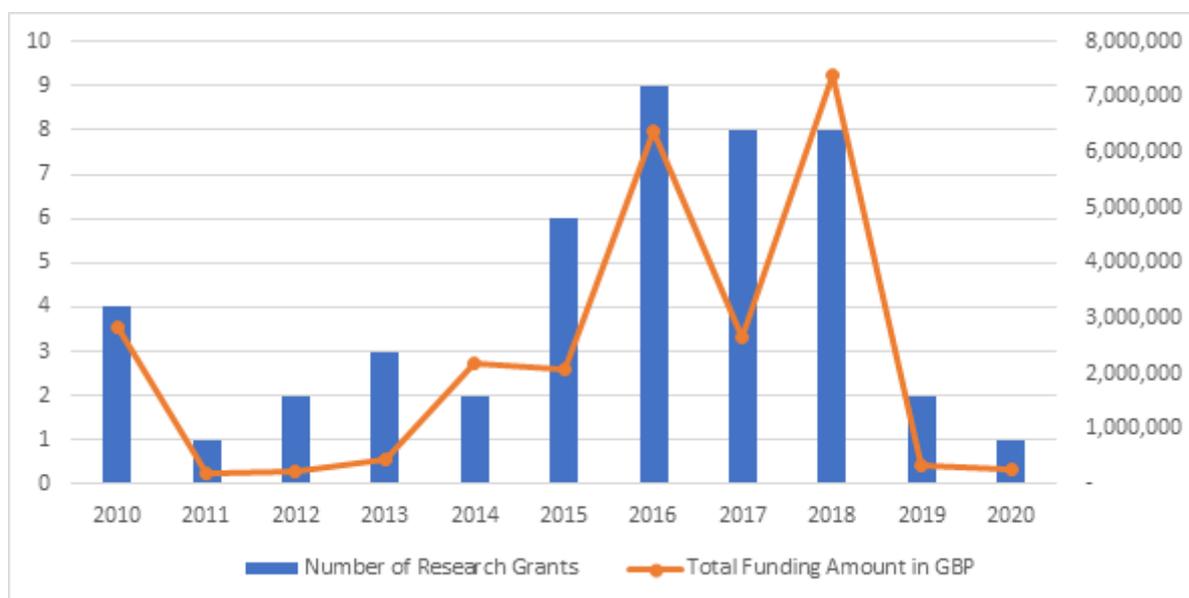
EU Councils	Number of Grants	Total Funding Amount in GBP	Max. of Funding Amount in GBP	Min. of Funding Amount in GBP	Average of Funding Amount in GBP	Average of Duration (years)
All EU Funding	46	25,016,201	3,791,581	63,320	543,830	2.6
European Commission	41	17,835,344	3,791,581	63,320	435,008	2.3
European Research Council	5	7,180,858	1,692,938	1,194,154	1,436,172	5.0

Table 2.8.3 and Figure 2.8.1 display the trends of EU-funded research grants (UK PI only) based on their starting years. They show an overall increase in the 2015-2018 period as compared to other periods, in terms of total number and funding value.

Table 2.8.3. EC/ERC funding for research grants by starting year (UK PI only)

Start Year	Number of Grants	Total Funding Amount in GBP	Average of Funding Amount in GBP	Average Duration (years)
2010	4	2,843,642	710,911	2.5
2011	1	203,808	203,808	3.0
2012	2	236,118	118,059	2.5
2013	3	442,037	147,346	2.7
2014	2	2,187,987	1,093,994	2.5
2015	6	2,068,830	344,805	2.8
2016	9	6,379,773	708,864	2.6
2017	8	2,666,236	333,279	2.1
2018	8	7,406,358	925,795	2.9
2019	2	325,696	162,848	2.0
2020	1	255,716	255,716	3.0

Figure 2.8.1. EC/ERC funding for research grants by starting year (UK PI only)



Among institutions leading EC/ERC grants as PI institutions, 10 institutions hosted projects worth more than one million GBP in funding: University of Cambridge, University College London, University of Nottingham, Sheffield Hallam University, Brunel University London, University of Oxford, London Business School, University of York, University of Northumbria at Newcastle, and University of Exeter.

Table 2.8.4 Top Recipients of EU Research Grants Funding (UK PI only; Total funding over One million)

No.	UK PI Institutions	Total Funding Amount (GBP)	Average of Funding Amount (GBP)	Number of Research Grants	Average of Duration (years)
1	University of Cambridge	4,374,549	1,093,637	4	2.3
2	University College London	3,960,621	565,803	7	2.6
3	University of Nottingham	2,211,145	2,211,145	1	3.0
4	Sheffield Hallam University	1,957,916	1,957,916	1	3.0
5	Brunel University London	1,955,781	977,890	2	2.0
6	University of Oxford	1,626,771	406,693	4	3.5
7	London Business School	1,473,320	1,473,320	1	4.0
8	University of York	1,194,154	1,194,154	1	6.0
9	University of Northumbria at Newcastle	1,124,888	1,124,888	1	3.0
10	University of Exeter	1,011,323	505,662	2	2.0

3. RESEARCH OUTPUTS

Volume of publications

Open access

Citations

Institutional affiliations

Co-authorship patterns

Funding and collaborations

Doctoral theses

3.1. PUBLICATION VOLUME

The dataset of this study contains 26,839 publications, comprising 19,583 journal articles, 1,396 books, and 5,860 book chapters (5,659 chapters from individual books and 201 chapters from book series).

As Table 3.1.1 and Figure 3.1.1 show, the total number of publications involving an author (or authors) affiliated with a UK institution ranged from a minimum of 1,847 in 2010 to a maximum of 3049 in 2013. The number of educational research outputs published each year increased over the course of the period of interest (2010 to 2020), from 1,847 research outputs in 2010 to 2,696 in 2019 (the most recently completed calendar year at the time of the analysis; see Figure 3.1.1). On average, authors affiliated with a UK institution contributed to 2,440 educational research outputs per year (1,780 journal articles, 127 books, and 533 book chapters). The number of book chapters and books published each year is smaller than the number of journal articles (Figure 3.1.2).

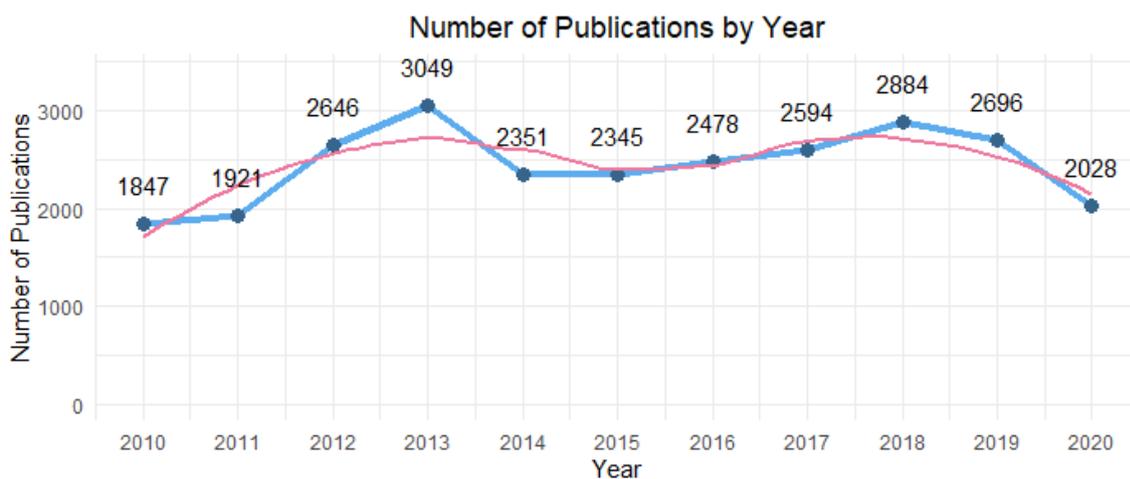


Figure 3.1.1. Number of published educational research outputs involving an author (or authors) affiliated with a UK institution published by year, for the period 2010 to 2020.

Figure 3.1.2. Total publication number by year (journal articles, books and chapters)

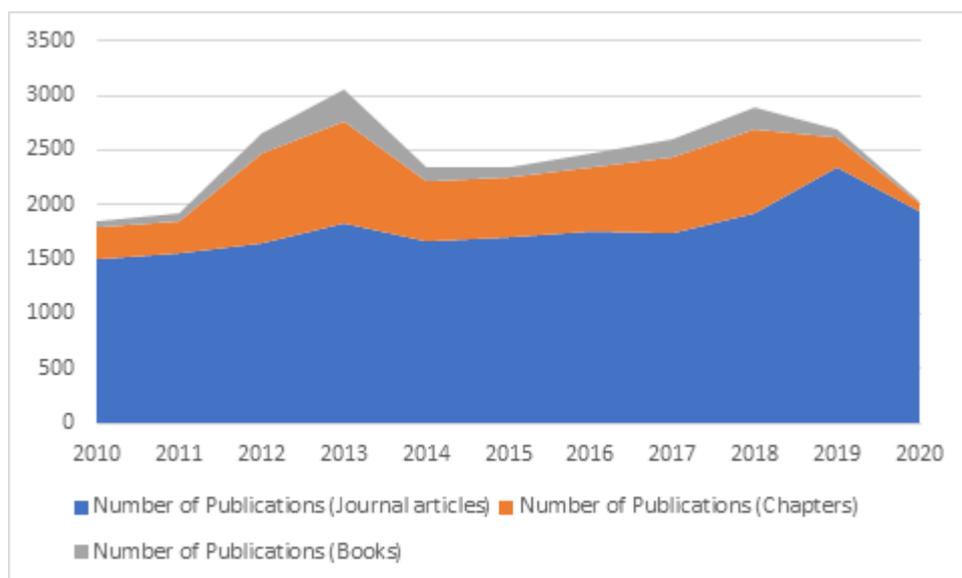


Table 3.1.1. Yearly number of publications (journal articles, books, and chapters)

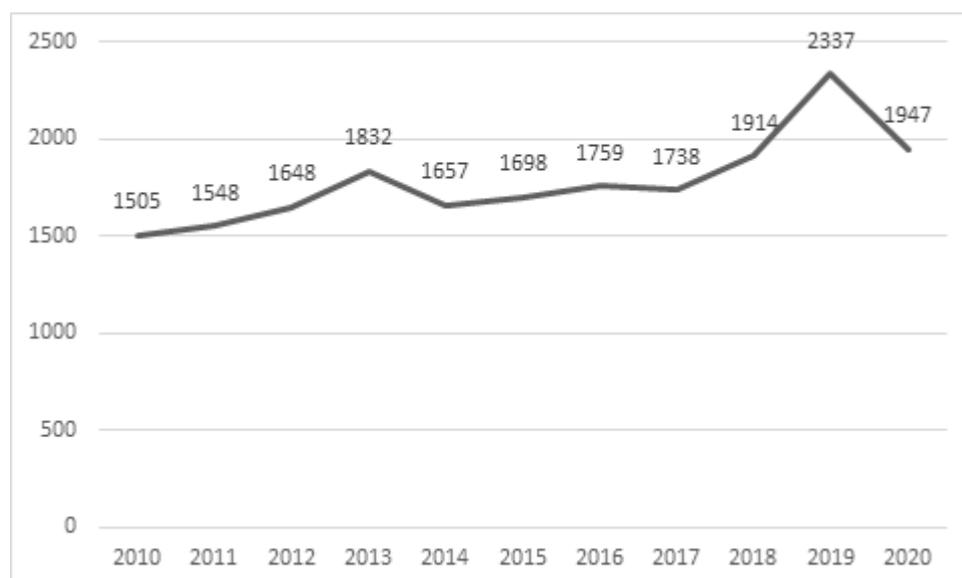
Year	Number of Journal Articles	Number of Books	Number of Chapters	Total Number of Publications
2010	1505	60	282	1847
2011	1548	77	296	1921
2012	1648	182	816	2646
2013	1832	279	938	3049
2014	1657	134	560	2351
2015	1698	91	556	2345
2016	1759	130	589	2478
2017	1738	169	687	2594
2018	1914	187	783	2884
2019	2337	79	280	2696
2020	1947	8	73	2028
Total Number of Publications	19583	1396	5860	26839
Yearly Average Number of Publications	1780	127	533	2440

JOURNAL ARTICLES

The curated dataset for journal articles includes a total of 19,583 journal articles.

The number of journal articles by UK researchers per year on education included in the dataset increased from 1505 in 2010, to 2,337 articles in 2019 (Figure 3.1.3). The average number of journal articles published per year (within the dataset) is 1,780, with 2337 articles published in 2019, ranking the highest among the ten years.

Figure 3.1.3. Total number of journal articles in the dataset, by year



The 19,583 articles were published in 955 journals. The 20 journals with the largest volume of articles published over the period are ranked in Table 3.1.2. The average publication year of articles published in a certain journal is listed in the table. Journals with an average publication year after 2015 are marked in grey, meaning those journals are the source of more recent articles in the dataset.

Table 3.1.2 The 20 journals with the highest number of articles published

Journals	Number of Articles	Percentage (n=19,583)	Average Pub-Year
<i>Studies in Higher Education</i>	478	2%	2016.43
<i>Medical Teacher</i>	462	2%	2014.44
<i>Nurse Education Today</i>	353	2%	2014.16
<i>British Educational Research Journal</i>	346	2%	2015.55
<i>BMC Medical Education</i>	334	2%	2015.86
<i>Journal of Further and Higher Education</i>	308	2%	2016.18
<i>Medical Education</i>	246	1%	2014.51
<i>Research in Post-Compulsory Education</i>	242	1%	2014.59

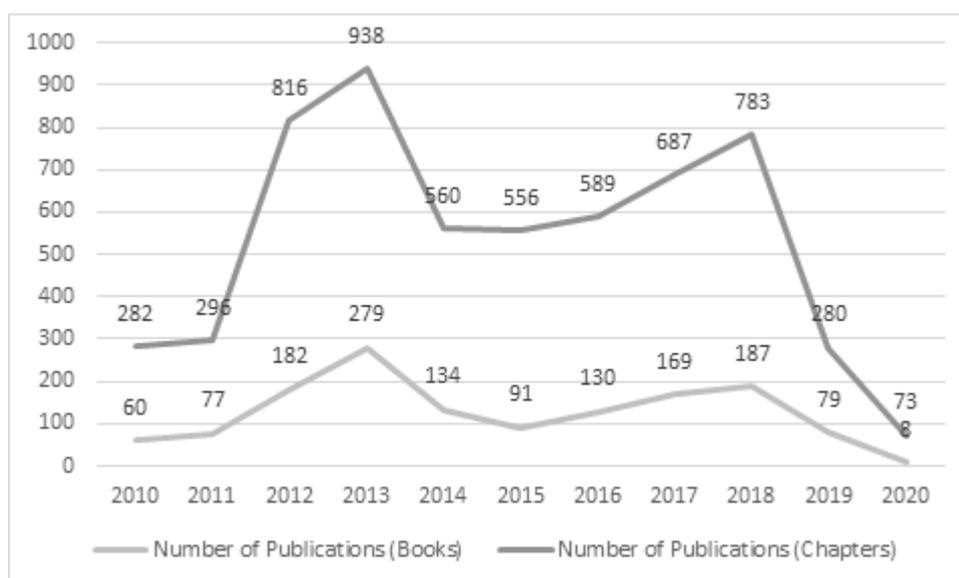
<i>Education 3-13</i>	229	1%	2015.80
<i>Oxford Review of Education</i>	224	1%	2015.05
<i>Teaching in Higher Education</i>	208	1%	2015.75
<i>British Journal of Sociology of Education</i>	206	1%	2015.80
<i>Nurse Education in Practice</i>	190	1%	2014.37
<i>Higher Education</i>	172	1%	2016.33
<i>Journal of Education Policy</i>	168	1%	2014.82
<i>Social Work Education</i>	166	1%	2014.69
<i>Journal of Surgical Education</i>	157	1%	2015.92
<i>International Journal of Educational Development</i>	155	1%	2014.77
<i>Law Teacher</i>	152	1%	2016.08
<i>Sport, Education and Society</i>	149	1%	2016.08

BOOKS AND BOOK CHAPTERS

The curated dataset contains 1,396 books and 5,860 book chapters (5,659 chapters from individual books and 201 chapters from book series). Note that some books may have been republished (e.g. as e-books) in the period or may have been second or third editions, but would be recorded in Scopus with the latest publication date.

The annual number of books and book chapters varied between 2010 and 2020. As Figure 3.1.4 shows, the highest and second highest number of books and chapters were published in 2013 and 2018. The lowest number of book and chapters publications (excluding 2020) was 2010.

Figure 3.1.4. Total number of books and chapters in the dataset, by year



The 5,860 book chapters were published in 2,151 books and book series. The 20 books and book series with the largest numbers of total chapters published are listed in Table 3.1.3.

Table 3.1.3. The 20 books and book series with the largest numbers of total chapters published

Books/Book Series	Number of Chapters	Percentage (n=5,860)
<i>World Sustainability Series</i>	54	1%
<i>Handbook of Educational Ideas and Practices</i>	48	1%
<i>Palgrave Studies in Gender and Education</i>	30	1%
<i>The Cambridge Primary Review Research Surveys</i>	25	<1%
<i>International Encyclopedia of the Social & Behavioral Sciences: Second Edition</i>	23	<1%
<i>A Companion to Research in Teacher Education</i>	21	<1%
<i>Learning for Life: Politics and Progress in Recurrent Education</i>	21	<1%
<i>Handbook of Quality Assurance for University Teaching</i>	20	<1%
<i>Developing Citizenship in the Curriculum</i>	19	<1%
<i>Perspectives on Legal Education: Contemporary Responses to the Lord Upjohn Lectures</i>	18	<1%
<i>Education in the Asia-Pacific Region</i>	17	<1%
<i>The Routledge Companion to Education</i>	17	<1%
<i>Enhancing Student-Centred Teaching in Higher Education: The Landscape of Student-Staff Research Partnerships</i>	16	<1%
<i>Handbook for Teaching and Learning in Geography</i>	16	<1%
<i>The SAGE Handbook of Special Education: Two Volume Set, Second Edition</i>	16	<1%
<i>Dimensions of Marketisation in Higher Education</i>	15	<1%
<i>Researching Catholic Education: Contemporary Perspectives</i>	15	<1%
<i>The Palgrave International Handbook of Alternative Education</i>	15	<1%
<i>The Routledge Companion to Severe, Profound and Multiple Learning Difficulties</i>	15	<1%
<i>Understanding and Developing Student Engagement</i>	15	<1%

3.2. OPEN ACCESS

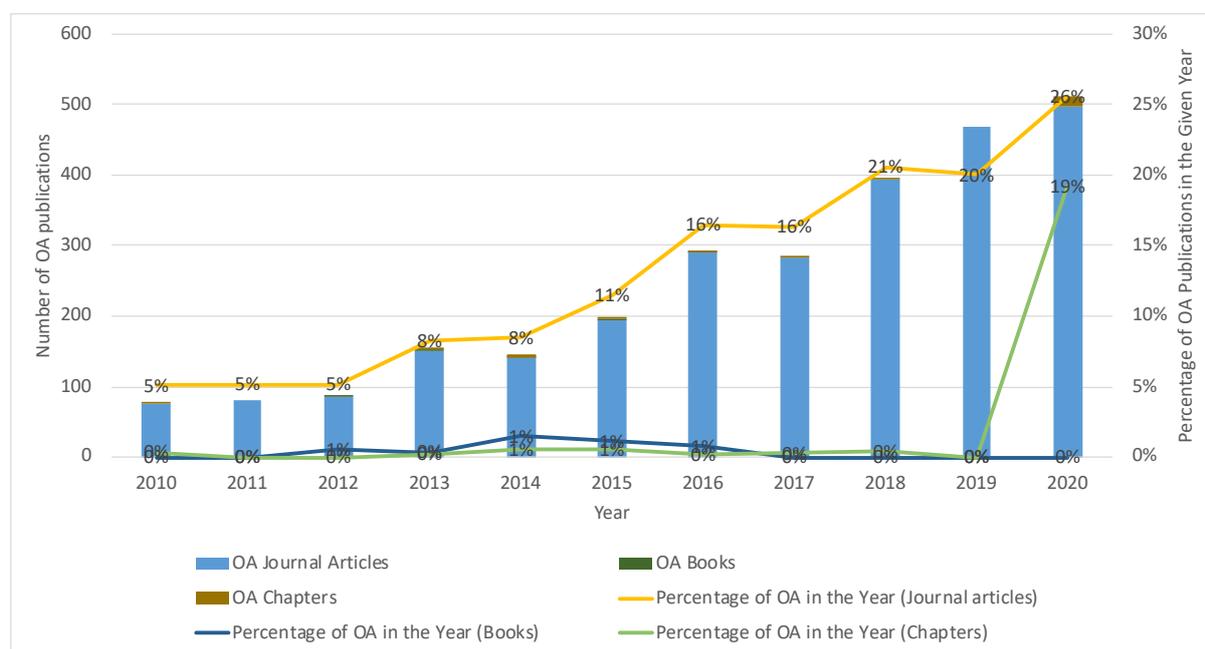
'Open access' (OA) attributes were extracted from Scopus, at both the journal and article level. Note that as of 2019, Scopus indexes 4,065 OA journals. It registers journals as being OA only if they are registered as Gold OA or Subsidized OA in the 'Directory of Open Access Journals' and/or 'Directory of Open Access Scholarly Resources'. Articles are registered as being OA in Scopus if they are registered as Gold or Subsidized OA with Impactstory (Scopus, 2020d).

In general, the number and proportion of OA publications increased for journal articles, but not for books or chapters, which remained low in the past decade (Table 3.2.1 and Figure 3.2.1).

Table 3.2.1. Open access publications by year (journal articles, books, and book chapters)

Year	OA Journal Articles	Percentage in the Year (Journal articles)	OA Books	Percentage in the Year (Books)	OA Chapters	Percentage in the Year (Chapters)
2010	77	5%		<1%	1	<1%
2011	80	5%		<1%		<1%
2012	85	5%	1	1%		<1%
2013	151	8%	1	<1%	2	<1%
2014	140	8%	2	1%	3	1%
2015	195	11%	1	1%	3	1%
2016	290	16%	1	1%	1	<1%
2017	284	16%		<1%	2	<1%
2018	394	21%		<1%	3	<1%
2019	469	20%		<1%		<1%
2020	498	26%		<1%	14	19%
Total	2663	14%	6	<1%	29	<1%

Figure 3.2.1. Trend of open access publications (journal articles, books, and chapters)



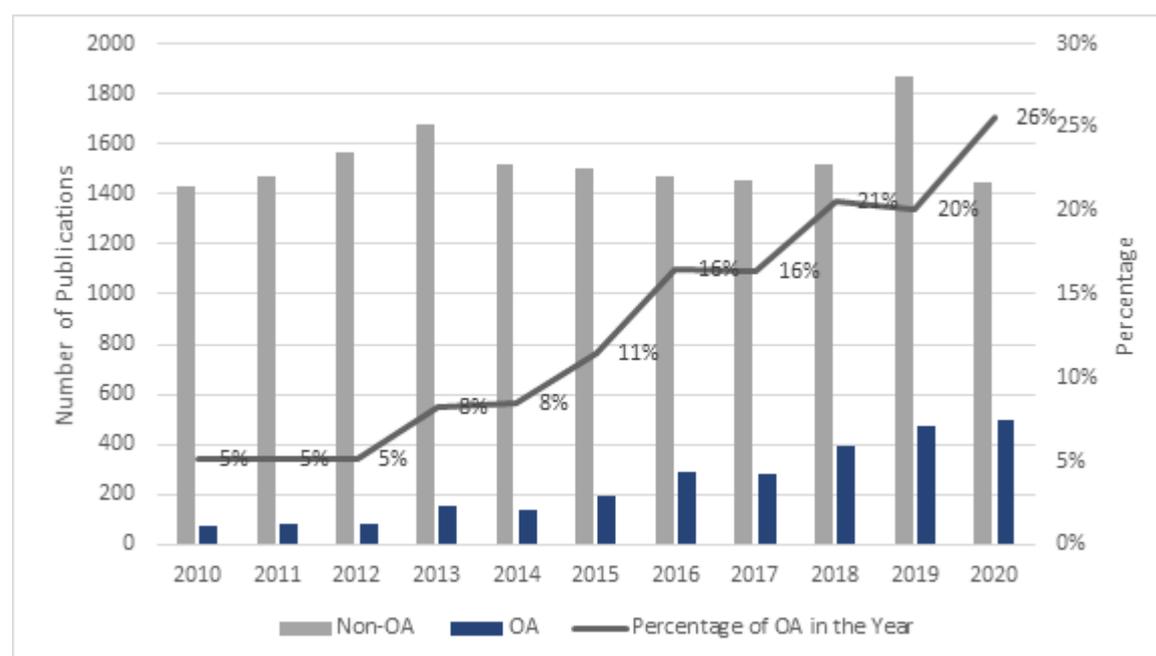
JOURNAL ARTICLES

In UK educational research fields, the number and percentage of Gold or Subsidized open access (OA) journal articles increased from 77 articles (5%) in 2010, to 498 (26%) in 2020. Table 3.2.2 and Figure 3.2.2 show the distribution and trend of journal articles published as Gold or Subsidized open access.

Table 3.2.2. Gold or subsidized open access journal articles by year

Year	Non-OA	Percentage in the Year	OA	Percentage in the Year	Total Publications
2010	1428	95%	77	5%	1505
2011	1468	95%	80	5%	1548
2012	1563	95%	85	5%	1648
2013	1681	92%	151	8%	1832
2014	1517	92%	140	8%	1657
2015	1503	89%	195	11%	1698
2016	1469	84%	290	16%	1759
2017	1454	84%	284	16%	1738
2018	1520	79%	394	21%	1914
2019	1868	80%	469	20%	2337
2020	1449	74%	498	26%	1947

Figure 3.2.2. Growth in gold or subsidized open access journal articles



The 20 journals with the largest volume of open access articles published over the period are ranked in Table 3.2.3. Among all journals in the dataset, *BMC Medical Education* published the largest volume (n=334) of open access articles, followed by *Higher Education*, *Journal of the Royal College of Physicians of Edinburgh*, *Research in Learning Technology*, *British Educational Research Journal*, *Higher Education Pedagogies*, *Education Sciences*, *Medical Teacher*, and *Perspectives on Medical Education*.

Table 3.2.3. The 20 journals with the largest volume of open access articles published over the period

Journal	Number of Open Access Publications
<i>BMC Medical Education</i>	334
<i>Higher Education</i>	74
<i>Journal of the Royal College of Physicians of Edinburgh</i>	72
<i>Research in Learning Technology</i>	71
<i>British Educational Research Journal</i>	59
<i>Higher Education Pedagogies</i>	58
<i>Education Sciences</i>	56
<i>Medical Teacher</i>	55
<i>Perspectives on Medical Education</i>	53
<i>Academic Medicine</i>	39
<i>Frontiers in Education</i>	36
<i>International Review of Research in Open and Distance Learning</i>	31
<i>Cogent Education</i>	30
<i>Advances in Health Sciences Education</i>	26
<i>Health Education Research</i>	23
<i>European Educational Research Journal</i>	22
<i>Medical education online</i>	22
<i>International Journal of Emerging Technologies in Learning</i>	21
<i>Oxford Review of Education</i>	21
<i>International Journal of Educational Development</i>	19

BOOKS AND CHAPTERS

The number and percentage of open access (OA) book publications remained low between 2010 and 2020, with only six OA books. Table 3.2.4 shows the distribution of entire books published as open access per year.

Table 3.2.4. Open access books, by year

Year	Non-OA	Percentage in the Year	OA	Percentage in the Year	Total Publications
2010	60	100%		0%	60
2011	77	100%		0%	77
2012	181	99%	1	1%	182
2013	278	100%	1	0%	279
2014	132	99%	2	1%	134
2015	90	99%	1	1%	91
2016	129	99%	1	1%	130
2017	169	100%		0%	169
2018	187	100%		0%	187
2019	79	100%		0%	79
2020	8	100%		0%	8

The number and ratio of OA individual book chapters followed a similar pattern, with only 29 OA chapters published between 2010 and 2020 present in the dataset. The distribution of OA book chapters is shown in Table 3.2.5. Note that the increase in 2020 to 14 OA book chapters includes 10 chapters published in the same OA book (*Handbook on Promoting Social Justice in Education*).

Table 3.2.5. Open access chapters, by year

Year	Non-OA	Percentage in the Year	OA	Percentage in the Year	Total Publications
2010	281	100%	1	0%	282
2011	296	100%		0%	296
2012	816	100%		0%	816
2013	936	100%	2	0%	938
2014	557	99%	3	1%	560
2015	553	99%	3	1%	556
2016	588	100%	1	0%	589
2017	685	100%	2	0%	687
2018	780	100%	3	0%	783
2019	280	100%		0%	280
2020	59	81%	14	19%	73

3.3. CITATIONS

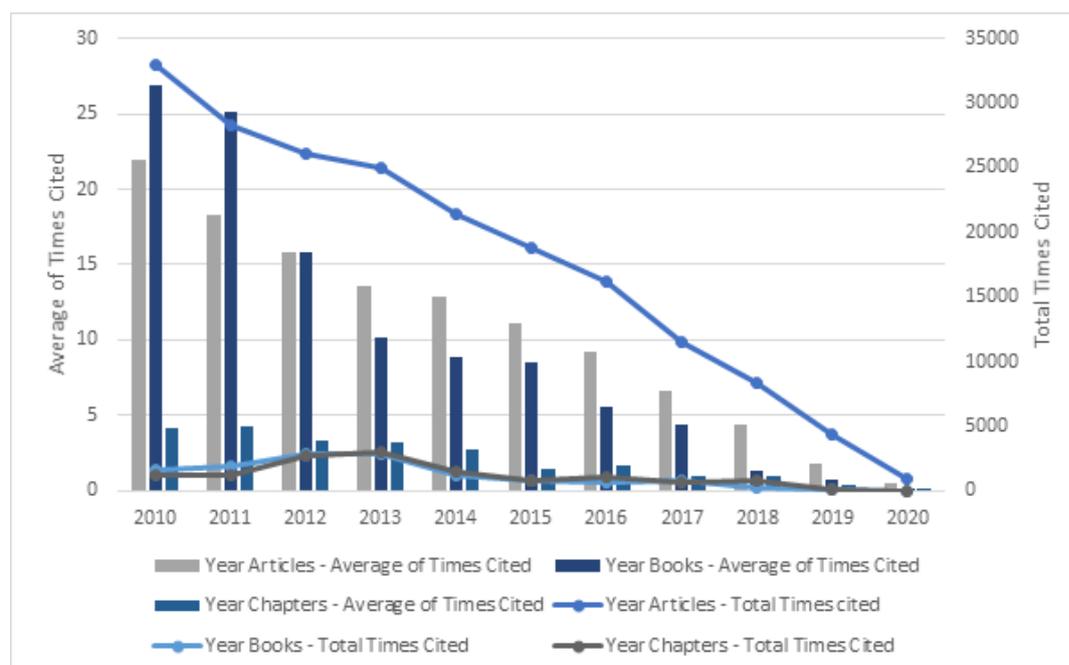
The analysis revealed a natural decrease in the total and average citation rates for all types of publications (Table 3.3.1 and Figure 3.3.1). In general, journal articles have a higher average citation counts (9.90), as compared to books (9.32) and chapters (2.24). However, books published in 2010 and 2011 had the highest average citation counts as compared to journal articles and chapters.

Note that the citation figures reported here are raw counts. None of the figures were normalized by year or field.

Table 3.3.1. Citations measures 2010-20 (journal articles, books, and chapters)

Year	Journal Articles			Books			Chapters		
	Total Times cited	Average of Times Cited	Max. of Times Cited	Total Times Cited	Average of Times Cited	Max. of Times Cited	Total Times Cited	Average of Times Cited	Max. of Times Cited
2010	33028	21.95	761	1614	26.90	364	1181	4.19	40
2011	28274	18.26	435	1934	25.12	307	1275	4.31	80
2012	26093	15.83	1151	2877	15.81	657	2747	3.37	42
2013	24979	13.63	252	2849	10.21	734	3034	3.23	522
2014	21382	12.9	401	1195	8.92	102	1539	2.75	88
2015	18775	11.06	195	778	8.55	96	790	1.42	22
2016	16217	9.22	303	721	5.55	93	1022	1.74	54
2017	11478	6.6	123	752	4.45	84	649	0.94	27
2018	8391	4.38	338	239	1.28	29	752	0.96	20
2019	4353	1.86	40	57	0.72	7	106	0.38	8
2020	968	0.5	23	1	0.13	1	13	0.18	2
Total	193938	9.90		13017	9.32		13108	2.24	

Figure 3.3.1. Trend of citations (journal articles, books, and chapters)



Published educational research outputs involving an author (or authors) affiliated with a UK institution during the period 2010 to 2020 have been, on average, cited 8.2 times each – however, this figure is heavily skewed by several outlying publications which have received considerably more citations than typical for publications during this period (e.g. five outputs have been cited more than 500 times). This distortion is amply apparent in the histogram of citation counts below (see Figure 3.3.2), which illustrates the vast predominance of articles with relatively few, if any, citations. The median citation count – 3 – may therefore better reflect the typical number of times educational research publications were cited during this period. Indeed, 26.3% of publications during this period have not yet been cited.

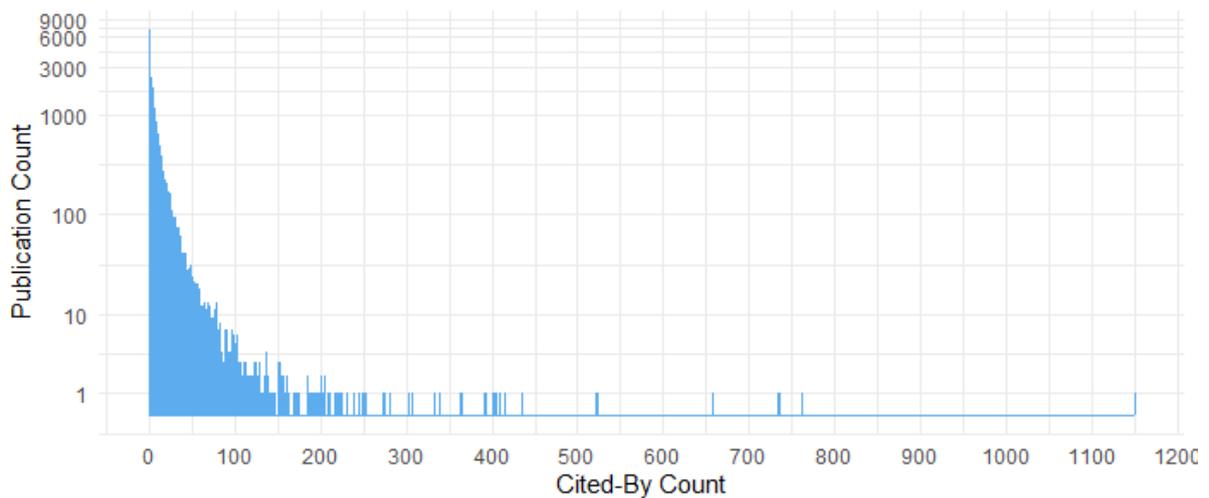


Figure 3.3.2. Histogram of the number of times cited for educational research involving UK-based researchers published between the years 2010 and 2020. Note, the y-axis, publication count, has been log10 transformed.

The average (mean) and median number of times outputs were cited was found to have steadily declined over the period of 2010 to 2020 (see Figure 3.3.3). This decrease may be a reflection of a natural trend in the accumulation of citations over time, whereby the number of times outputs are cited increases over time, with the recency of outputs limiting the opportunity for citation in later research.



Figure 3.3.3. Mean and median number of times educational research involving UK-based researchers published between the years 2010 and 2020 were cited.

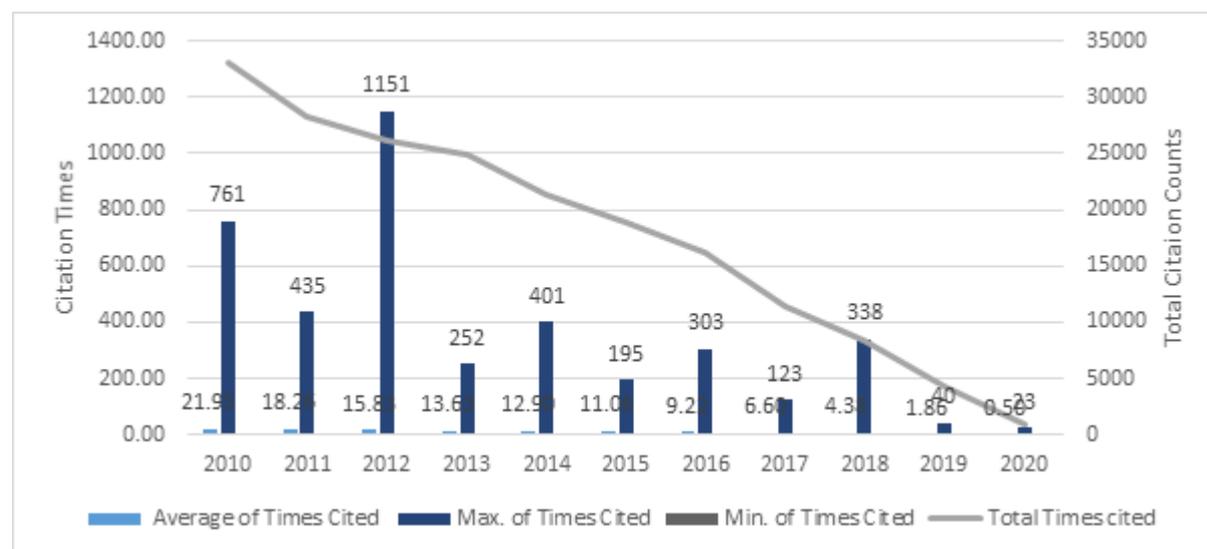
JOURNAL ARTICLES

The total and average citation counts of journal articles naturally decrease from 2010 to 2020, with an average of 9.90 citation counts. The frequencies and trend of total citations, average citation counts, maximum and minimum citation counts are presented in Table 3.3.2 and Figure 3.3.4.

Table 3.3.2. Total citations 2010-20 (journal articles)

Year	Total Times Cited	Average Times Cited	Max. Times Cited	Min. Times Cited
2010	33028	21.95	761	0
2011	28274	18.26	435	0
2012	26093	15.83	1151	0
2013	24979	13.63	252	0
2014	21382	12.90	401	0
2015	18775	11.06	195	0
2016	16217	9.22	303	0
2017	11478	6.60	123	0
2018	8391	4.38	338	0
2019	4353	1.86	40	0
2020	968	0.50	23	0
Total	193938	9.90		

Figure 3.3.4. Trend of citations (journal articles)



The 20 journals with the highest total raw citation counts in our dataset are listed in Table 3.3.3.

Table 3.3.3. Journals by total citations (journal articles)

Journals	Total Citation Counts	Average Citation Counts	Max. Citation Counts	Min. of Citation Counts
<i>Medical Teacher</i>	7448	16.12	761	0
<i>Studies in Higher Education</i>	7123	14.90	201	0
<i>Computers and Education</i>	5826	54.45	1151	0
<i>British Educational Research Journal</i>	5732	16.57	415	0
<i>Nurse Education Today</i>	5239	14.84	146	0
<i>Medical Education</i>	5187	21.09	169	0
<i>BMC Medical Education</i>	3648	10.92	218	0
<i>Journal of Education Policy</i>	3155	18.78	191	0
<i>British Journal of Sociology of Education</i>	2764	13.42	151	0
<i>Higher Education</i>	2655	15.44	156	0
<i>Oxford Review of Education</i>	2594	11.58	185	0
<i>British Journal of Educational Technology</i>	2459	18.77	123	0
<i>International Journal of Educational Development</i>	2211	14.26	172	0
<i>Sport, Education and Society</i>	2118	14.21	78	0
<i>Teaching in Higher Education</i>	2109	10.14	100	0
<i>Assessment and Evaluation in Higher Education</i>	2013	14.91	392	0
<i>Nurse Education in Practice</i>	1814	9.55	57	0
<i>Journal of Further and Higher Education</i>	1635	5.31	93	0
<i>British Journal of Educational Psychology</i>	1557	15.89	95	0
<i>Journal of Surgical Education</i>	1557	9.92	58	0

A description of articles with the highest citation counts within the dataset is included in Table 3.3.4.

Table 3.3.4. 10 Most cited journal articles in the dataset (2010-2020)

Citations	Substantive field	Methodological domain	Number of UK authors / total authors	Home country of author institution/s	Publication year	Gold OA
1151	Learning and technology (gaming)	Systematic review	5/5	Scotland	2012	no
761	Medical education	Systematic review and expert panel	2/20	England, Scotland	2010	no

435	Learning and technology ('digital natives')	Mixed methods (survey/interview)	3/3	Scotland	2011	no
415	Learning and technology ('digital natives')	Survey	2/2	England	2010	no
409	Learning and technology ('digital natives')	Survey	4/4	England	2010	no
401	Learning and technology (MOOC)	Secondary analysis	1/1	England	2014	yes
392	Higher education (assessment)	Conceptual	1/1	Scotland	2010	no
338	Methodology (quantitative)	Statistical tests	1/1	England	2018	yes
303	Learning and technology (gaming)	Systematic review	4/10	Scotland	2016	no
274	Higher education (inequalities)	Mixed-method case study	3/3	England	2010	no

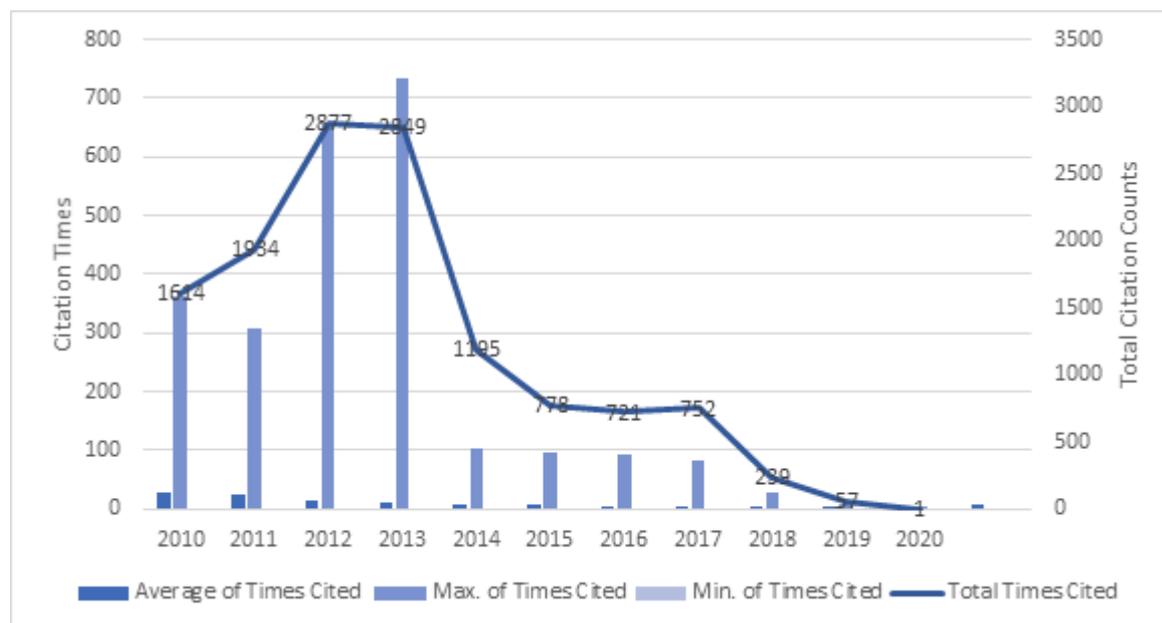
BOOKS AND BOOK CHAPTERS

For books, the total and average citation counts decreased from 2010 to 2020, with an average citation count of 9.32 for the period. Table 3.3.5 and Figure 3.3.5 summarise the frequencies and trend of total citations, average citation counts, maximum and minimum citation counts.

Table 3.3.5. Citation measures (books)

Year	Total Times Cited	Average Times Cited	Max. Times Cited	Min. Times Cited
2010	1614	26.90	364	0
2011	1934	25.12	307	0
2012	2877	15.81	657	0
2013	2849	10.21	734	0
2014	1195	8.92	102	0
2015	778	8.55	96	0
2016	721	5.55	93	0
2017	752	4.45	84	0
2018	239	1.28	29	0
2019	57	0.72	7	0
2020	1	0.13	1	0
Total	13017	9.32		

Figure 3.3.5. Trend of citation (books)



For book chapters, the average citation counts decreased from 2010 to 2020, with an average citation count of 2.24, the lowest compared to journal articles (9.90) and books (9.32).

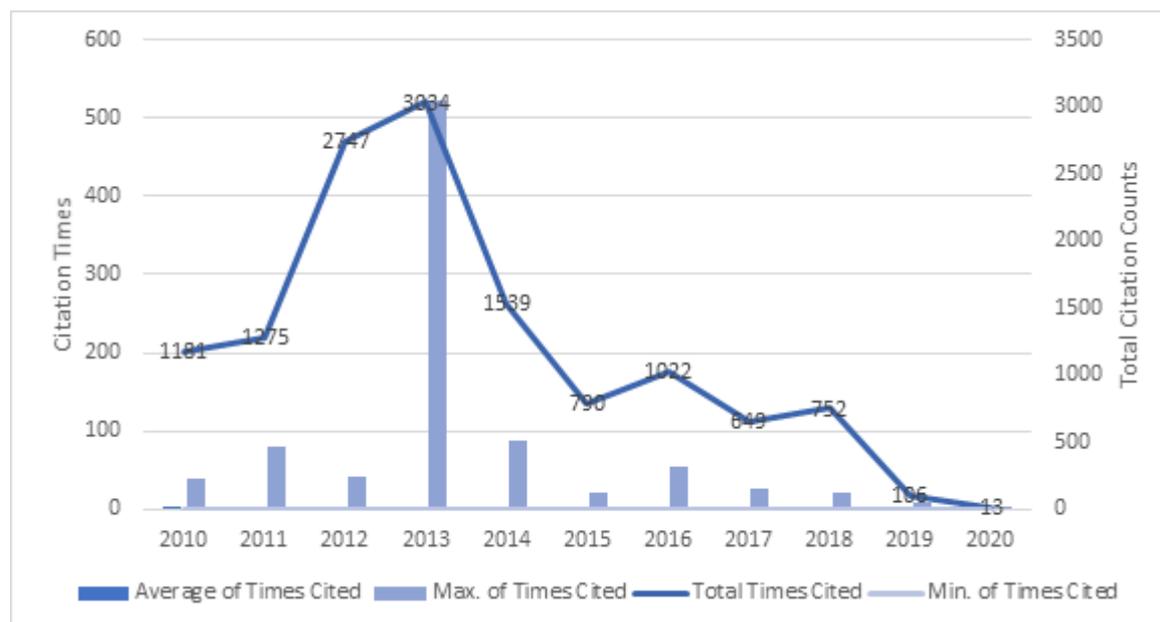
Although the total citation count for chapters in the dataset seems to have peaked in the year 2013, this is due to a chapter being cited 522 times, the highest citation among all chapters. The chapter is 'Teachers: Beliefs and Knowledge' in Handbook of Educational Psychology, originally published in print form in 2006, but captured in this dataset due to an online publication recorded by Scopus as in 2013.

The trend of total citation, average citation counts, maximum and minimum citation counts are presented in Table 3.3.6 and Figure 3.3.6.

Table 3.3.6. Citation measures (chapters)

Year	Total Times Cited	Average Times Cited	Max. Times Cited	Min. Times Cited
2010	1181	4.19	40	0
2011	1275	4.31	80	0
2012	2747	3.37	42	0
2013	3034	3.23	522	0
2014	1539	2.75	88	0
2015	790	1.42	22	0
2016	1022	1.74	54	0
2017	649	0.94	27	0
2018	752	0.96	20	0
2019	106	0.38	8	0
2020	13	0.18	2	0
Total	13108	2.24		

Figure 3.3.6. Trend of citation (chapters)



Descriptions of the books and book chapters with the highest citation counts are included in Table 3.3.7 and Table 3.3.8.

Table 15. The 10 most cited books (2010-2020)

Times cited	Substantive domain	Number of UK authors / total authors	Home country of author institution/s	Publication Year	OA
734	Applied linguistics (bilingualism)	1/2	England	2013	no
657	Educational policy (secondary)	3/3	England	2012	no
404	Education and technology (pedagogy)	1/1	England	2012	no
364	Sociology of education (actor-network theory)	2/2	Scotland	2010	no
333	Educational governance	2/2	England	2012	no
307	Inclusive education (school exclusions)	1/1.	England	2011	no
281	Higher education (internationalisation)	2/2	England	2011	no
231	Higher education (marketisation)	2/2	England	2013	no
209	Teachers and teacher education	2/2	England	2010	no
160	Education systems (comparative study)	1/4	England	2011	no

Table 16 The 10 most cited book chapters (2010-2020)

Times cited	Topic of chapter	Substantive domain of book	Number of UK authors / total authors	Home country of author institution/s	Publication Year	OA
522	Teachers and teacher education	Educational psychology	1/1	England	2013 (2006)	no

98	Mathematics education	Educational psychology	1/2	Northern Ireland	2013	no
88	Higher education	Learning styles	3/3	England; Scotland	2014	no
80	Migration and education	Economics of education	2/2.	England	2011	no
70	Pedagogic tasks	Second language education	1/1	England	2013	no
60	Higher education	Writing	2/2	England	2014	no
59	Inclusive education	Inclusive education	1/1	England	2013	no
54	Inclusive education	Inclusive education	1/2	England	2016	no
52	Teachers and teacher education	Teacher education	1/1	England	2014	no
49	Higher education	Higher education	1/1	England	2013	no
49	Identity	Second language education	1/2	England	2011	no

3.4. INSTITUTIONAL AFFILIATIONS OF AUTHORS

Authors' affiliations were reported and recorded differently for articles across the dataset, with the name of universities being spelled differently, or with departmental/faculty-level affiliations being mentioned instead. The information was curated and standardised manually, to contain only the university-level institutional name in a standardised format. Names of partnership institutes were recorded alongside all universities involved. For instance, an affiliation such as Duke-NUS Medical School was coded as "Duke University; National University of Singapore".

Publications with more than 25 co-authors were removed from the analysis, resulting in 19,580 articles, 1,396 books and 5,860 chapters.

Overall, authors of educational research outputs published over the course of the period of interest (2010 to 2020) indicated affiliations with 6,316 different institutions or organisations. It should be noted that some of these institutions may be departments or constituent colleges – where possible, the most common instances of such variations have been standardized to the relevant parent institution. Authors affiliated with University College London (which includes Institute of Education) (2,014 outputs), University of Oxford (980), University of Cambridge (900), University of Edinburgh, University of Nottingham, and Open University contributed to the greatest number of outputs amongst those institutions identified (see Figure 3.4.1).

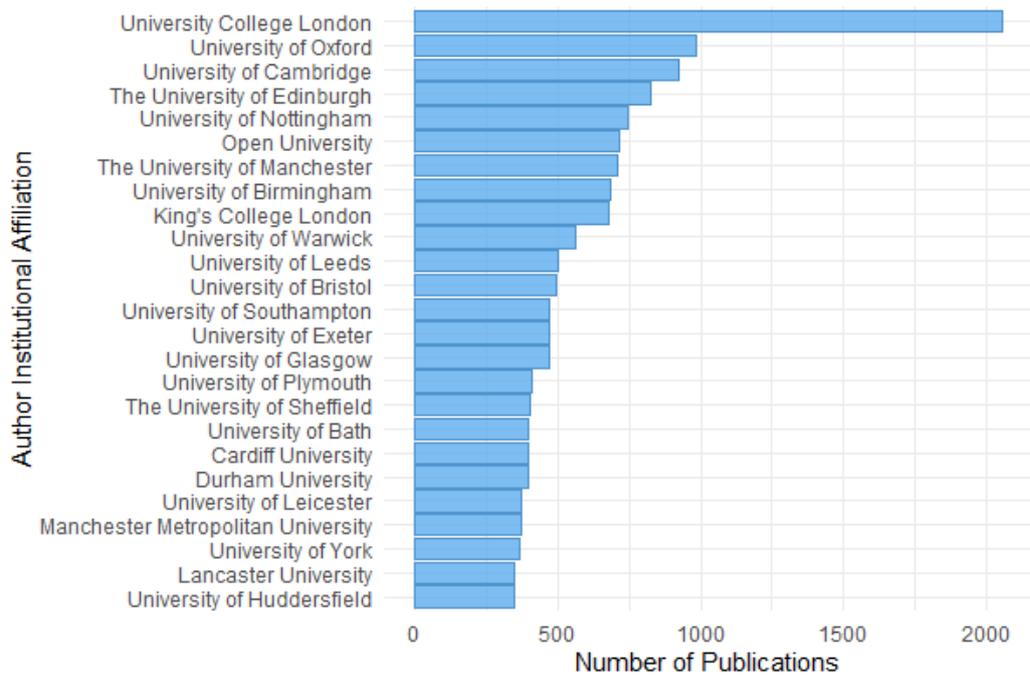


Figure 3.4.1. Number of published educational research outputs which authors from institutions produced or contributed to throughout the period of 2010 to 2020 (twenty-five most prolific institutions, in term of number of outputs contributed to by affiliated authors).

JOURNAL ARTICLES

A total of 5,281 institutions were reported in the 19,580 journal articles. The ten institutions with the largest total publication numbers in the dataset are shown in Table 3.4.1.

Table 3.4.1. Institutions with the highest total publication counts in the dataset (journal articles)

No	Institutions	Total Publication Number	Percentage (n=19,583)
1	University College London	1493	8%
2	University of Oxford	716	4%
3	University of Cambridge	664	3%
4	The University of Edinburgh	616	3%
5	University of Nottingham	528	3%
6	King's College London	506	3%
7	The University of Manchester	501	3%
8	University of Birmingham	495	3%
9	The Open University	477	2%
10	University of Warwick	407	2%

BOOKS AND BOOK CHAPTERS

For books, a total of 681 institutions were reported. The total number of co-authoring institutions for book chapters is 1,652.

The ten institutions with the largest publication numbers in the dataset are shown in Table 3.4.2 and Table 3.4.3, respectively for books and book chapters.

Table 3.4.2. Institutions with the highest total publication counts in the dataset (books)

No	Institutions	Number of Publications	Percentage (n=1,396)
1	University College London	122	9%
2	University of Oxford	54	4%
3	University of Cambridge	53	4%
4	The Open University	52	4%
5	University of Birmingham	52	4%
6	University of Nottingham	50	4%
7	The University of Manchester	48	3%
8	University of Warwick	38	3%
9	University of London	34	2%
10	Canterbury Christ Church University	32	2%

Table 3.4.3. Institutions with the highest total publication counts in the dataset (chapters)

No	Institutions	Number of Publications	Percentage (n=5,860)
1	University College London	399	7%
2	University of Oxford	210	4%
3	University of Cambridge	203	3%
4	The Open University	186	3%
5	University of Nottingham	153	3%
6	The University of Manchester	149	3%
7	University of Birmingham	136	2%
8	King's College London	133	2%
9	University of Bristol	132	2%
10	The University of Edinburgh	128	2%

COMPARISON ACROSS DIFFERENT TYPES OF PUBLICATIONS

Some institutions are among those with the highest counts for all three types of publications. As Table 3.4.4 shows, six institutions (marked with an asterisk) are among the most represented 10 producers of journal articles, books, and chapters in our dataset: University College London, University of Oxford, University of Cambridge, University of Nottingham, University of Birmingham, and Open University. All six are based in England. Except for The Open University, the remaining five are all Russell Group universities.

Table 3.4.4. Institutions with high publication counts across all types of publication

Articles			Books			Chapters		
No	Institutions	Ratio	No	Institutions	Ratio	No	Institutions	Ratio
1	University College London*	4%	1	University College London*	9%	1	University College London*	7%
2	University of Oxford*	4%	2	University of Oxford*	4%	2	University of Oxford*	4%
3	University of Cambridge*	2%	3	University of Cambridge*	4%	3	University of Cambridge*	3%
4	The University of Edinburgh	2%	4	The Open University*	4%	4	The Open University*	3%
5	University of Nottingham*	2%	5	University of Birmingham*	4%	5	University of Nottingham*	3%
6	King's College London	1%	6	University of Nottingham*	4%	6	The University of Manchester	3%
7	The University of Manchester	1%	7	The University of Manchester	3%	7	University of Birmingham*	2%
8	University of Birmingham*	1%	8	University of Warwick	3%	8	King's College London	2%
9	The Open University*	1%	9	University of London	2%	9	University of Bristol	2%
10	University of Warwick	1%	10	Canterbury Christ Church University	2%	10	The University of Edinburgh	2%

3.5. CO-AUTHORSHIP PATTERNS AMONG COUNTRIES/REGIONS

6,407 (23.9%) educational research outputs published between 2010 and 2020 involved collaboration between authors affiliated with UK institutions and colleagues affiliated with non-UK institutions, totalling 8717 international collaborative links. Authors affiliated with UK institutions collaborated with authors affiliated with institutions in 135 different countries or territories (as defined by Scopus®; see Figure 3.5.1). Of these international collaborations, the most productive overall in terms of published research outputs were collaborations between authors affiliated with UK institutions and colleagues affiliated with institutions in Australia, United States, Canada, Netherlands, Ireland, and Germany.



Figure 3.5.1. Network of international collaborations in educational research outputs involving an author (or authors) affiliated with a UK institution published between the years 2010 and 2020. Edges are weighted by the number of collaborations.

JOURNAL ARTICLES

For journal articles, authors' affiliations are from, in total, 132 countries/regions. As each publication in the dataset has at least one UK author, this means that UK authors have collaborated with authors from other 131 countries/regions for journal articles in educational research between 2010 and 2020. Publications with more than 25 co-authors were removed from the analysis. Among the remaining 19,580 articles 7,038 international co-authoring links with the UK were identified.

Table 3.5.1 shows the most frequently occurring ten co-authoring countries (in terms of the number of co-authored papers with the UK that involve at least one co-author from that country). Six are EU countries (cells in grey), the others are Australia, the United States of America, Canada, and China (mainland).

Table 3.5.1. Co-authoring countries/regions with the UK (journal articles)

No	Country/region	Number of co-authored articles with the UK
1	Australia	880
2	United States	815
3	Netherlands	382
4	Canada	358
5	Ireland	302
6	Spain	285
7	Germany	266
8	China (mainland)	222
9	Sweden	178
10	South Africa	176

In terms of the total link strength (including co-authorship with any countries, not limited to the UK), co-authoring countries with the highest total link strength are Australia, United States, Netherlands, Canada, Germany, Spain, Ireland, Italy, China, and Sweden. Six are EU countries, as marked in grey in Table 3.5.2. Note that the term ‘link’ refers to the co-authorship relation between two authors (or their institutions and countries/regions). ‘Link strength’ refers to the counts of such co-authorship relations; the higher the value, the more co-authorship relations two researchers/institutions/countries/regions have with each other. The total link strength represents the cumulative counts of co-authorship relations of an author/institution/country/region with all others, among the publications included in the dataset. The higher the value of ‘total link strength’, the more co-authorship connections a researcher/institution/country/region has with others, among the publications included in the analysis (Van Eck and Waltman, 2020).

Note that this study applied the (arguably more intuitive – see Perianes-Rodriguez, Waltman, and Van Eck, 2016) ‘full counting’ approach when calculating the total link strength for co-authorship, meaning that for a publication co-authored by ‘x’ number of researchers, each researcher (and thus their affiliated institutions and countries/regions) is assigned with a full weight of ‘one’. To reduce the limitations of the approach adopted, we excluded publications with too many co-authors (over 25).

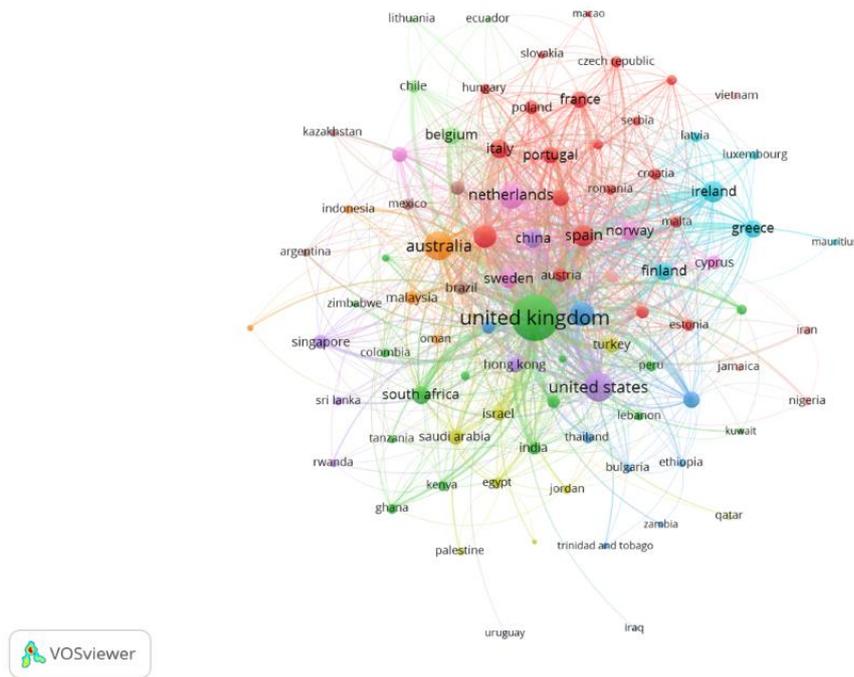
In Table 3.5.2 the United Kingdom has a total link strength of 7,038 and a total 19,580 journal articles, meaning among the 19,580 journal articles, UK authors had 7,038 collaboration links with authors from other countries/regions. Note that the UK is, on this measure, not directly comparable to the others, as the dataset itself was constructed with UK authorship as a criterion. For the United States of America, the total link strength is 1,491 and the total publications are 815. This means among the 815 journal articles, authors affiliated with American institutions in the dataset had 1,491 collaboration links with authors outside the USA (and at least 815 among the 1,491 collaboration links were with UK authors, as the dataset only includes publications with at least one UK author).

Table 3.5.2. Countries/regions based on total link strength (journal articles)

No	Country/region	Total link strength
	United Kingdom	7038
1	United States	1491
2	Australia	1478
3	Netherlands	882
4	Canada	778
5	Germany	643
6	Spain	565
7	Ireland	531
8	China (mainland)	377
8	Italy	377
10	Sweden	362

Figure 3.5.2 shows the collaboration network of the 90 countries/regions with at least 5 journal articles in the dataset. The size of each node (represented by a circle) indicates the total link strength of that country/region. The 90 countries/regions are classified into 15 clusters; countries/regions within each cluster have stronger links with each other and are shown in the same colour.

Figure 3.5.2. Collaboration among countries/regions (journal articles)



BOOKS AND BOOK CHAPTERS

For books, authors' affiliations are from a total of 60 countries/regions. As each publication in the dataset has at least one UK author, this means UK authors have collaborated with authors from other 59 countries/regions for books in educational research between 2010 and 2020. Among the 1,396 books, 471 international co-authoring links with the UK were identified.

Table 3.5.3 shows the top 11 co-authoring countries/regions in terms of the total co-authored publication number (with six tied on the 6th place). Four are EU countries (marked in grey), the rest are the United States, Australia, Canada, New Zealand, China (mainland), Hong Kong, and South Africa.

Table 3.5.3. Co-authoring countries/regions with the UK (books)

No	Country/ region	Number of co-authored books with the UK
1	United States	98
2	Australia	83
3	Canada	33
4	New Zealand	24
5	Germany	18
6	China (mainland)	12
6	Hong Kong	12
6	Ireland	12
6	Netherlands	12

6	South Africa	12
6	Sweden	12

Among the 5,860 chapters, UK authors have collaborated with authors from other 95 countries/regions. 1,208 international co-authoring links with the UK were identified in the 5,860 book chapters. Table 3.5.4 shows the ten co-authoring countries with the largest total co-authored publication counts. Four are EU countries (shaded in grey).

Table 3.5.4 Co-authoring countries/regions with the UK (chapters)

No	Country/ region	Number of co-authored chapters with the UK
1	United States	193
2	Australia	185
3	Canada	56
4	Germany	52
5	Netherlands	49
6	New Zealand	43
7	Spain	41
8	China (mainland)	39
9	Ireland	38
10	South Africa	33

For books and book chapters, co-authoring countries with the highest total link strength (which includes co-authorship with any countries in the dataset, not limited to the UK) are listed in Table 3.5.5 and Table 3.5.6, with EU countries marked in grey. Note that the UK is not directly comparable with the other countries given that UK authorship was a criterion in assembling the dataset.

Table 3.5.5. Countries/regions with highest total link strength (books)

No	Country/ region	Total Link Strength
	United Kingdom	471
1	United States	154
2	Australia	126
3	Canada	59
4	New Zealand	41
5	Germany	32
6	China (mainland)	24
7	Ireland	22
8	Sweden	22
9	Netherlands	21
10	South Africa	20

Table 3.5.6. Countries/regions with highest total link strength (chapters)

No	Country	Total Link Strength
	United Kingdom	1208
1	United States	295
2	Australia	253
3	Canada	98
4	Germany	98
5	Netherlands	87
6	New Zealand	71
7	Spain	61
8	Ireland	60
9	China (mainland)	54
10	South Africa	51
10	Sweden	51

Figure 3.5.3 and Figure 3.5.4 show the collaboration network of countries/regions for books and book chapters in our dataset. The size of each node represents the total link strength of that particular country/region. The width of the links between two nodes demonstrates the number of co-authored publications. The wider the link, the higher the number of co-authored publications between two countries/regions. Countries/regions within each cluster have stronger links with each other and are shown in the same colour.

Figure 3.5.3. Collaboration among countries/regions (books)

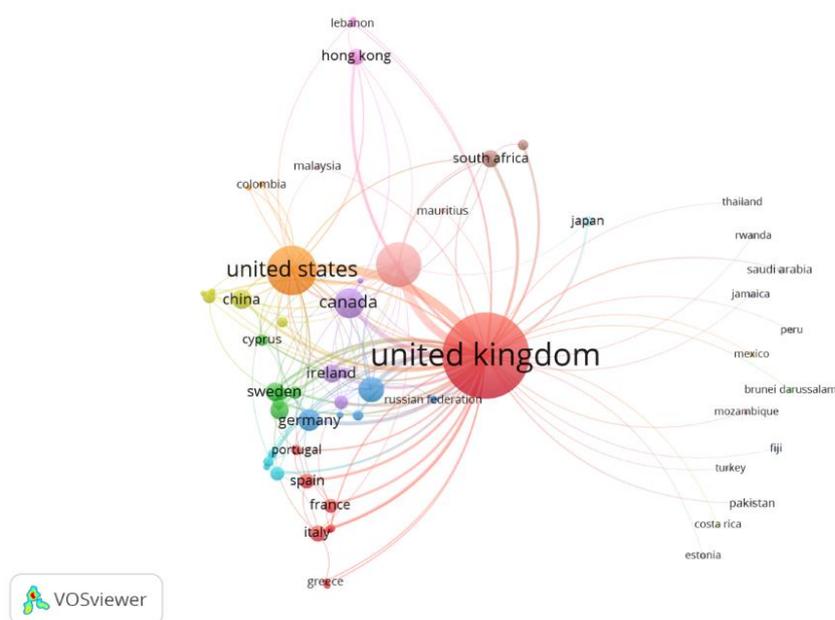
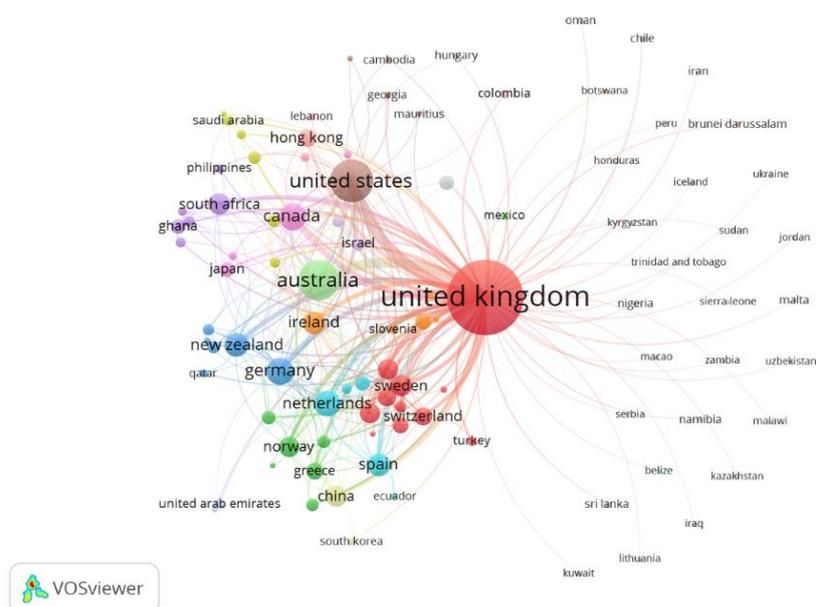


Figure 3.5.4. Collaboration among countries/regions (chapters)



COMPARISON ACROSS DIFFERENT TYPES OF PUBLICATIONS

Eight countries rank top for all three types of publications. They are Australia (1,148 collaborative outputs), United States (1106), Canada (447), Netherlands (443), Ireland (352), Germany (336), China (mainland), and South Africa (marked with an asterisk in the table). Australia and the United States rank top two among the three categories. Some other countries/regions among the top ten in two categories: Spain is among the top 10 co-authoring countries for journal articles and book chapters, Sweden is for co-authored journal articles and books, New Zealand for co-authored books and chapters. Hong Kong is the only one that appears in a single category, i.e. co-authored books.

Table 3.5.7. Comparison of co-authoring countries/regions based on total co-authored publications

Countries/regions co-authoring articles with the UK		Number of co-authored articles	Countries/regions co-authoring books with the UK		Number of co-authored books	Countries/regions co-authoring chapters with the UK		Number of co-authored chapters
1	Australia*	880	1	United States*	98	1	United States*	193
2	United States*	815	2	Australia*	83	2	Australia*	185
3	Netherlands*	382	3	Canada*	33	3	Canada*	56
4	Canada*	358	4	New Zealand	24	4	Germany*	52
5	Ireland*	302	5	Germany*	18	5	Netherlands*	49
6	Spain	285	6	China (mainland)*	12	6	New Zealand	43
7	Germany*	266	6	Hong Kong	12	7	Spain	41
8	China (mainland)*	222	6	Ireland*	12	8	China (mainland)*	39
9	Sweden	178	6	Netherlands*	12	9	Ireland*	38
10	South Africa*	176	6	South Africa*	12	10	South Africa*	33
			6	Sweden	12			

3.6. CO-AUTHORSHIP PATTERNS AMONG INSTITUTIONS

Across the dataset, 11,126 (41.5%) educational research outputs published between 2010 and 2020 involved collaboration between authors indicating different institutional affiliations. Amongst the most productive institutional collaborations, in terms of published research outputs, were collaborations between authors affiliated with University College London and King's College London (60 published outputs), University College London and University of Oxford (46), University of Exeter and University of Plymouth (39), Middlesex University and Deakin University (29), University of Technology Sydney and Middlesex University (27), and Queen's University Belfast and Ulster University (27). The chord diagram below (Figure 3.6.1) illustrates the collaborations between those institutions which demonstrated the most productive collaborations. Note that institutions and their associated chords have been coloured based on general geographic location, such that institutions located in London and Greater London are in shades of orange and yellow, South and South-East England in shades of red and pink, Northern England and the Midlands in shades of purple, Wales and Northern Ireland in shades of green, Scotland in shades of blue, and the rest of the world in shades of grey.

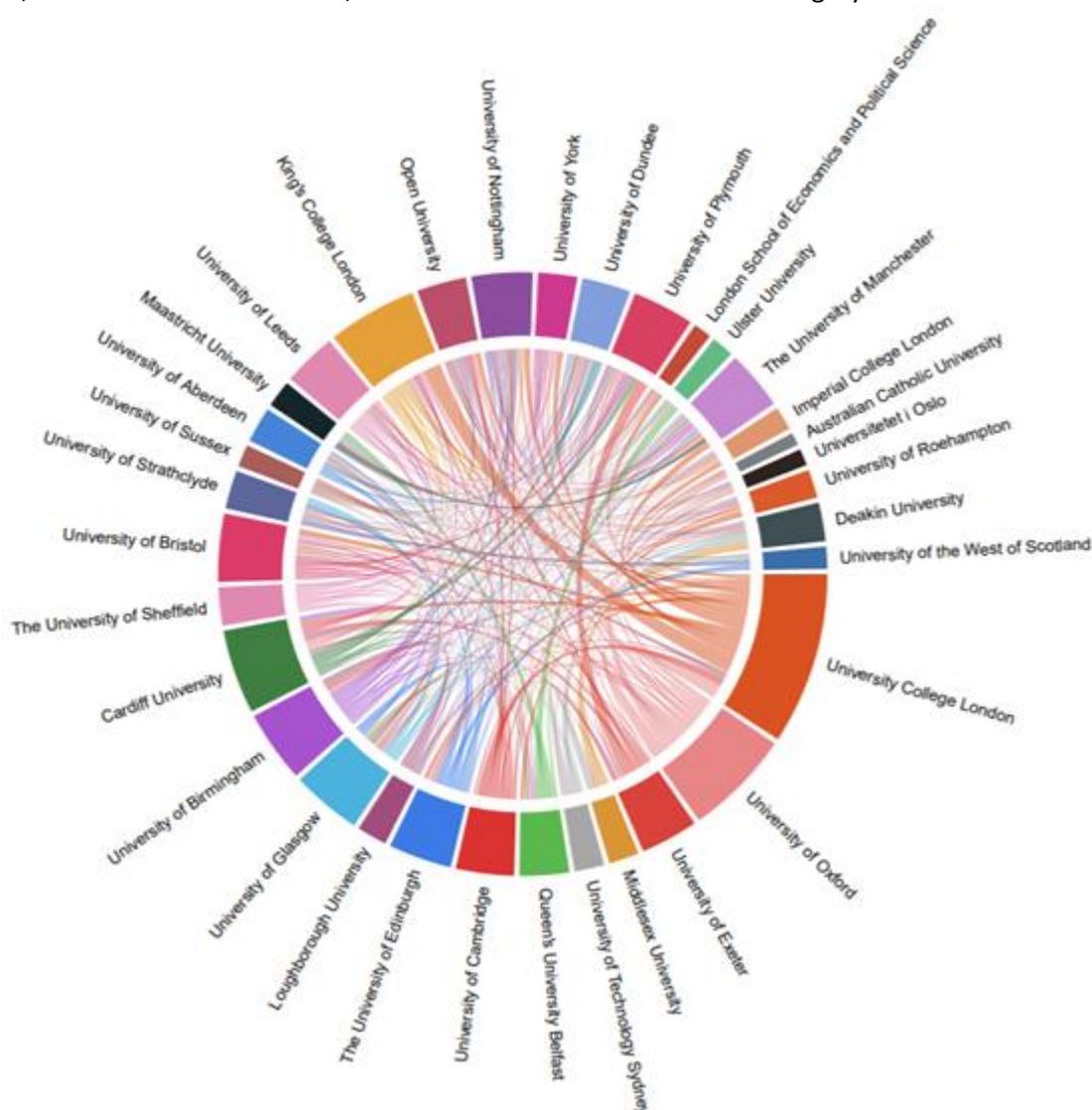


Figure 3.6.1. Chord diagram illustrating the most productive inter-institutional collaborations in terms of educational research outputs involving an author (or authors) affiliated with a UK institution researchers published between the years 2010 and 2020. Sectors and chords weighted by number of collaborations. Only those institutions involved in the most productive institutional collaborations (33 most productive collaborations) are included.

JOURNAL ARTICLES

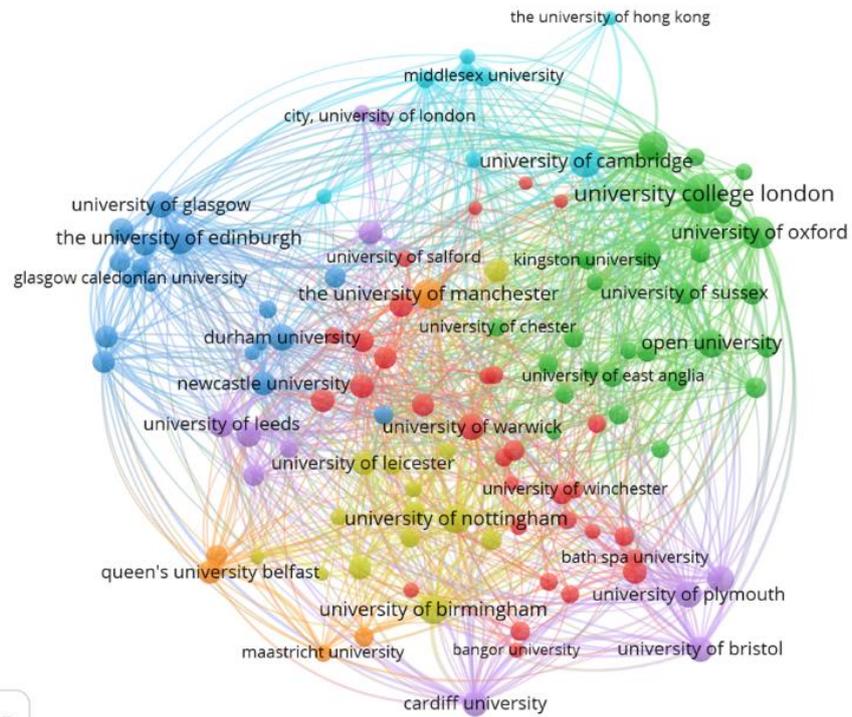
To explore collaboration among institutions, documents co-authored by more than 25 organisations were excluded from the analysis. Institutions with the highest total link strength for journal articles (meaning collaboration strength) are shown in Table 3.6.1.

Table 3.6.1. Institutions with the highest total link strength (journal articles)

No	Institutions	Total Link Strength	Number of Publications
1	University College London	1391	1493
2	University of Oxford	937	716
3	King's College London	786	506
4	The University of Edinburgh	687	616
5	University of Cambridge	626	664
6	The University of Manchester	624	501
7	University of Birmingham	601	495
8	University of Nottingham	600	528
9	Cardiff University	555	325
10	University of Leeds	515	354

Figure 3.6.2 illustrates the collaboration networks among institutions with at least 50 journal articles in the dataset (114 institutions). The size of each node represents the total publications of journal articles of the institution, the bigger the size, the more journal articles the institution have produced. The width of the links between two nodes demonstrates the number of co-authored publications. The wider the link, the higher number of co-authored publications between two institutions. The 114 institutions are classified into seven clusters; institutions within each cluster have stronger links with each other and are shown in the same colour in the figure.

Figure 3.6.2. Collaborations among institutions (journal articles)



BOOKS AND BOOK CHAPTERS

Institutions with the highest total link strength (meaning collaboration strength) for books and book chapters are showed in Table 3.6.2 and Table 3.6.3.

Table 3.6.2. Institutions with the highest total link strength (books)

No	Institutions	Total Link Strength	Number of Publications
1	University College London	100	122
2	University of Oxford	59	54
3	University of Cambridge	58	53
4	University of Birmingham	58	52
5	University of Nottingham	56	50
6	The University of Manchester	46	48
7	Open University	44	52
8	Manchester Metropolitan University	42	31
9	University of Warwick	38	38
10	King's College London	35	27

Table 3.6.3. Institutions with highest total link strength (chapters)

No	Institutions	Total Link Strength	Number of Publications
1	University College London	227	399
2	University of Oxford	157	210
3	University of Cambridge	143	203
4	University of Nottingham	111	153
5	Open University	89	186
6	King's College London	88	133
7	University of Southampton	86	90
8	University of Warwick	79	116
9	The University of Manchester	74	149
10	University of Bristol	74	132

Figure 3.6.3 and Figure 3.6.4 illustrate the collaboration networks among institutions with at least 5 books (98 institutions) or at least 10 chapters (126 institutions) in the dataset. The size of each node represents the total number of journal articles in the dataset associated with a particular institution. The width of the links between two nodes demonstrates the number of co-authored publications. The wider the link, the higher the number of publications co-authored between two institutions. Institutions within each cluster have stronger links with each other and are shown in the same colour in the figure.

Figure 3.6.3. Collaboration among institutions (books)

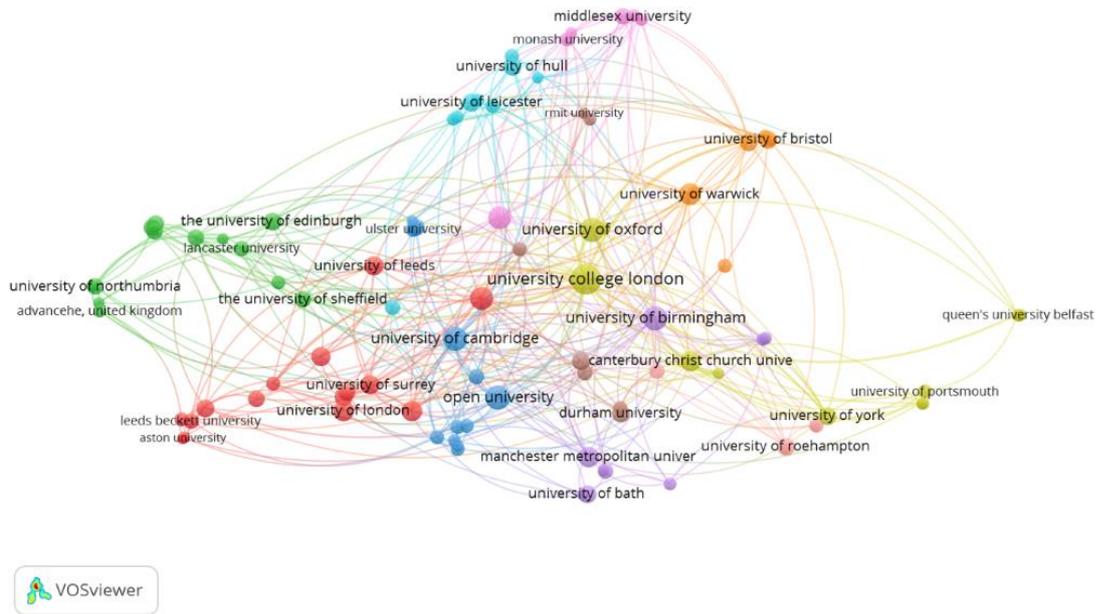
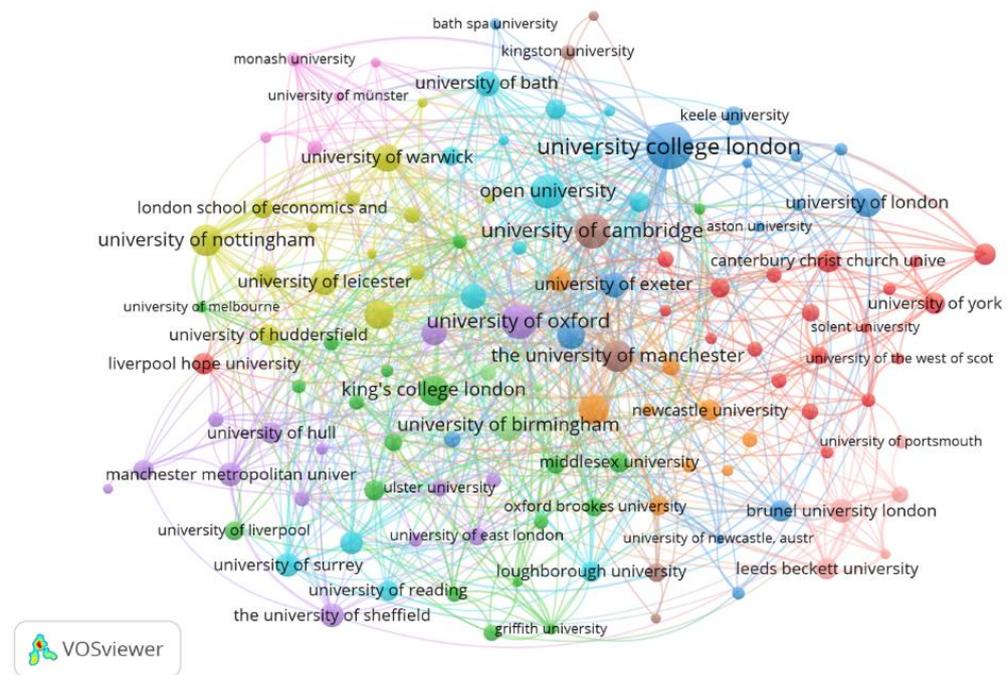


Figure 3.6.4. Collaboration among institutions (chapters)



3.7. INDIVIDUAL AUTHORS AND THEIR COLLABORATIONS (JOURNAL ARTICLES)

The 19,583 journal articles had 27,960 authors. Information about authors' names was recoded as "Surname plus initial(s)"; therefore, there may be issues with authors with the same initials and surnames, or with different forms of initials.

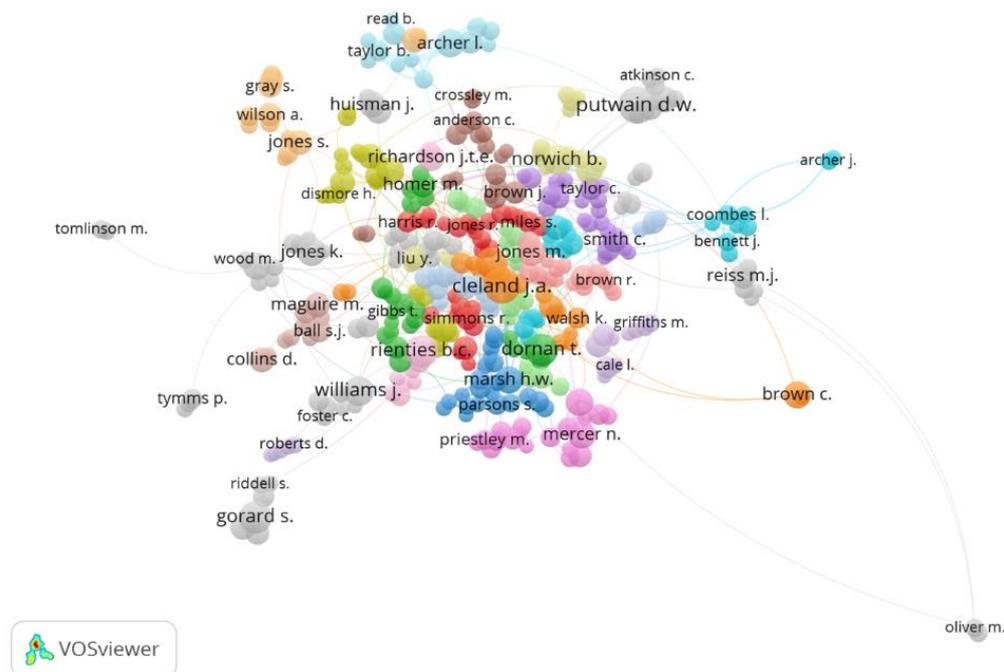
Information about the five authors with the largest number of publications in the dataset is shown in Table 3.7.1. (Note that gender attributions were made by using pronouns from each author's institutional web profile).

Table 3.7.1. Authors with the highest publication count in the dataset (journal articles)

Author (gender)	Substantive domain	Affiliation	Number of Publications	Total Link Strength
1 (m)	Psychology of education	Post-1992 university (England)	55	117
2 (f)	Healthcare education research	Pre-1992 university (Scotland)	51	165
3 (m)	Educational technology.	Other	43	132
4 (m)	Medical education	Pre-1992 university (Northern Ireland)	42	160
5 (m)	Equity and effectiveness	Pre-1992 university (England)	42	57

For journal articles, the 465 authors with at least 10 publications can be grouped in 27 clusters, generated based on their co-authorship patterns. Figure 3.7.1 shows the co-authorship networks of the 484 authors who published collaborative articles. The size of each node represents the total journal articles published by the author. Authors within each cluster have stronger links with each other and are shown in the same colour.

Figure 3.7.1. Collaboration among authors (journal articles)



3.8. FUNDING BODIES AND COLLABORATIONS

Relatively few educational research outputs published between 2010 and 2020 (4,237 outputs, 15.8%) indicated funding body information – however, some outputs of funded research may have failed to indicate funding body information where relevant. Amongst outputs which provided funding body information, 2,976 different funding bodies were identified, with the most commonly acknowledged funding bodies including the ESRC (903 outputs), European Commission (273), Higher Education Funding Council for England (128), Higher Education Academy (101), MRC (92), and British Academy (81; see Figure 3.8.1).

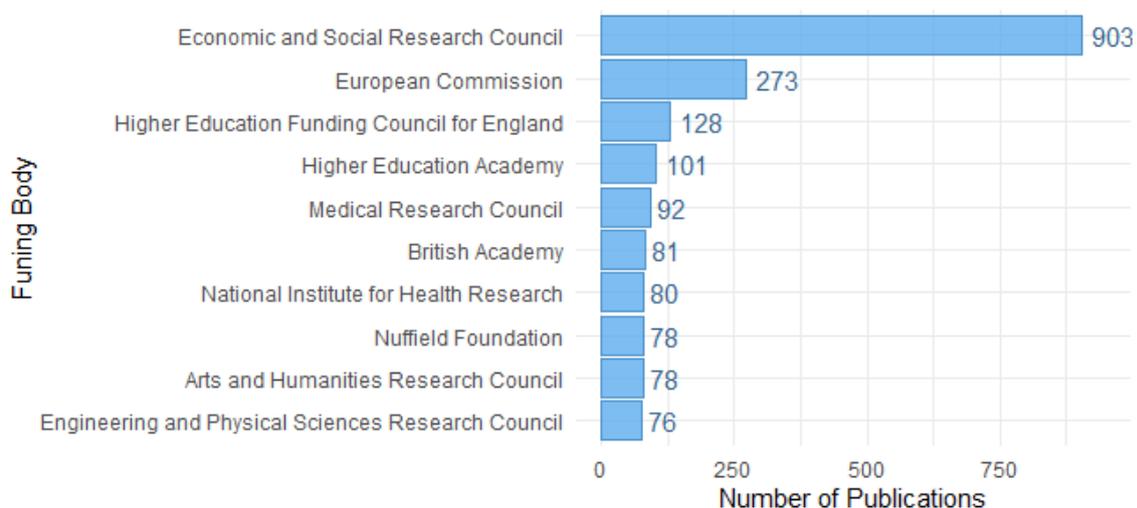


Figure 3.8.1. Number of published educational research outputs involving an author (or authors) from UK institutions which acknowledging each funding body (ten most prominent funding bodies, in term of number of outputs identifying funding body in funder information).

1,505 (5.6%) research outputs published between 2010 and 2020 indicated collaborative funding (i.e. identified two or more funding bodies), with the most frequent funding collaborations (that is, number of outputs identifying two given funding bodies together) between funding bodies occurring between the ESRC and Wellcome Trust (21 collaborations), MRC and ESRC (18), MRC and Wellcome Trust (17), and ESRC and British Academy (14; see Figure 3.8.2).

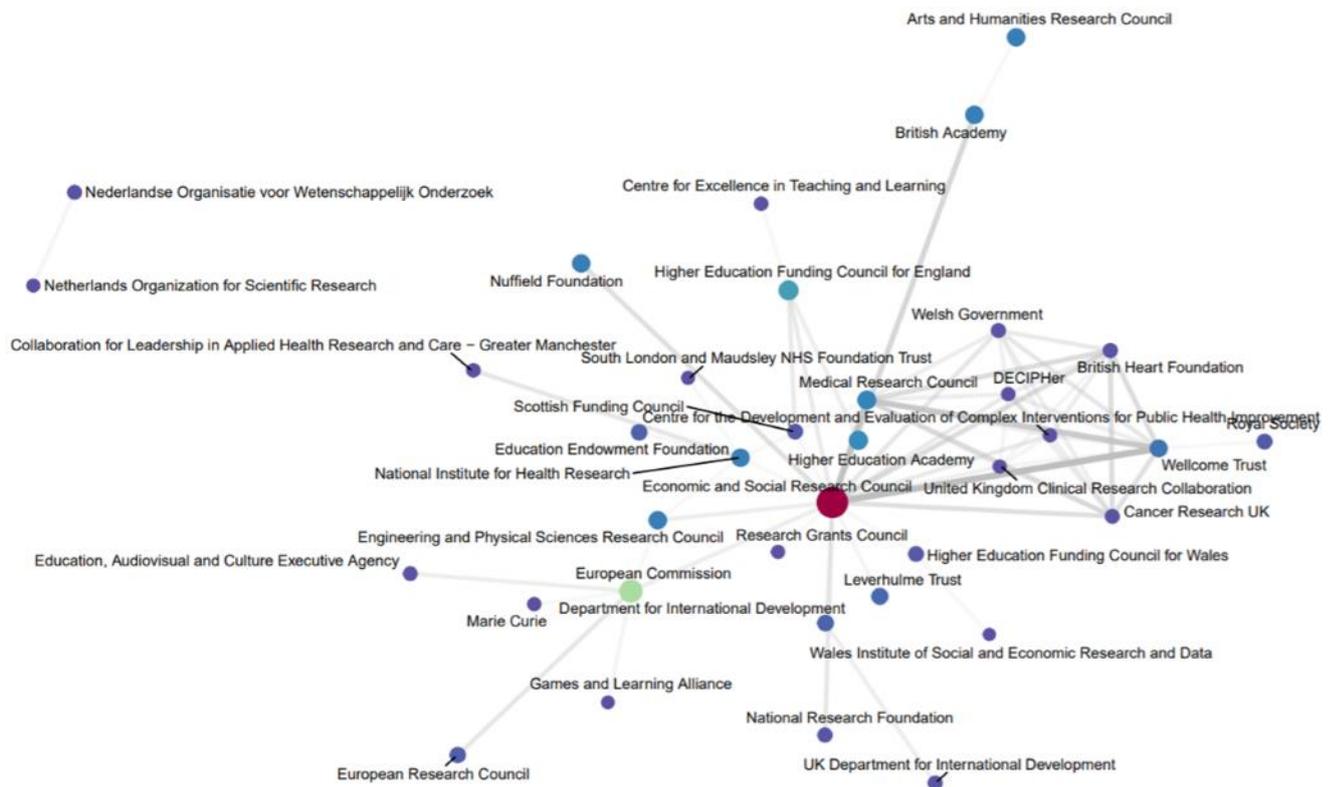


Figure 3.8.2. Network of most frequent funding body collaborations in funding educational research involving an author (or authors) affiliated with UK institutions based on acknowledgement in outputs published between the years 2010 and 2020. Nodes are weighted by the total number of outputs acknowledging the funding body and edges are weighted by the number of funding collaborations. Only funding bodies involved in collaborations which occurred four or more times are included.

The proportion of research outputs indicating funding varied between topics (as generated by topic modelling, with documents allocated to the topic most prominent or probable therein), ranging from 30.7% of research outputs primarily addressing the topic of “Learning Outcomes” acknowledging funding to 5% of outputs primarily addressing the topic of “General Education (Overviews)” acknowledging funding. Apart from “Learning Outcomes”, the topics for which the proportion of outputs indicating funding was greatest included the topics of “Inequalities” (29.9%), “Science Education” (29.1%), “Survey” (29%), “RCT/ Intervention/ Experiment” (27.9%), and “Classroom Talk and Interaction” (26.6%; see Appendix 6 for plot).

3.9. DOCTORAL THESES

NUMBER OF THESES BY YEAR OF COMPLETION

Our dataset, drawn from the British Library's EThOS database, comprised 6,593 theses completed between the start of 2010 and (August) 2020. The number of educational doctoral theses completed at UK institutions each year remained relatively steady for the majority of the period of interest (2010 to 2020) - however, there was a notable decline in the apparent number of doctoral theses completed after 2017 (417 completed in 2018, 255 in 2019, and 6 in 2020 prior to September) (Figure 3.9.1). It is believed that this severe reduction in the volume of completed doctoral theses in the database obtained may be reflective of a delay or lag in the submission of information on more recently completed doctoral theses to the British Library's EThOS database rather than being representative of a steep decline in the number of educational doctoral theses completed at UK institutions over the latter half of the past decade. On average, 599 educational doctoral theses were completed each year from 2010 to 2020 at UK institutions - however, when considering only those years which do not appear to be affected by missing data (in this context, delayed entries; 2010-2017), the average number of doctoral theses completed each year was 739.

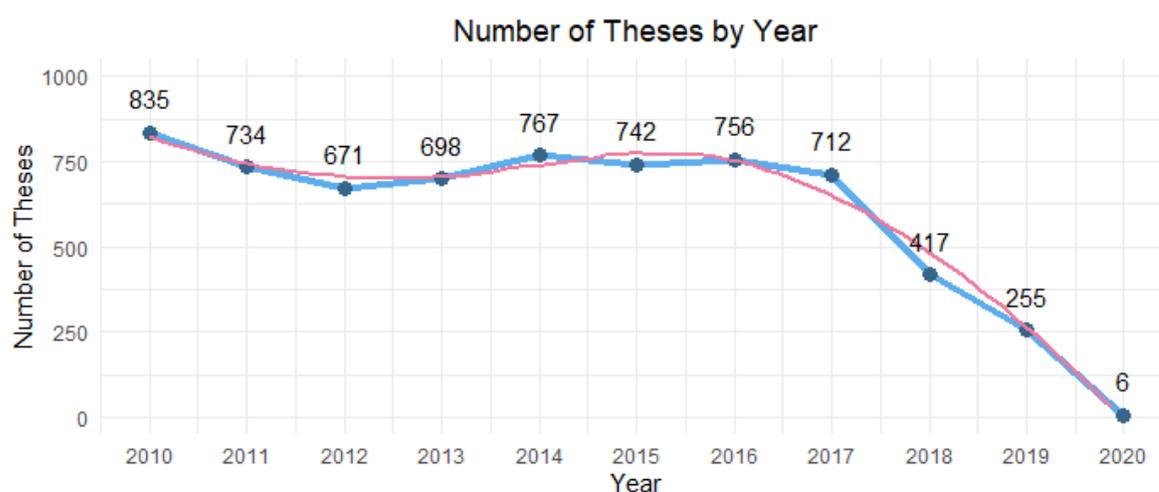


Figure. Number of educational doctoral theses completed at UK institutions by year, for the period 2010 to 2020.

DOCTORAL THESES BY AWARDING INSTITUTION

Over the course of the period of interest (2010 to 2020), educational doctoral theses were completed at 120 different UK institutions. The greatest number of doctoral theses were completed at University of Sheffield (451 theses completed), University College London (370), University of Birmingham (353), University of Exeter (284), and University of Nottingham (234; see Figure 3.9.2).

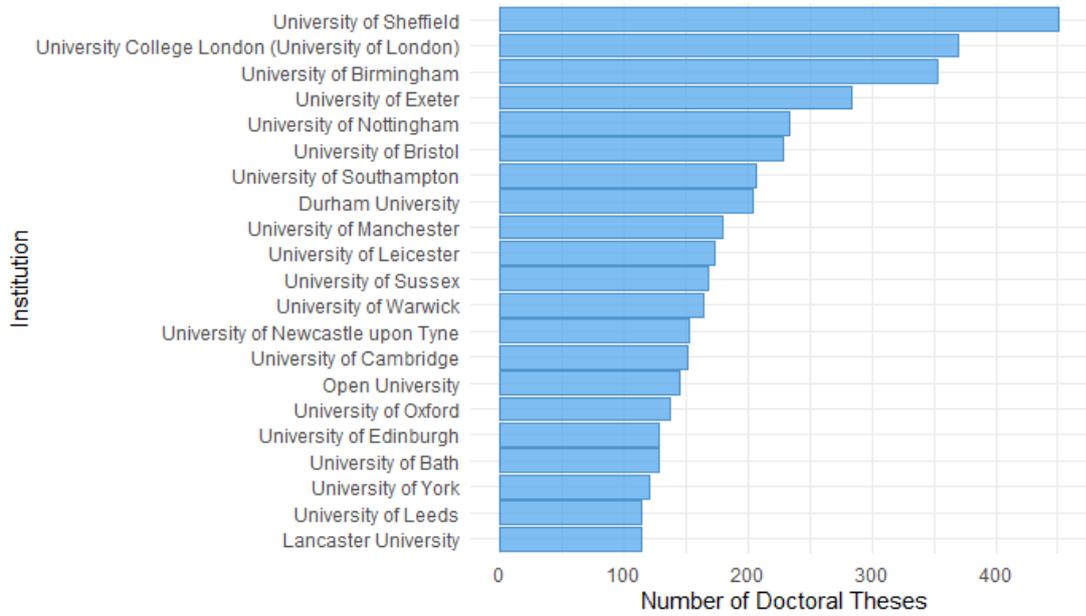


Figure 3.9.2. Number of educational doctoral theses completed at institutions throughout the period of 2010 to 2020 (twenty institutions with the greatest number of completed theses during the period of interest).

4. FOCUS OF EDUCATIONAL RESEARCH

Topic modelling of publications

Topic modelling of doctoral theses

Topic modelling of grants awarded

Prevalence of disciplinary terms (grants, theses, publications)

Keyword analysis

4.1. TOPIC MODELLING: PUBLICATIONS CORPUS

Following the exclusion of documents for which no abstract text was obtained from Scopus (3,645 documents), the remaining corpus (23,194 documents) was examined in order to identify a range of probable numbers of latent topics present. HDBSCAN clustering of documents based on their similarity (calculated as cosine distance) as determined by the extent to which documents shared terms, themselves weighted by their relative importance (tf-idf), indicated 71 distinct clusters of documents within the corpus (11,496 noise points, $R^2 = .748$, BIC = 72961.66; see Appendix 7 for plot of clustering results). Subsequent evaluation of a range of numbers of topics based on several proposed metrics intended for identification of the natural number of latent topics (Arun, Suresh, Veni Madhavan, & Narasimha Murthy, 2010; Juan, Tian, Jintao, Yongdon, & Sheng, 2009; Deveaud, SanJuan, & Bellot, 2014; Griffiths & Steyvers, 2004; Nikita, 2020) and the mean topic coherence of fitted LDA models indicated several probable numbers of topics (69, 73, 80).

LDA models were generated for suggested numbers of topics, and subsequently evaluated based on topic diagnostic measures (topic coherence, distance from corpus, document prominence, topic exclusivity) and inspection of top-loading terms and documents. Through this process, 80 topics was determined to be the optimal number of topics for modelling of the corpus. The final, 80 topic model generated clusters of documents which ranged in size from 106 documents (“Games and Play”) to 556 documents (“Education Policy”); see Figure 4.1.1 and Appendix 8 for plots of topic size). Here, it is worth noting that documents were deemed to address a topic, and were consequently assigned to that topic, based on the topic identified as most probable or prominent within the document – this is not to say that documents solely addressed this topic. Indeed, it is an accepted assertion of topic modelling that documents, in fact, address a mixture of topics simultaneously to varying extents. Therefore, whilst some topics may be quite large in terms of the number of documents in which that topic appeared as the most probable or prominent topic addressed, it may be that the prevalence of that same topic throughout the corpus is limited, appearing relatively infrequently or to negligible extents within the mixture of topics addressed by other documents (examples of such topics include the “Medical Education” and “Leadership” topics). Conversely, some topics may be, on average, relatively prevalent throughout the corpus, frequently appearing to some extent within the mixture of topics addressed by documents, but appear relatively seldomly as the dominant or primary topic addressed (examples of such topics include the “Interview” and “Survey” topics). See Appendix 9 for the relative prevalence of topics throughout the corpus – that is, the average extent to which corpus documents addressed a given topic.

Generated topics were labelled following evaluation of topic content, based on the twenty terms with the greatest probability of occurring in each topic and the thirty (or, in some instances, more) documents with the greatest likelihood of addressing each topic (See Appendix 10 for topic labels, as well as the ten terms most associated with each topic). As previously noted, topic labels therefore reflect a subjective judgement of topic content and represent a consensus “best fit” label intended to broadly communicate the thematic content of terms and documents associated with topics.

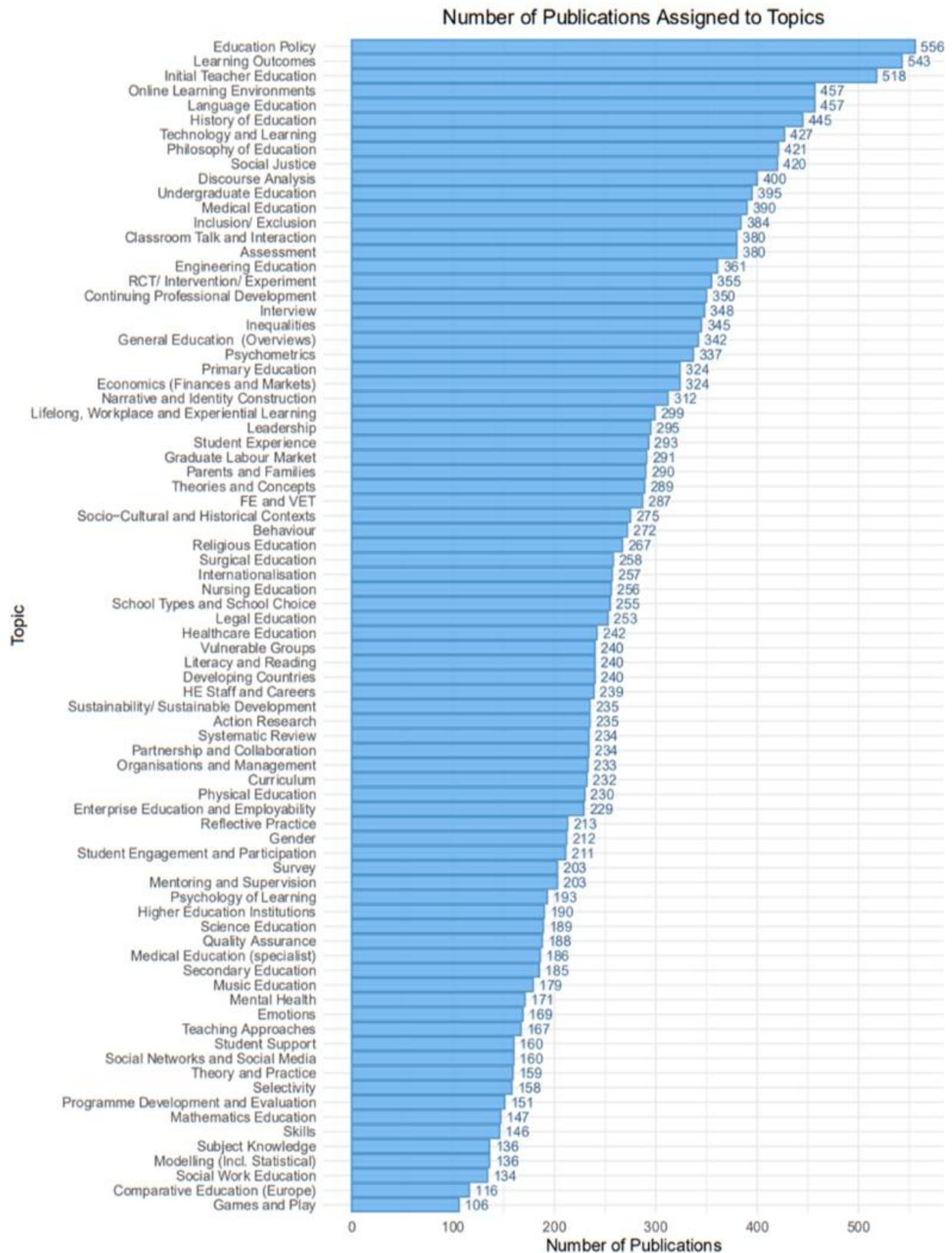


Figure 4.1.1. Number of published research output documents allocated to each topic (i.e. number of documents primarily addressing a given topic)

The model failed to allocate 1,455 documents to a single topic, with these documents demonstrating equal probability of addressing two or more topics (or, in alternate terms, documents concerned two or more topics to an equal extent). Topic allocation of unassigned documents was investigated through k-nearest neighbours (k-NN) clustering (or classification) of documents - based on topic probability amongst documents, represented in vector space through dimensionality reduction (t-SNE) of the model's document-topics matrix - intended to allocate documents to topics based on the topic most prominent amongst neighbouring documents (that is, documents with the most similar topic distributions). However, inspection of resulting topic allocations were found to be of varying accuracy – that is, whilst some documents appeared to have been assigned to an appropriate topic, others were erroneously allocated to non-relevant topics – and it was therefore decided that documents which the initial LDA model failed to allocate would be considered “noise”. As such, these documents are excluded from analysis involving allocation of documents to a topic (that is, the primary topic addressed), but are included in analysis concerning relative prevalence of topics throughout the corpus as a whole.

The similarity between topics derived through the LDA model was investigated through hierarchical clustering of the Hellinger distance (the similarity between two probability distributions) – here, similarity describes the degree to which topics co-occur within documents. Figure 4.1.2 presents a dendrogram illustrating the results of this hierarchical clustering of topics. The Hellinger distance scale here indicates similarity between topics, with smaller distances between topics (i.e. at the point of confluence between the respective branches of topics) indicative of greater similarity in terms of topic distribution throughout documents in comparison with those topics which meet at a greater distance. Consequently, topics clustered together indicate topics which are often combined or co-occur within research. Thus, this hierarchical clustering illustrates “different ‘islands’ in the field of research” on education (Daenekindt & Huisman, 2020, p. 581). A number of relatively distinct clusters of topics, or ‘islands’, were subsequently identified.

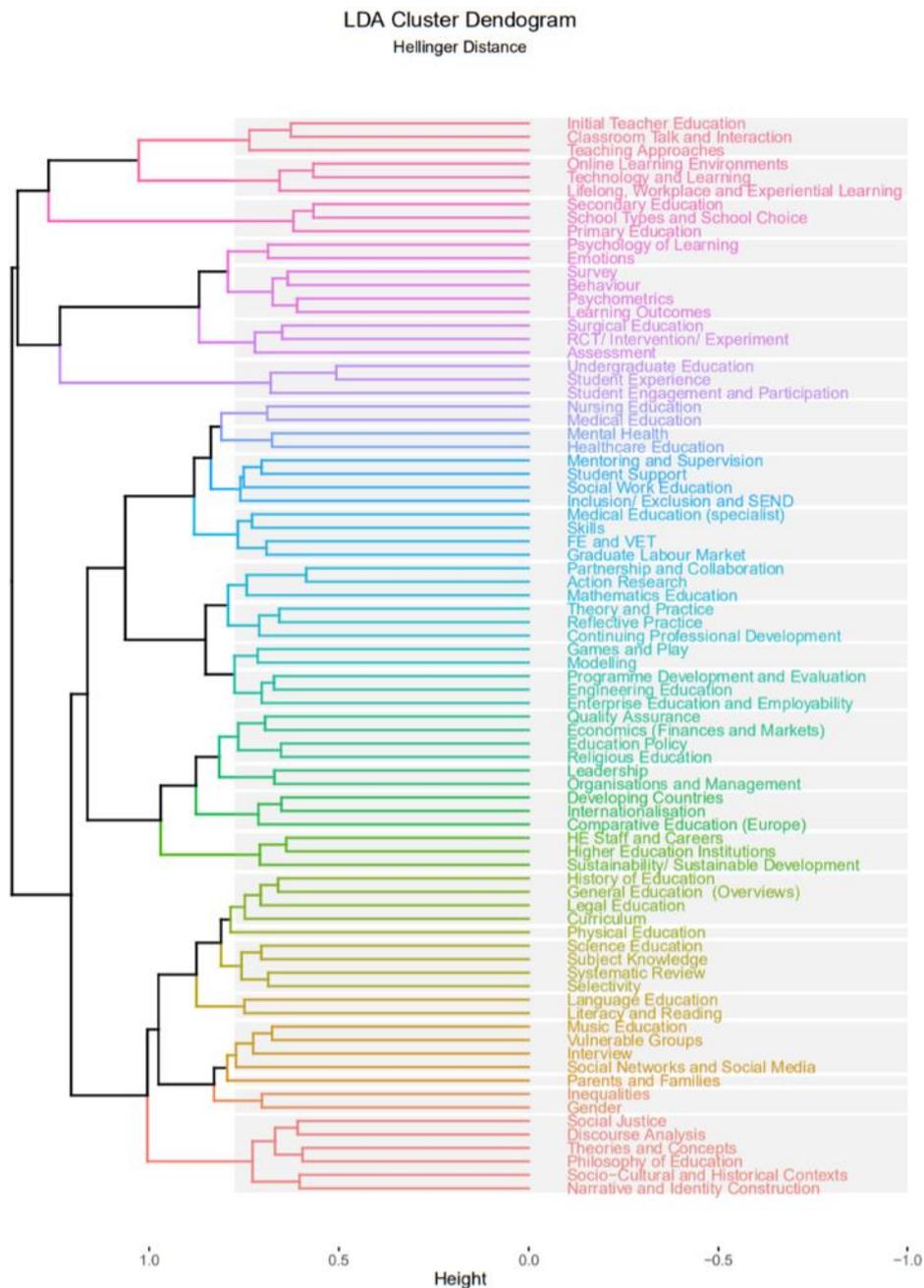
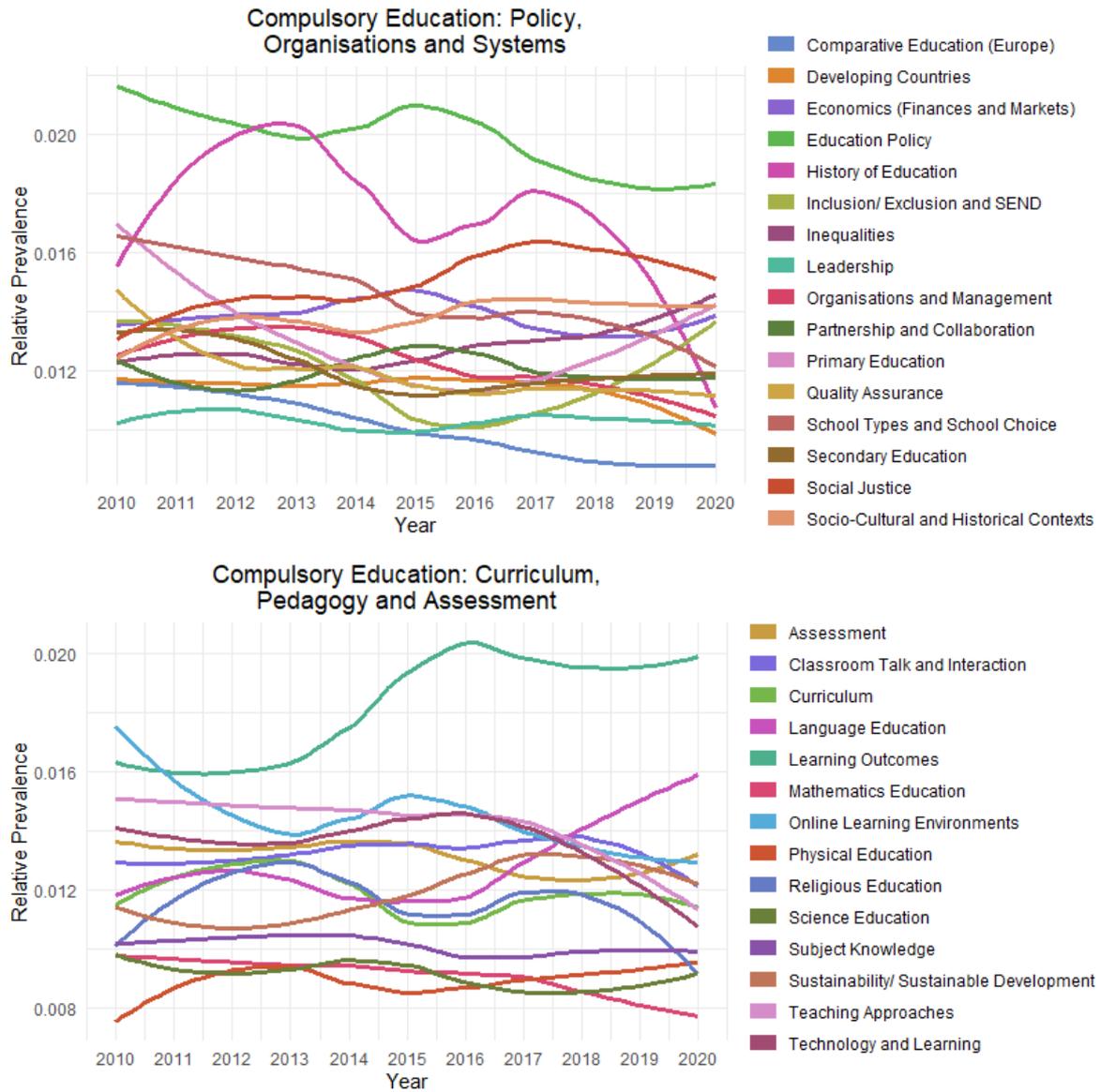
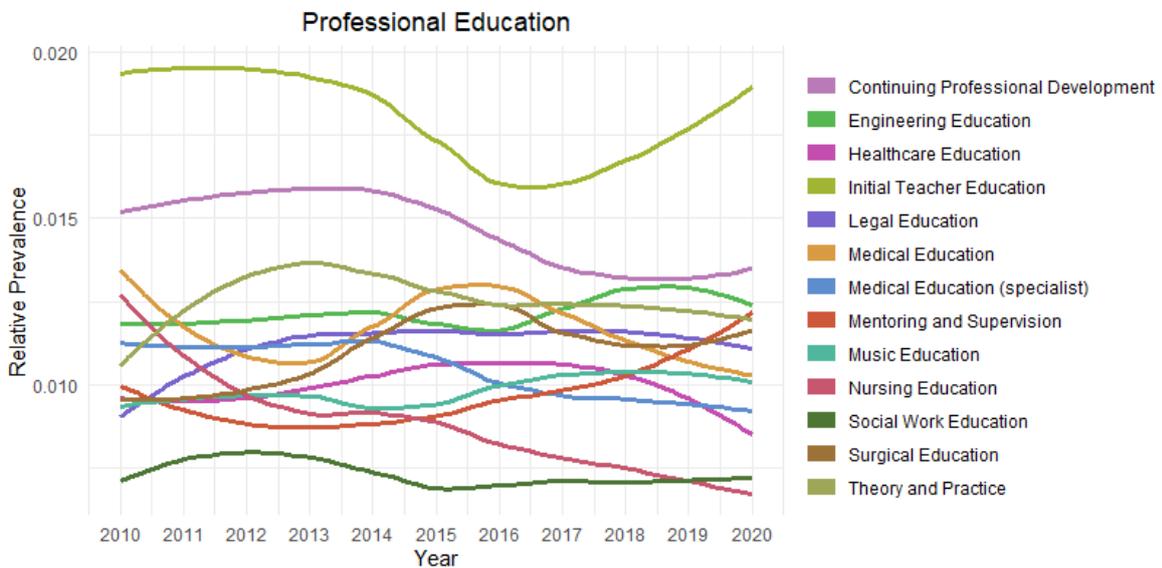
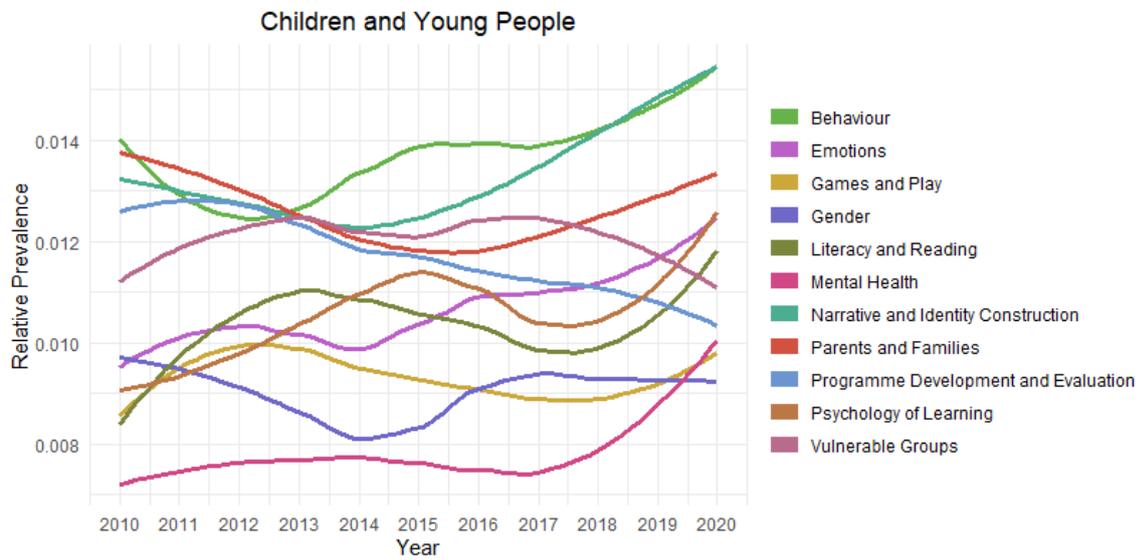
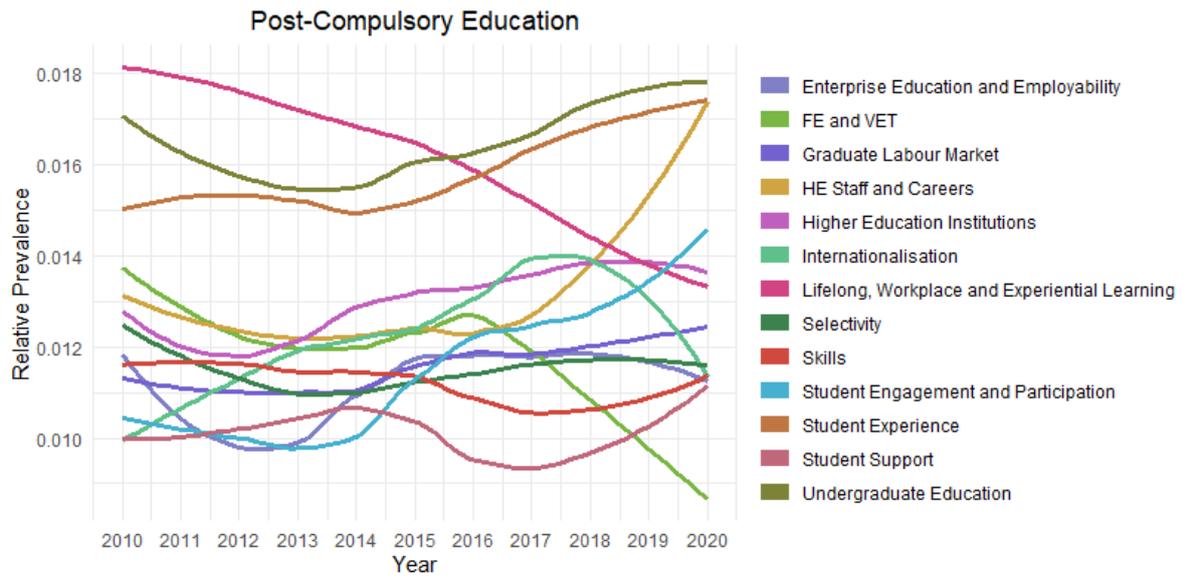


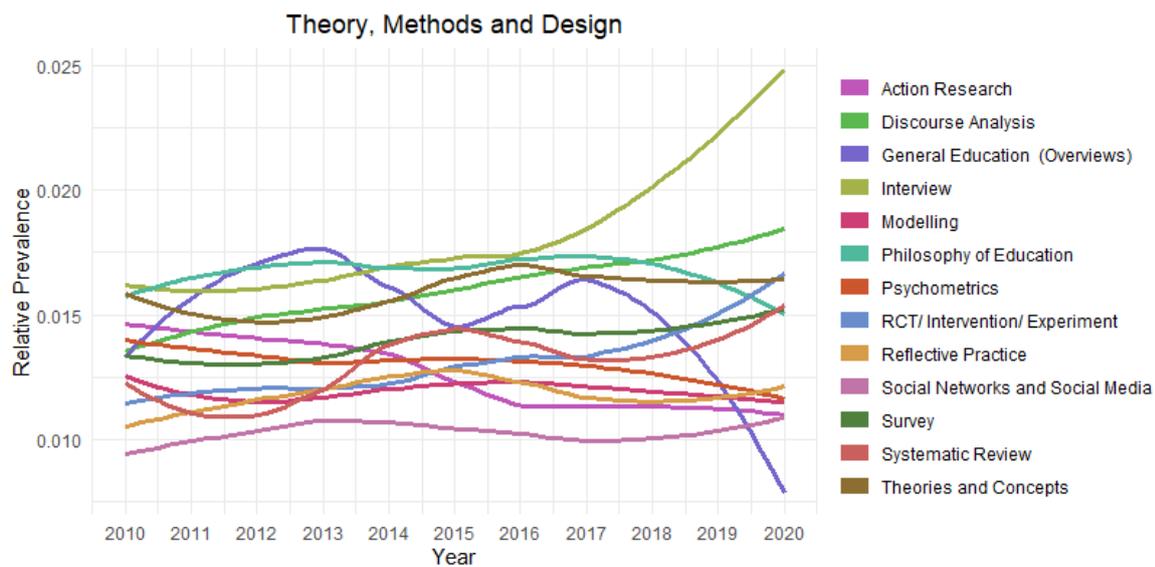
Figure 4.1.2. Dendrogram illustrating hierarchical clustering (using Ward's method) of topics based on Hellinger distance, with twenty-seven clusters indicated

The relative prevalence of topics over time was examined based on the extent to which published research outputs, as a whole, addressed each topic on an annual basis (that is, the average extent to which research outputs in a given year addressed a given topic). Relative prevalence here refers to the mean probability, across all published research outputs in a given year, of documents concerning a given topic, with greater relative prevalence indicative of a topic appearing to a greater extent amongst documents. Figure 4.1.3 illustrates changes in the relative prevalence of topics throughout published research outputs over the course of the period of interest (2010 to 2020). To ensure clarity of presentation, topics have been clustered under general domains based on visual inspection of topic content and hierarchical clustering of topics.

Figure 4.1.3. Change in the relative prevalence of identified topics throughout the period of interest, 2010 to 2020. Trajectories are estimated using Locally Estimated Scatterplot Smoothing (LOESS; $\alpha = 0.7$)







4.2. TOPIC MODELLING: DOCTORAL THESES

Following exclusion of 3 doctoral theses due to insufficient relevant text content - that is, these documents did not contain any of the terms retained for clustering and topic-modelling purposes following removal of stopwords and sparse terms (terms which appeared in fewer than 1% of documents) – the remaining corpus (6,590 documents) was examined in order to identify a range of probable numbers of latent topics present. HDBSCAN clustering of documents based on their similarity (calculated as cosine distance) as determined by the extent to which documents shared terms, themselves weighted by their relative importance (tf-idf), indicated 65 distinct clusters of documents within the corpus (3,168 noise points, $R^2 = .688$, $BIC = 21875.24$; see Appendix 11 for plot of clustering results). Subsequent evaluation of a range of numbers of topics based on several proposed metrics intended for identification of the natural number of latent topics (Arun, Suresh, Veni Madhavan, & Narasimha Murthy, 2010; Juan, Tian, Jintao, Yongdon, & Sheng, 2009; Deveaud, SanJuan, & Bellot, 2014; Griffiths & Steyvers, 2004; Nikita, 2020) and the mean topic coherence of fitted LDA models indicated several probable numbers of topics (57, 61, 63).

LDA models were generated for suggested numbers of topics, and subsequently evaluated based on topic diagnostic measures (topic coherence, distance from corpus, document prominence, topic exclusivity) and inspection of top-loading terms and documents. Through this process, 63 topics was determined to be the optimal number of topics for modelling of the corpus. However, of the topics generated by this model, following evaluation of topic content and inspection of topic diagnostics, two (36 and 44 documents in size) were considered to lack adequate coherence and clarity in thematic content, and were therefore deemed “junk” topics (AlSumait, Barbará, Gentle & Domeniconi, 2009) which were subsequently omitted from further analysis.

The resultant, 61 retained clusters of documents generated through the topic model ranged in size from 32 theses (“Relationships and Trust”) to 177 theses (“Language Education (Incl. EFL)” and “Online, Mobile and Games-Based Learning”); see Figure 4.2.1 and Appendix 12 for plots of topic size). Here, it is again worth noting that documents were deemed to address a topic, and were consequently assigned to that topic, based on the topic identified as most probable or prominent within the document – this is not to say that documents solely addressed this topic. Indeed, it is an

accepted assertion of topic modelling that documents, in fact, address a mixture of topics simultaneously to varying extents. Therefore, whilst some topics may be quite large in terms of the number of documents in which that topic appeared as the most probable or prominent topic addressed, it may be that the prevalence of that same topic throughout the corpus is limited, appearing relatively infrequently or to negligible extents within the mixture of topics addressed by other documents (examples of such topics include the “Postgraduate Education” and “SEND” topics). Conversely, some topics may be, on average, relatively prevalent throughout the corpus, frequently appearing to some extent within the mixture of topics addressed by documents, but appear relatively seldomly as the dominant or primary topic addressed (examples of such topics include the “Interview” and “Secondary Education” topics). See Appendix 13 for the relative prevalence of topics throughout the corpus – that is, the average extent to which corpus documents addressed a given topic.

The model failed to allocate 525 documents to a single topic, with these documents demonstrating equal probability of addressing two or more topics (or, in alternate terms, documents concerned two or more topics to an equal extent). Topic allocation of unassigned documents was investigated through k-nearest neighbours (k-NN) clustering (or classification) of documents - based on topic probability amongst documents, represented in vector space through dimensionality reduction (t-SNE) of the model’s document-topics matrix - intended to allocate documents to topics based on the topic most prominent amongst neighbouring documents (that is, documents with the most similar topic distributions). However, inspection of resulting topic allocations were found to be of varying accuracy – that is, whilst some documents appeared to have been assigned to an appropriate topic, others were erroneously allocated to non-relevant topics – and it was therefore decided that documents which the initial LDA model failed to allocate would be considered “noise”. As such, these documents are excluded from analysis involving allocation of documents to a topic (that is, the primary topic addressed; e.g. Figure), but are included in analysis concerning relative prevalence of topics throughout the corpus as a whole.

Generated topics were labelled following evaluation of topic content, based on the twenty terms with the greatest probability of occurring in each topic and the thirty (or, in some instance, more) documents with the greatest likelihood of addressing each topic (See Appendix 14 for topic labels, as well as the ten terms most associated with each topic). As previously noted, topic labels therefore reflect a subjective judgement of topic content and represent a consensus “best fit” label intended to broadly communicate the thematic content of terms and documents associated with topics.

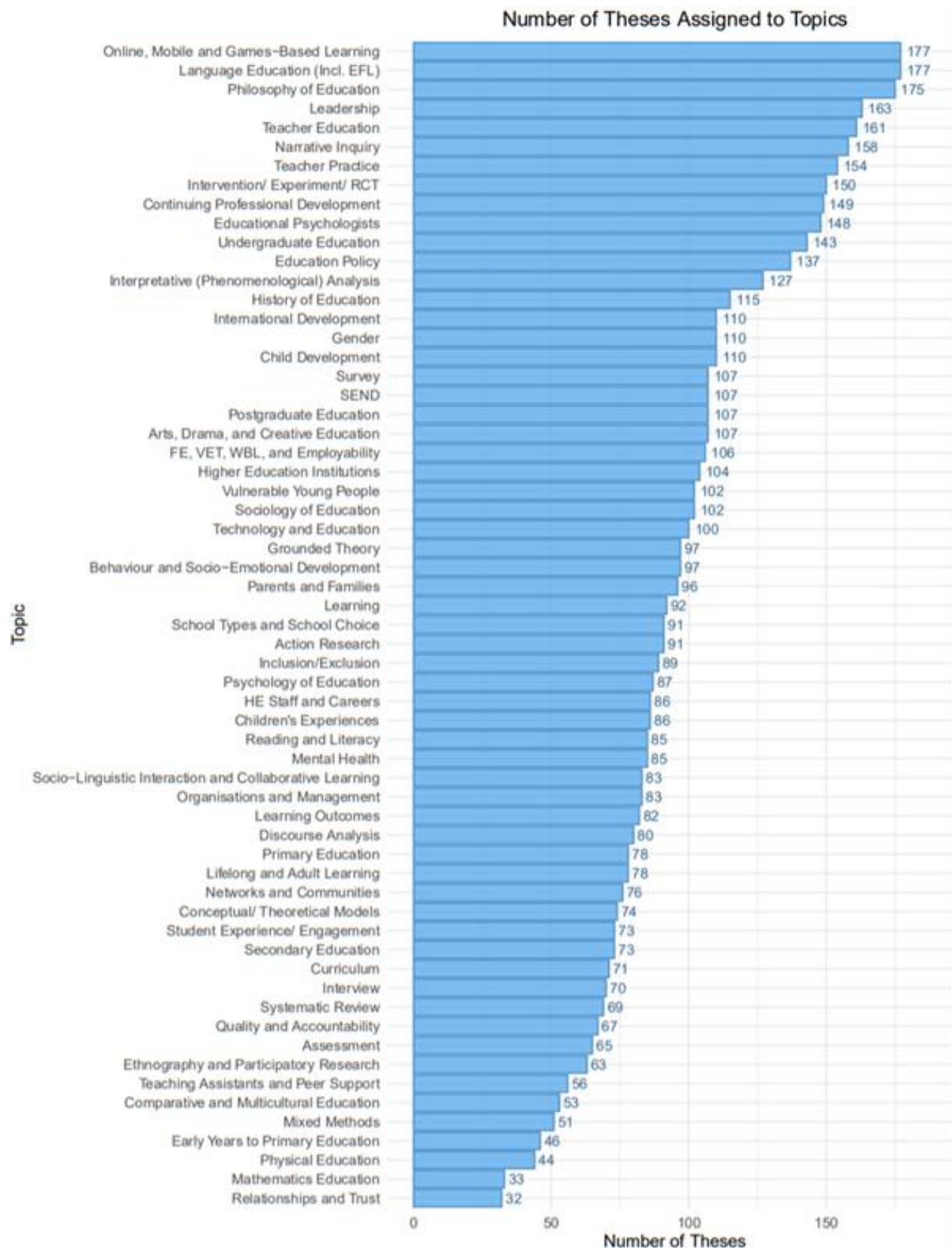


Figure 4.2.1. Number of doctoral theses allocated to each topic (i.e. number of documents primarily addressing a given topic)

The similarity between topics derived through the LDA model was investigated through hierarchical clustering of the Hellinger distance (the similarity between two probability distributions) – here, similarity describes the degree to which topics co-occur within documents. Figure 4.2.2 presents a dendrogram illustrating the results of this hierarchical clustering of topics. The Hellinger distance scale here indicates similarity between topics, with smaller distances between topics (i.e. at the point of confluence between the respective branches of topics) indicative of greater similarity in terms of topic distribution throughout documents in comparison with those topics which meet at a greater distance. Consequently, topics clustered together indicate topics which are often combined or co-occur within research. Thus, this hierarchical clustering illustrates “different ‘islands’ in the field of research” on education (Daenekindt & Huisman, 2020, p. 581). A number of relatively distinct clusters of topics, or ‘islands’, were subsequently identified.

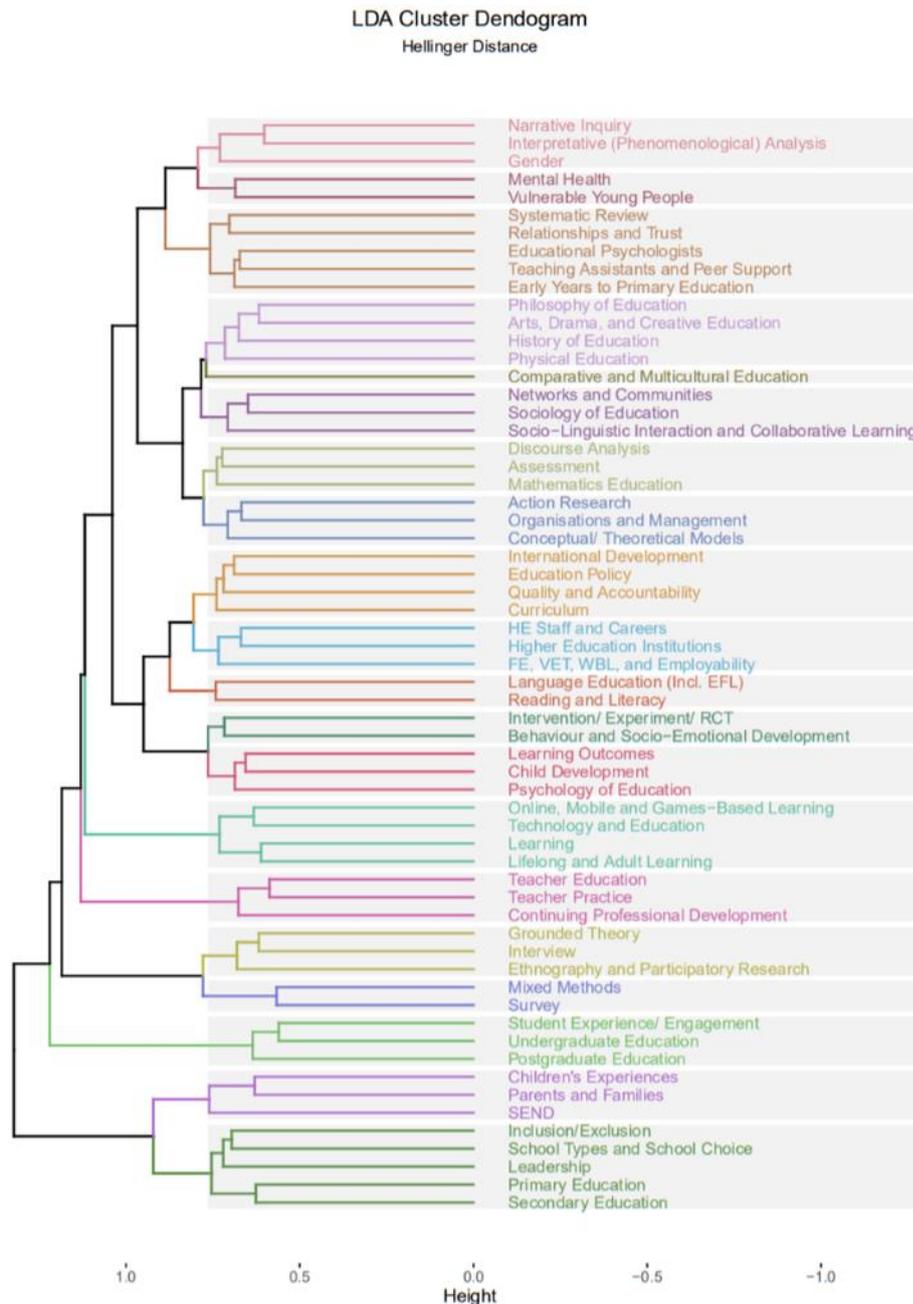
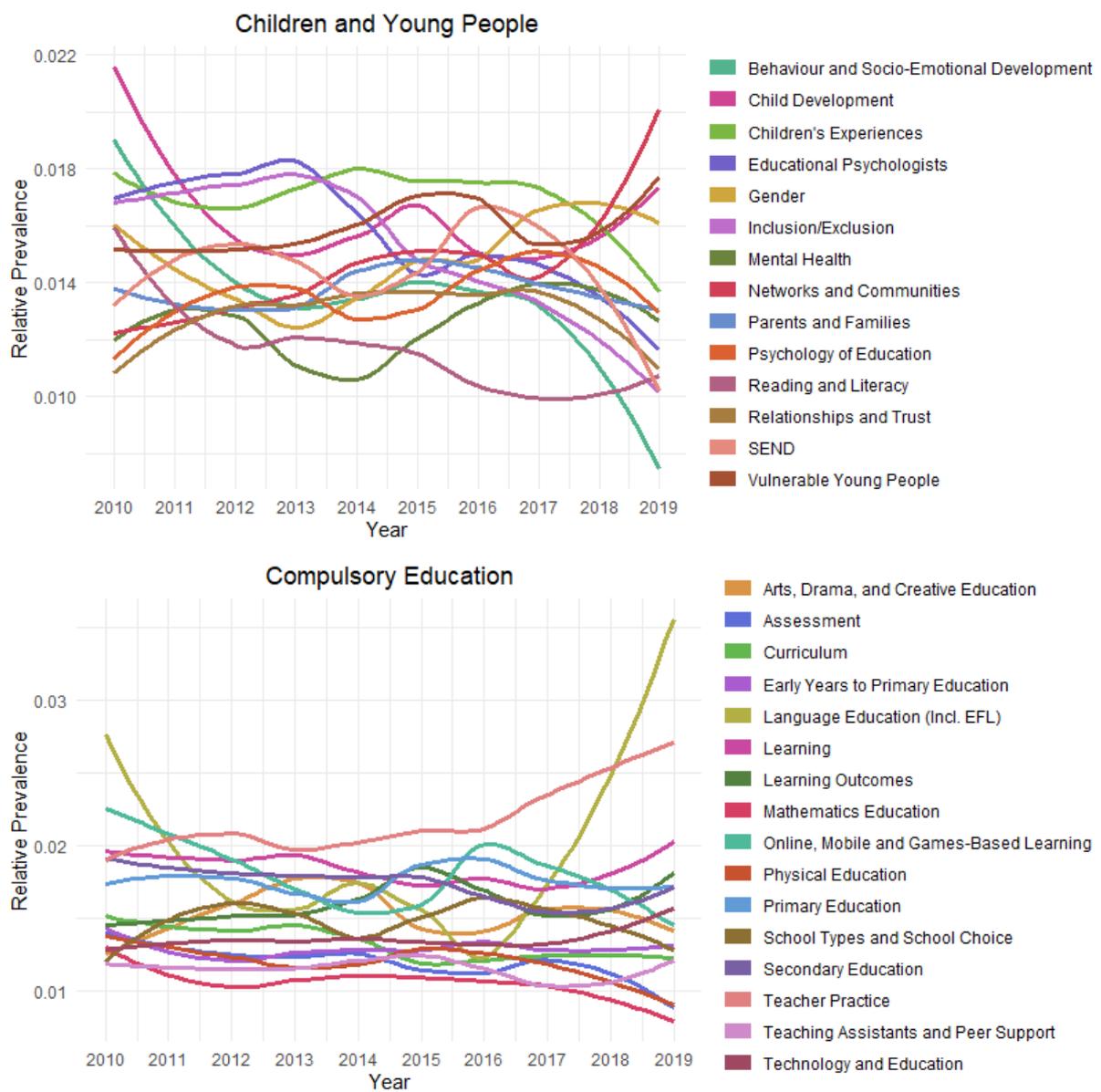
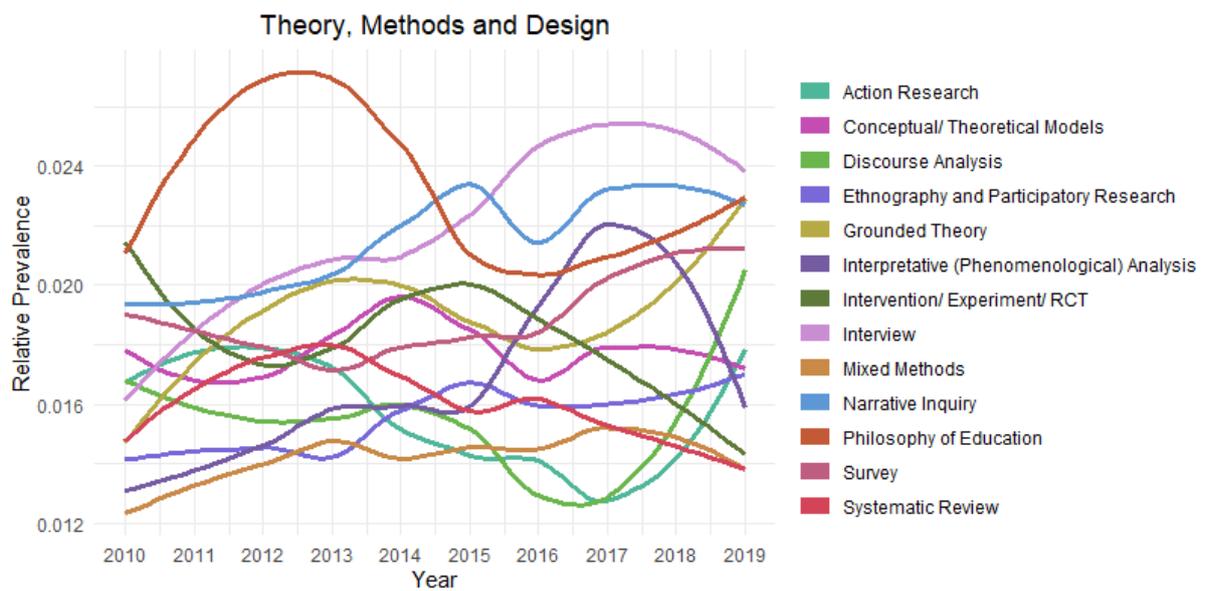
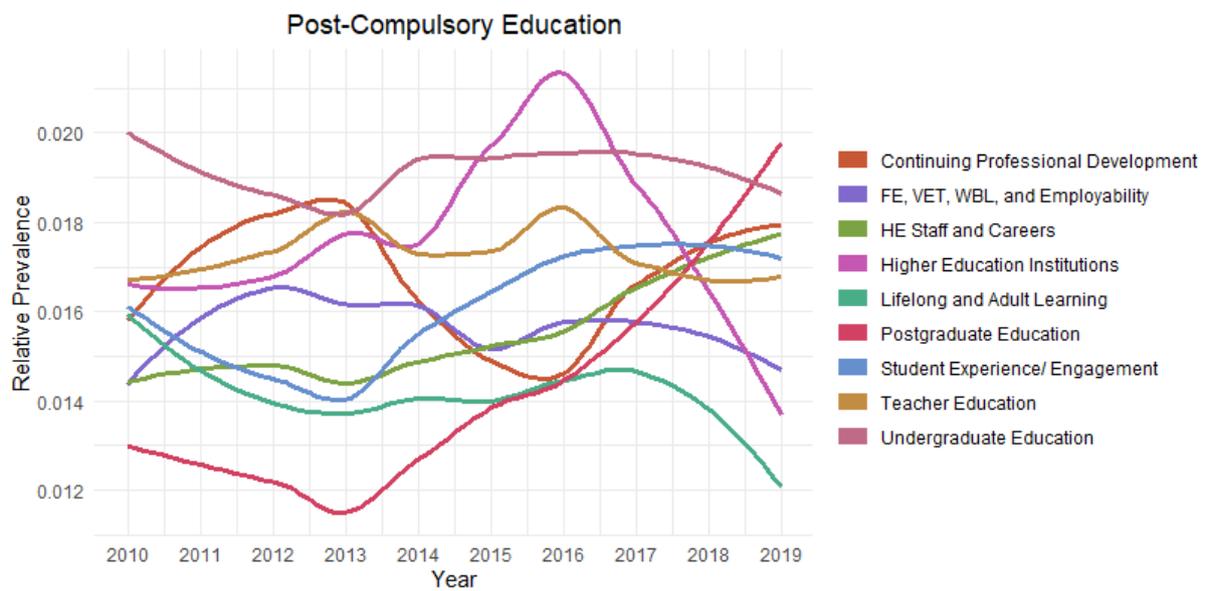
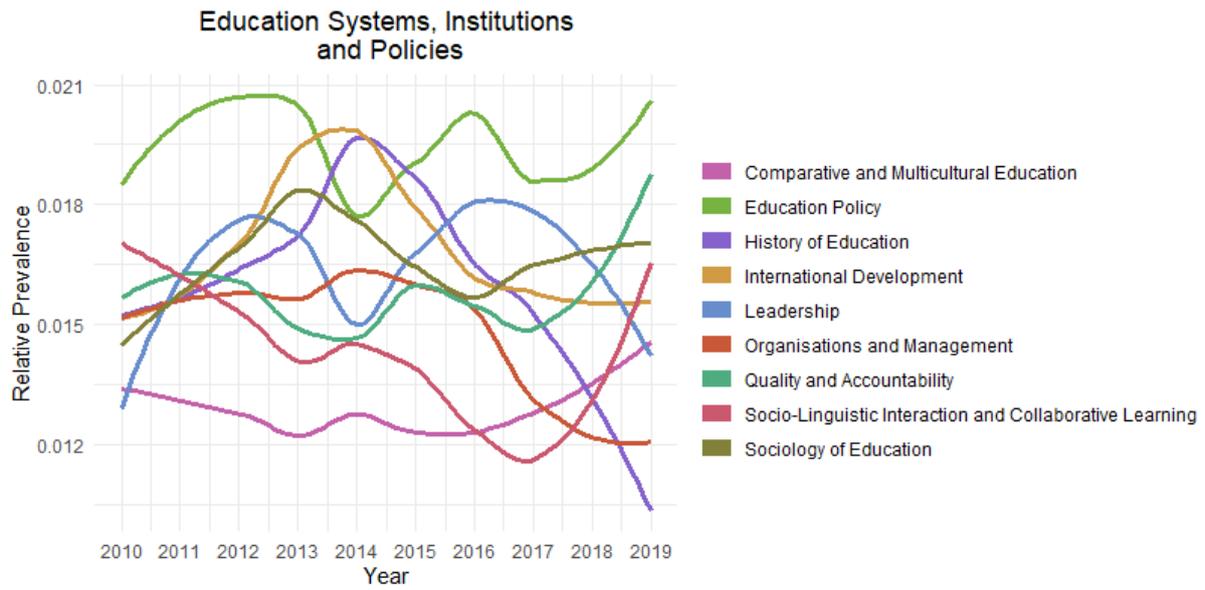


Figure 4.2.2. Dendrogram illustrating hierarchical clustering (using Ward’s method) of topics based on Hellinger distance, with twenty clusters indicated.

The relative prevalence of topics over time was examined based on the extent to which published research outputs, as a whole, addressed each topic on an annual basis (that is, the average extent to which research outputs in a given year addressed a given topic). Relative prevalence here refers to the mean probability, across all published research outputs in a given year, of documents concerning a given topic, with greater relative prevalence indicative of a topic appearing to a greater extent amongst documents. Figure 4.2.3 illustrates changes in the relative prevalence of topics throughout published research outputs over the course of the period of 2010 to 2019 (2020 was excluded due to the limited number of theses available for this year). To ensure clarity of presentation, topics have been clustered under general domains based on visual inspection of topic content and hierarchical clustering of topics.

Figure 4.2.3. Change in the relative prevalence of identified topics throughout the period of interest, 2010 to 2020. Trajectories are estimated using Locally Estimated Scatterplot Smoothing (LOESS; $\alpha = 0.7$).





4.3. TOPIC MODELLING: GRANTS AWARDED

Following exclusion of 1 document due to insufficient relevant text content - that is, it did not contain any of the terms retained for clustering and topic-modelling purposes following removal of stopwords and sparse terms (terms which appeared in fewer than 1% of documents) – the remaining corpus (989 documents) was examined in order to identify a range of probable numbers of latent topics present. HDBSCAN clustering of documents based on their similarity (calculated as cosine distance) as determined by the extent to which documents shared terms, themselves weighted by their relative importance (tf-idf), indicated 19 distinct clusters of documents within the corpus (572 noise points, $R^2 = .531$, $BIC = 2790.31$; see Appendix 15 for plot of clustering results). Subsequent evaluation of a range of numbers of topics based on several proposed metrics intended for identification of the natural number of latent topics (Arun, Suresh, Veni Madhavan, & Narasimha Murthy, 2010; Juan, Tian, Jintao, Yongdon, & Sheng, 2009; Deveaud, SanJuan, & Bellot, 2014; Griffiths & Steyvers, 2004; Nikita, 2020) and the mean topic coherence of fitted LDA models indicated several probable numbers of topics (15, 16, 21).

LDA models were generated for suggested numbers of topics, and subsequently evaluated based on topic diagnostic measures (topic coherence, distance from corpus, document prominence, topic exclusivity) and inspection of top-loading terms and documents. Through this process, 16 topics was determined to be the optimal number of topics for modelling of the corpus. However, of the topics generated by this model, following evaluation of topic content and inspection of topic diagnostics, one (30 documents in size) was considered to lack adequate coherence and clarity in thematic content, and was therefore deemed a “junk” topic (AlSumait, Barbará, Gentle & Domeniconi, 2009) which was subsequently omitted from further analysis.

The resultant, 15 retained clusters of documents generated through the topic model ranged in size from 29 documents (“Education in Developing Countries”) to 132 documents (“School-Based Interventions/ Effective Teaching”); see Figure 4.3.1). Here, it is again worth noting that documents were deemed to address a topic, and were consequently assigned to that topic, based on the topic identified as most probable or prominent within the document – this is not to say that documents solely addressed this topic. Indeed, it is an accepted assertion of topic modelling that documents, in fact, address a mixture of topics simultaneously to varying extents. Therefore, whilst some topics may be quite large in terms of the number of documents in which that topic appeared as the most probable or prominent topic addressed, it may be that the prevalence of that same topic throughout the corpus is limited, appearing relatively infrequently or to negligible extents within the mixture of topics addressed by other documents (examples of such topics include the “Applied Linguistics” and “Higher Education and Employment” topics). Conversely, some topics may be, on average, relatively prevalent throughout the corpus, frequently appearing to some extent within the mixture of topics addressed by documents, but appear relatively seldomly as the dominant or primary topic addressed (examples of such topics include the “Career Development Fellowships (Multiple Topics)” and “Science of Learning” topics). See Appendix 16 for the relative prevalence of topics throughout the corpus – that is, the average extent to which corpus documents addressed a given topic.

The model failed to allocate 79 documents to a single topic, with these documents demonstrating equal probability of addressing two or more topics (or, in alternate terms, documents concerned two or more topics to an equal extent). Topic allocation of unassigned documents was investigated through k-nearest neighbours (k-NN) clustering (or classification) of documents - based on topic probability amongst documents, represented in vector space through dimensionality reduction (t-SNE) of the model’s document-topics matrix - intended to allocate documents to topics based on the topic most prominent amongst neighbouring documents (that is, documents with the most similar topic distributions). However, inspection of resulting topic allocations were found to be of varying accuracy – that is, whilst some documents appeared to have

been assigned to an appropriate topic, others were erroneously allocated to non-relevant topics – and it was therefore decided that documents which the initial LDA model failed to allocate would be considered “noise”. As such, these documents are excluded from analysis involving allocation of documents to a topic (that is, the primary topic addressed; e.g. Figure 4.3.1), but are included in analysis concerning relative prevalence of topics throughout the corpus as a whole.

Generated topics were labelled following evaluation of topic content, based on the twenty terms with the greatest probability of occurring in each topic and the thirty (or, in some instance, more) documents with the greatest likelihood of addressing each topic (See Appendix 17 for topic labels, as well as the ten terms most associated with each topic). As previously noted, topic labels therefore reflect a subjective judgement of topic content and represent a consensus “best fit” label intended to broadly communicate the thematic content of terms and documents associated with topics.

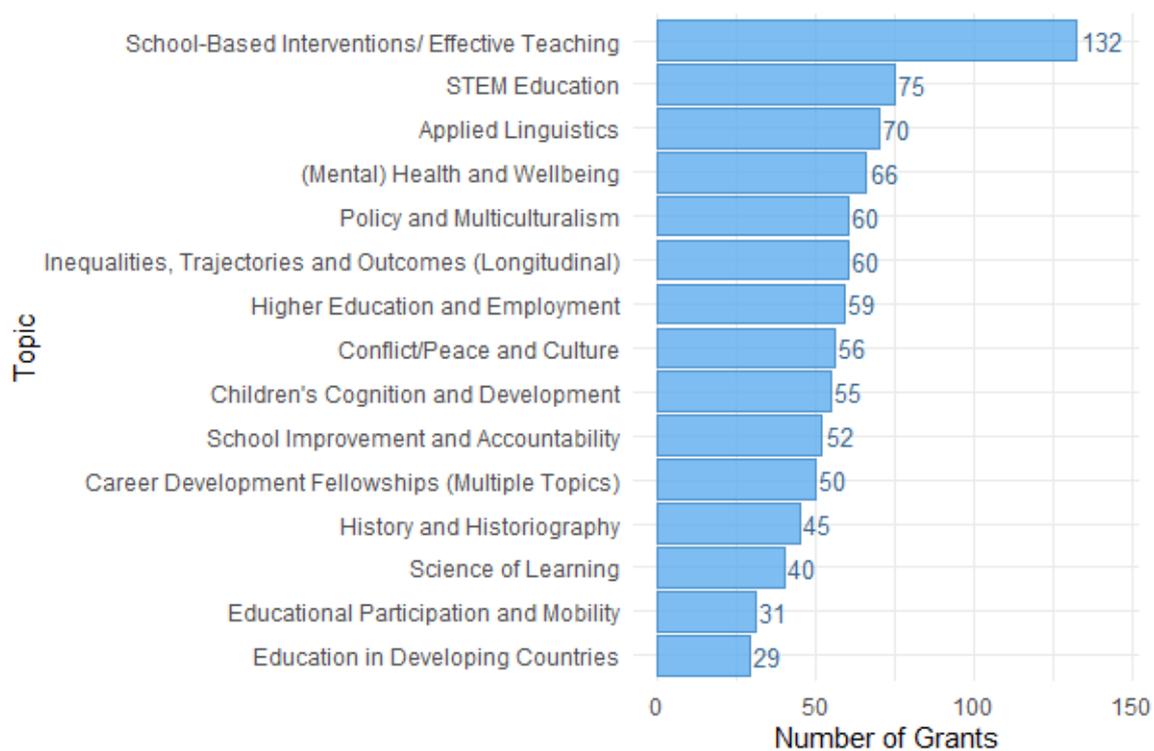


Figure 4.3.1. Number of research grants allocated to each topic (i.e. number of documents primarily addressing a given topic)

The similarity between topics derived through the LDA model was investigated through hierarchical clustering of the Hellinger distance (the similarity between two probability distributions) – here, similarity describes the degree to which topics co-occur within documents. Figure 4.3.2 presents a dendrogram illustrating the results of this hierarchical clustering of topics. The Hellinger distance scale here indicates similarity between topics, with smaller distances between topics (i.e. at the point of confluence between the respective branches of topics) indicative of greater similarity in terms of topic distribution throughout documents in comparison with those topics which meet at a greater distance. Consequently, topics clustered together indicate topics which are often combined or co-occur within research. Thus, this hierarchical clustering illustrates “different ‘islands’ in the field of research” on education (Daenekindt & Huisman, 2020, p. 581). A number of relatively distinct clusters of topics, or ‘islands’, were subsequently identified.

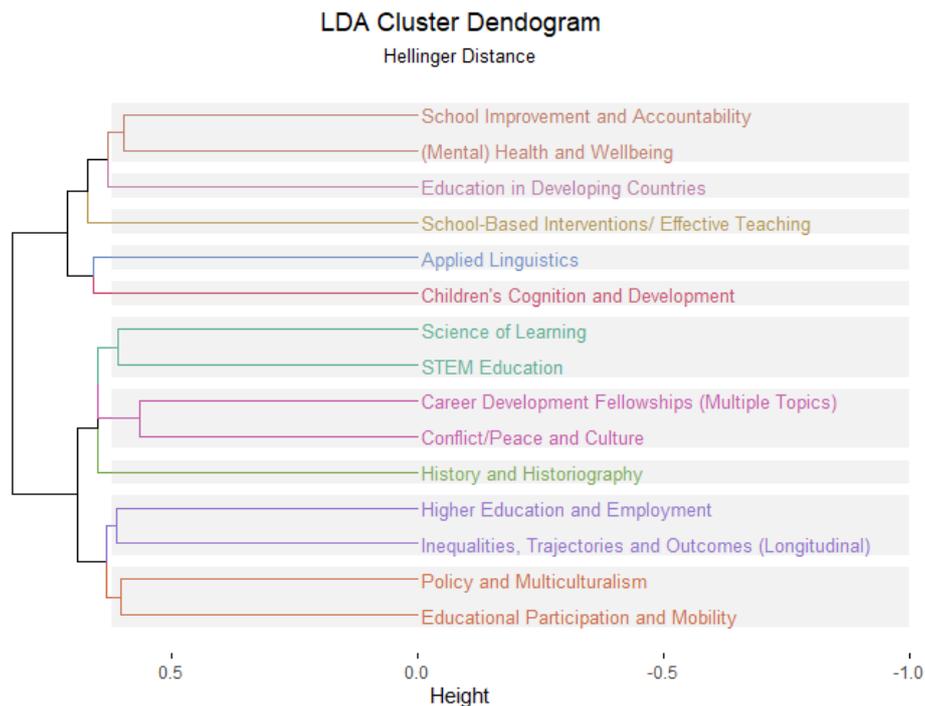


Figure 4.3.2. Dendrogram illustrating hierarchical clustering (using Ward's method) of topics based on Hellinger distance, with ten clusters indicated

The relative prevalence of topics over time was examined based on the extent to which published research outputs, as a whole, addressed each topic on an annual basis (that is, the average extent to which research outputs in a given year addressed a given topic). Relative prevalence here refers to the mean probability, across all published research outputs in a given year, of documents concerning a given topic, with greater relative prevalence indicative of a topic appearing to a greater extent amongst documents. Figure 4.3.3 illustrates changes in the relative prevalence of topics throughout published research outputs over the course of the period of interest (2010 to 2020).

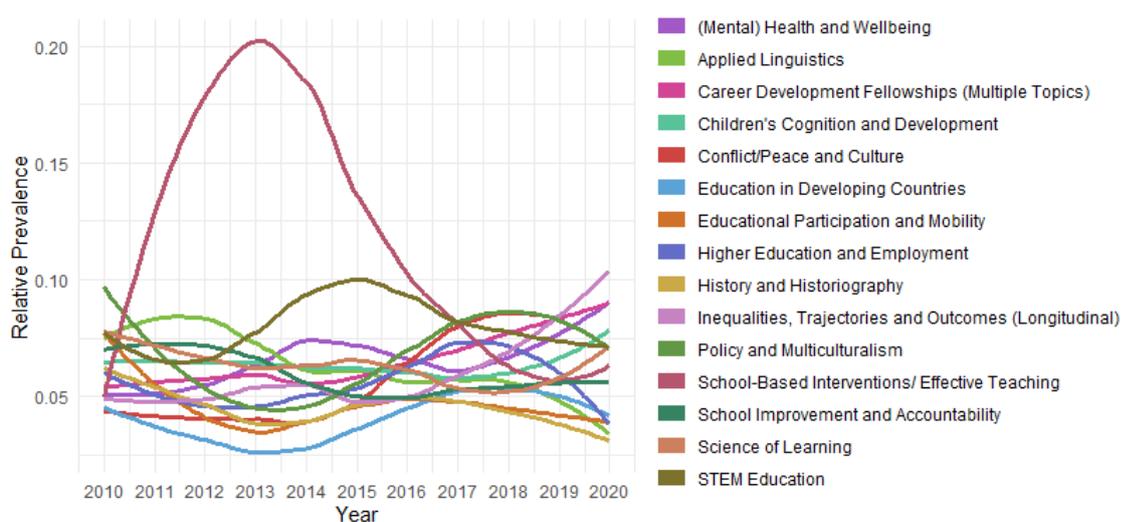


Figure. Change in the relative prevalence of identified topics throughout the period of interest, 2010 to 2020. Trajectories are estimated using Locally Estimated Scatterplot Smoothing (LOESS; $\alpha = 0.7$).

4.4. DISCIPLINARY TERMS

PUBLICATIONS – PREVALENCE OF DISCIPLINARY TERMS

Planned systematic searches of document text content (here, title, abstract, and keywords) for disciplinary terms identified at least one such disciplinary term in 28.9% (7,762) of published research outputs and two or more different disciplinary terms in 4.6% (1,225) of outputs. Disciplinary terms ranged in prevalence from variants of “Business and Management”, mentioned in 2,186 (8.1%) outputs, to variants of “Organisational Theory”, mentioned in 4 (0.01%) outputs (see Figure 4.4.1). In addition to business and management, the most commonly mentioned disciplines included healthcare education (5.3% of outputs), history (3.3%), mathematics (3.3%), engineering (1.8%), and psychology (1.7%).

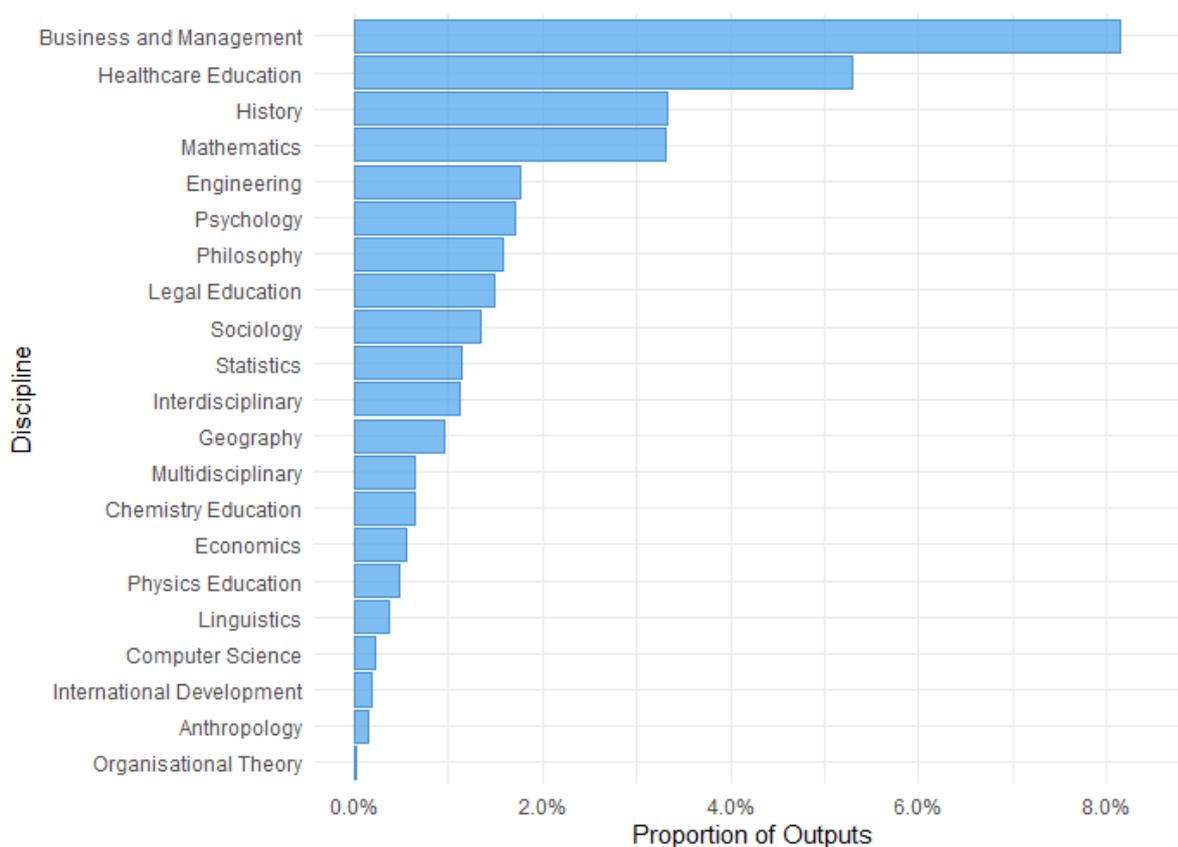


Figure 4.4.1. Prevalence of disciplinary terms throughout published research outputs (measured as the proportion of documents using the term or an associated variant).

DOCTORAL THESES – PREVALENCE OF DISCIPLINARY TERMS

Planned systematic searches of document text content (here, title, abstract, and keywords) for disciplinary terms identified at least one such disciplinary term in 22% (1,452) of published research outputs and two or more different disciplinary terms in 2.4% (160) of outputs. Disciplinary terms ranged in prevalence from variants of “Business and Management”, mentioned in 483 (7.3%) theses, to variants of “Organisational Theory”, mentioned in 3 (0.05%) theses (see Figure 4.4.2). In addition to business and management, the most commonly mentioned disciplines included history (3.5%), psychology (2.9%), mathematics (2.6%), philosophy (1.5%), and statistics (1.3%).

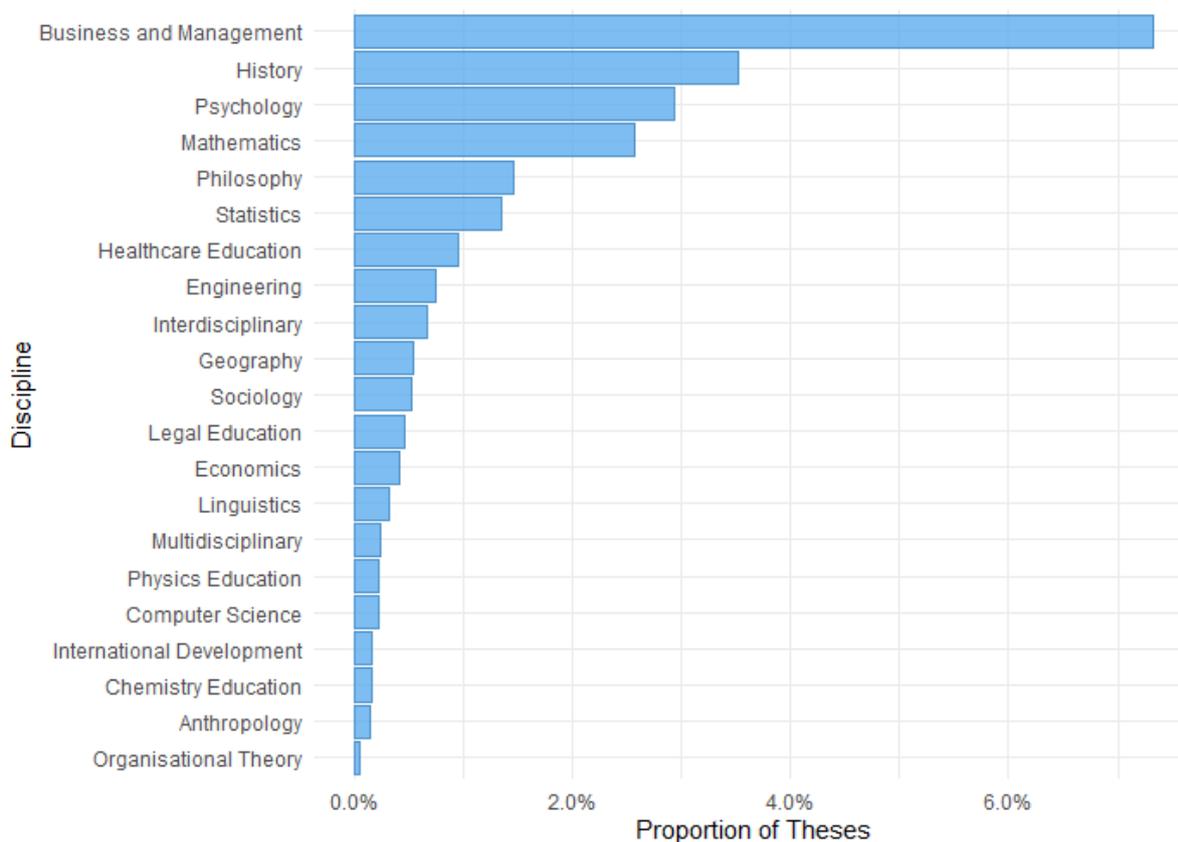


Figure 4.4.2. Prevalence of disciplinary terms throughout doctoral theses (measured as the proportion of documents using the term or an associated variant)

GRANTS AWARDED – PREVALENCE OF DISCIPLINARY TERMS

Planned systematic searches of document text content (here, title and abstract) for disciplinary terms identified at least one such disciplinary term in 28.3% (280) of research grants and two or more different disciplinary terms in 9.3% (92) of research grants. Disciplinary terms ranged in prevalence from variants of “Business and Management”, mentioned in 61 (6.2%) research grants, to variants of “Chemistry Education”, mentioned in 1 (0.01%) research grant (note, “Organisational Theory” was not mentioned in any research grant; see Figure 4.4.3). In addition to business and management, the most commonly mentioned disciplines included interdisciplinary (6% of research grants), mathematics (4.8%), history (4.4%), psychology (3.3%), and statistics (2.2%).

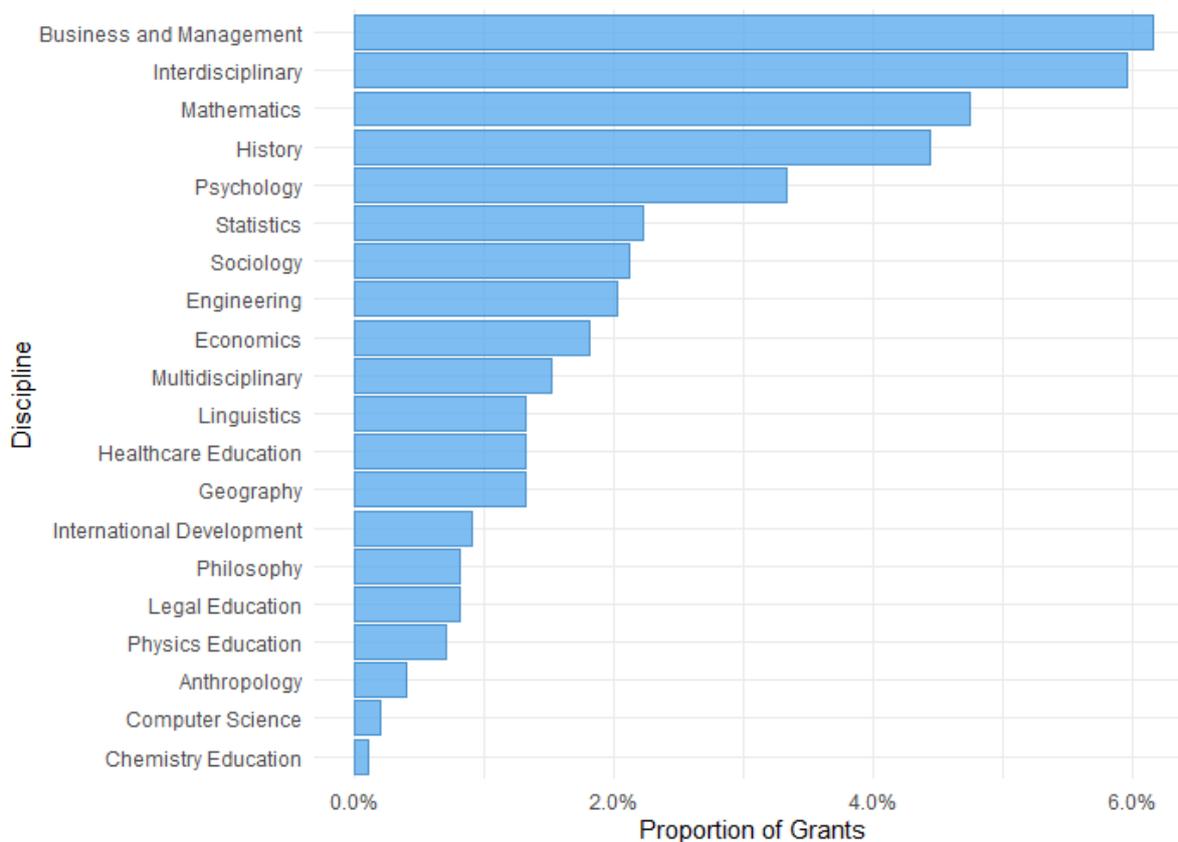


Figure 4.4.3. Prevalence of disciplinary terms throughout educational research grants (measured as the proportion of documents using the term or an associated variant).

4.5. KEYWORD ANALYSIS (JOURNAL ARTICLES)

The occurrence and co-occurrence of keywords can reveal the prevalence, relationships, and development of research topics. Keywords designated by authors and listed on the publications as such are 'author keywords'. In our dataset, information on author keywords is available for journal articles only. The top 10 author keywords in the dataset of journal articles are shown in Table 4.5.1.

Table 4.5.1. Top 10 co-occurrent author keywords (journal articles, 2010-2020)

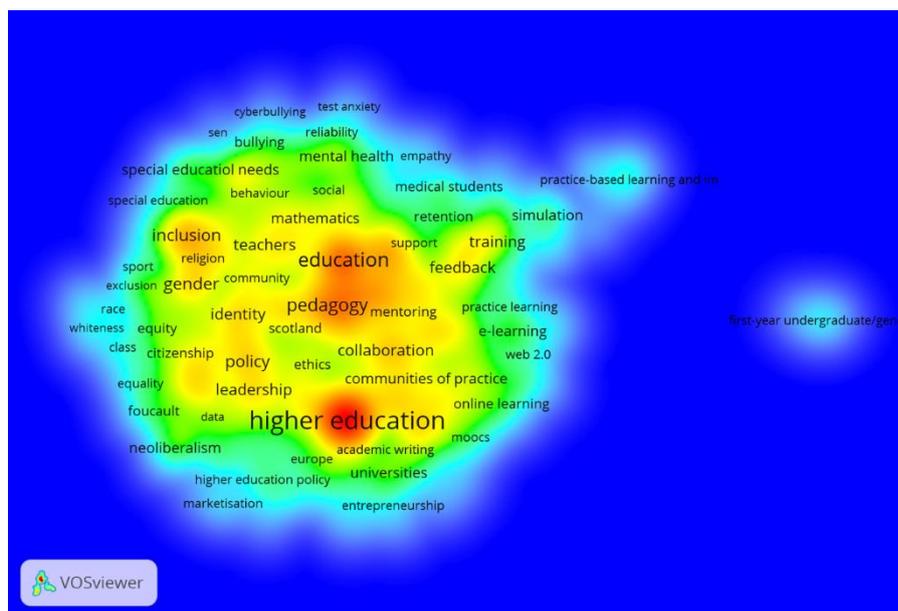
No	Keywords	Occurrences
1	Higher education	1578
2	Education	677
3	Assessment	450
4	Pedagogy	384
5	Curriculum	359
6	Profession development	299
7	Learning	271
8	Gender	292
9	Policy	261
10	Teacher education	256

Figure 4.5.1 visualises the density of keywords of journal articles in this dataset. The density map of keyword co-occurrence networks was generated with VOSviewer, in order to identify and visualise the most prevalent keywords and their changes over time.

Each node represents one keyword, and the font size reflects the frequency of occurrence – the bigger the font size, the higher the frequency with which the keyword appeared in the publications in our dataset. The density of a node depends on the number of relationships with the neighbouring nodes and the weights of the neighbouring nodes. Related keywords are grouped into the same cluster and thus displayed closer to each other. The colours of density maps in this study range from blue (lowest density) to red (highest density) (Van Eck and Waltman, 2020). To reduce noise in generating the density map, a minimal threshold of 20 occurrences of a keyword was applied.

As Figure 4.5.1 shows, the high-density keywords among journal articles published between 2010 and 2020 are: higher education, education, pedagogy, inclusion, religion, gender, policy, identity, leadership, citizenship, training, and feedback.

Figure 4.5.1. Density of keywords (journal articles, 2010-2020)



To trace the development and changes over time, Table 13 and Appendix 5 show the results of the analysis of keyword networks in journal articles published in each year. When generating the density maps for each calendar year from 2010 to 2020 (Appendix 5), a minimal threshold of five occurrences of a keyword was applied. Based on the density maps generated in VOSviewer, high-density keywords in addition to ‘higher education’ were extracted and recorded in Table 4.5.2. The maps and the frequency analysis show that over the past decade, ‘higher education’ has been the keyword with the highest density and frequency in the journal articles included in this dataset. ‘Assessment’ became a high-density keyword from 2014.

As Table 4.5.2 demonstrates, the high-frequent keywords largely correspond to the general top 5 keywords within the dataset (Table 4.5.2), with ‘higher education’ being the highest frequent keyword in each year and between 2010-2020. Keywords outside the general top 5 are marked in red colours, including: inclusion (2010 and 2014), United Kingdom (2012), learning (2013), teacher education (2014), policy (2017), and professional development (2020).

Table 4.5.2. Author keywords with high density and high frequency (journal articles, 2010-2020)

Publication Year	Keywords with high density (Based on the density maps generated in VOSviewer – see Appendix 5)	Keywords with high frequency (Top 5)
2010	Higher education, student experience, citizenship, policy, teacher development, assessment, leadership, literacy	higher education (112); education (43); assessment (31); inclusion (30); curriculum (22)
2011	Higher education, professional development, curriculum, assessment, education, students, inclusion, identity, policy	higher education (95); education (42);

		assessment (39); curriculum (36); pedagogy (35)
2012	Higher education, citizenship education, collaboration, teachers, professional development, policy, inclusion, gender, education, learning, engagement, United Kingdom	higher education (93); education (57); assessment (36); pedagogy (33); United Kingdom (32); curriculum (32)
2013	Higher education, education, inclusive education, learning, identity, social class, social media, e-learning	higher education (119); education (68); assessment (42); pedagogy (41); learning (35); curriculum (35)
2014	Higher education, assessment, teacher education, language, physical education, leadership, inclusion	higher education (117); education (60); assessment (43); curriculum (32); inclusion (29); teacher education (29)
2015	Higher education, assessment, learning, inclusion, identity, education policy, policy, governance; curriculum; pedagogy	higher education (133); education (61); assessment (37); pedagogy (34); curriculum (32)
2016	Higher education, assessment, education, learning, education policy, professional development, pedagogy, teacher education, teachers, social justice, equity	Higher education (136); education (70); assessment (51); pedagogy (39); curriculum (35)
2017	Higher education, education, active learning, teaching, assessment, evaluation, secondary education	higher education (148); education (54); assessment (37); policy (31); employability (31)
2018	Higher education, education, teacher education, learning, assessment, employability, gender; nursing	Higher education (164); education (62); pedagogy (42); assessment (42); curriculum (32)

2019	Higher education, education, identity, learning, students, supervision, pedagogy	Higher education (240); education (82); assessment (47); curriculum (46); pedagogy (40)
2020	Higher education, teacher education, assessment, inclusion, diversity, technology	Higher education (221); education (78); professional development (40); assessment (38); pedagogy (37)

5. METHODS AND DESIGNS

Methods and designs: publications

Methods and designs: doctoral theses

Methods and designs: grants

5.1. PUBLICATIONS – PREVALENCE OF METHODOLOGICAL TERMS

Planned systematic searches of document text content (here, title, abstract, and keywords) for methodological terms identified at least one such methodological term in 51% (13,678) of published research outputs and two or more different methodological terms in 21.6% (5,803) of outputs. Methodological terms ranged in prevalence from variants of “Interview(s)”, mentioned in 3,925 (14.6%) outputs, to variants of “Narrative”, mentioned in 37 (0.1%) outputs (see Figure 5.1.1). In addition to interviews, the most commonly mentioned methods included evaluation (11.2% of outputs), survey (8.3%), case study (7.9%), questionnaire (7.2%), and intervention (5.8%).

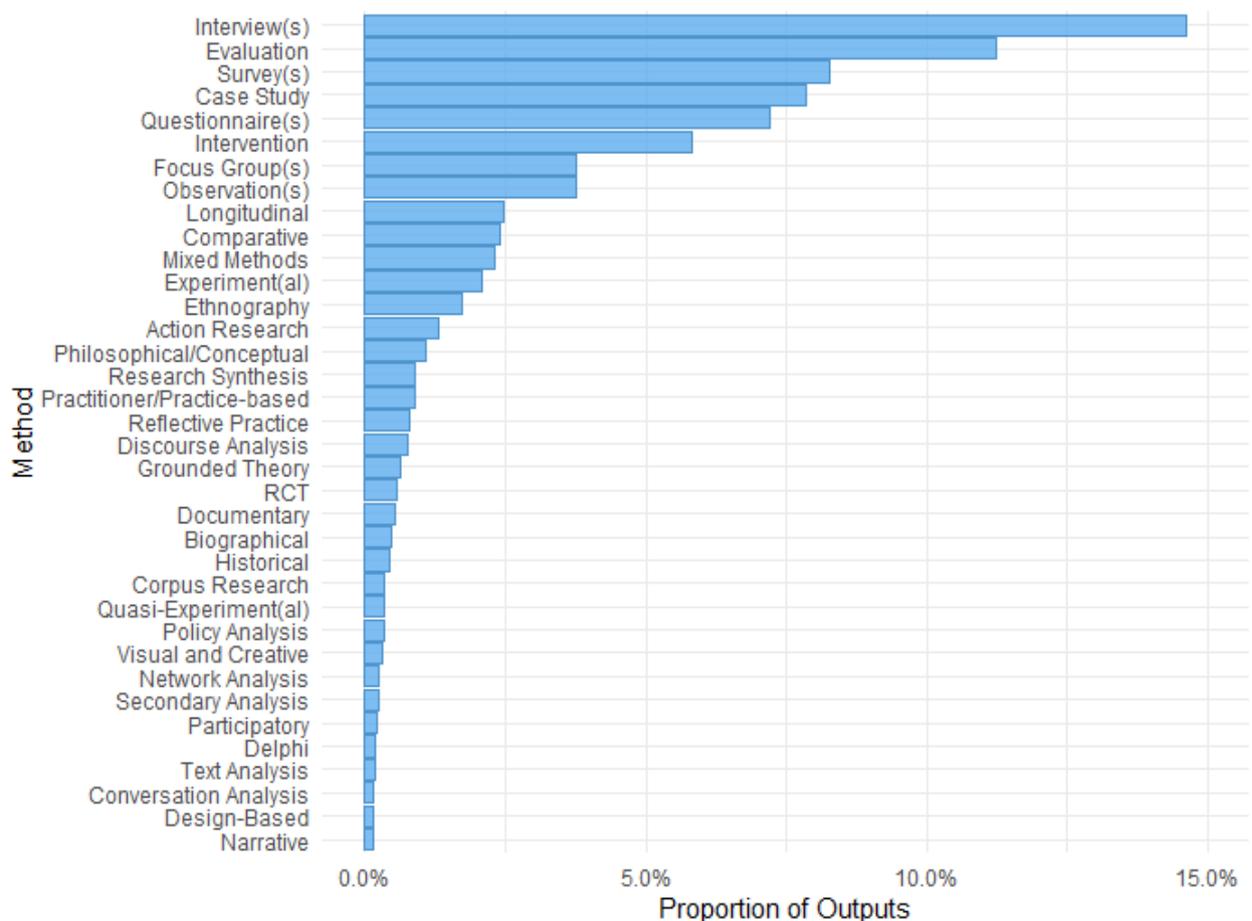


Figure 5.1.1. Prevalence of methodological terms throughout published research outputs (measured as the proportion of documents using the term or an associated variant)

5.2. DOCTORAL THESES – PREVALENCE OF METHODOLOGICAL TERMS

Planned systematic searches of document text content (here, title and abstract) for methodological terms identified at least one such methodological term in 74.4% (4,903) of doctoral theses and two or more different methodological terms in 45.6% (3,004) of theses. Methodological terms ranged in prevalence from variants of “Interview(s)”, mentioned in 2,598 (39.4%) theses, to variants of “Delphi”, mentioned in 9 (0.1%) theses (see Figure 5.1.2). In addition to interviews, the most commonly mentioned methods included case study (20.6% of theses), questionnaire (13.1%), observation (11%), mixed methods (10.9%), and evaluation (9.8%).

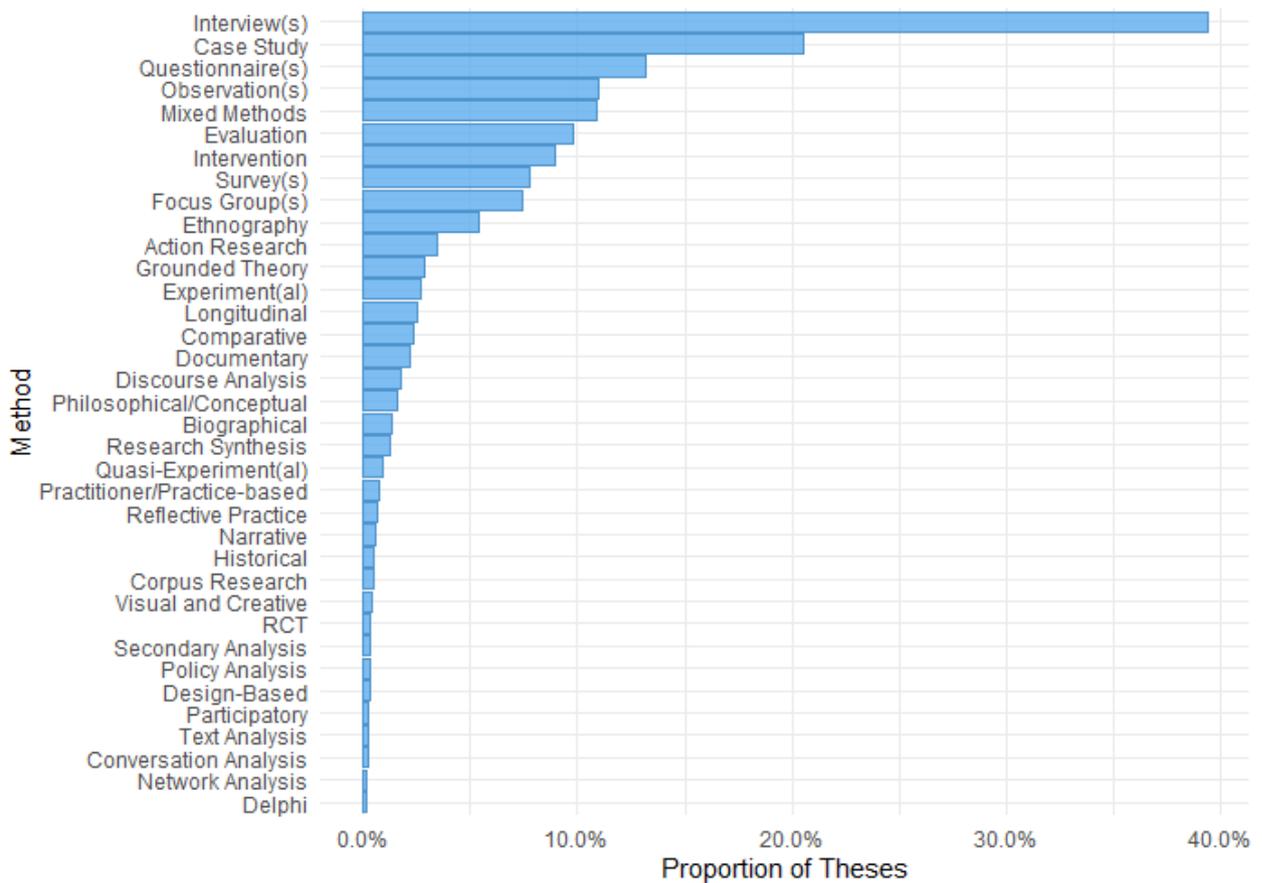


Figure 5.1.2. Prevalence of methodological terms throughout doctoral theses (measured as the proportion of documents using the term or an associated variant)

5.3. GRANTS AWARDED – PREVALENCE OF METHODOLOGICAL TERMS

Planned systematic searches of document text content (here, title and abstract) for methodological terms identified at least one such methodological term in 46.1% (456) of research grants and two or more different methodological terms in 25.1% (248) of research grants. Methodological terms ranged in prevalence from variants of “Intervention” mentioned in 157 (15.9%) outputs, to variants of “Design-Based” and “Delphi”, each mentioned in 1 (0.1%) grant (see Figure 5.1.3). Note, however, that neither conversation analysis nor narrative methods were identified as being mentioned in any grants. In addition to intervention, the most commonly mentioned methods included evaluation (12.4% of research grants), interview (9.8%), survey (8.8%), longitudinal (5.4%), and experimental approaches (5.3%).

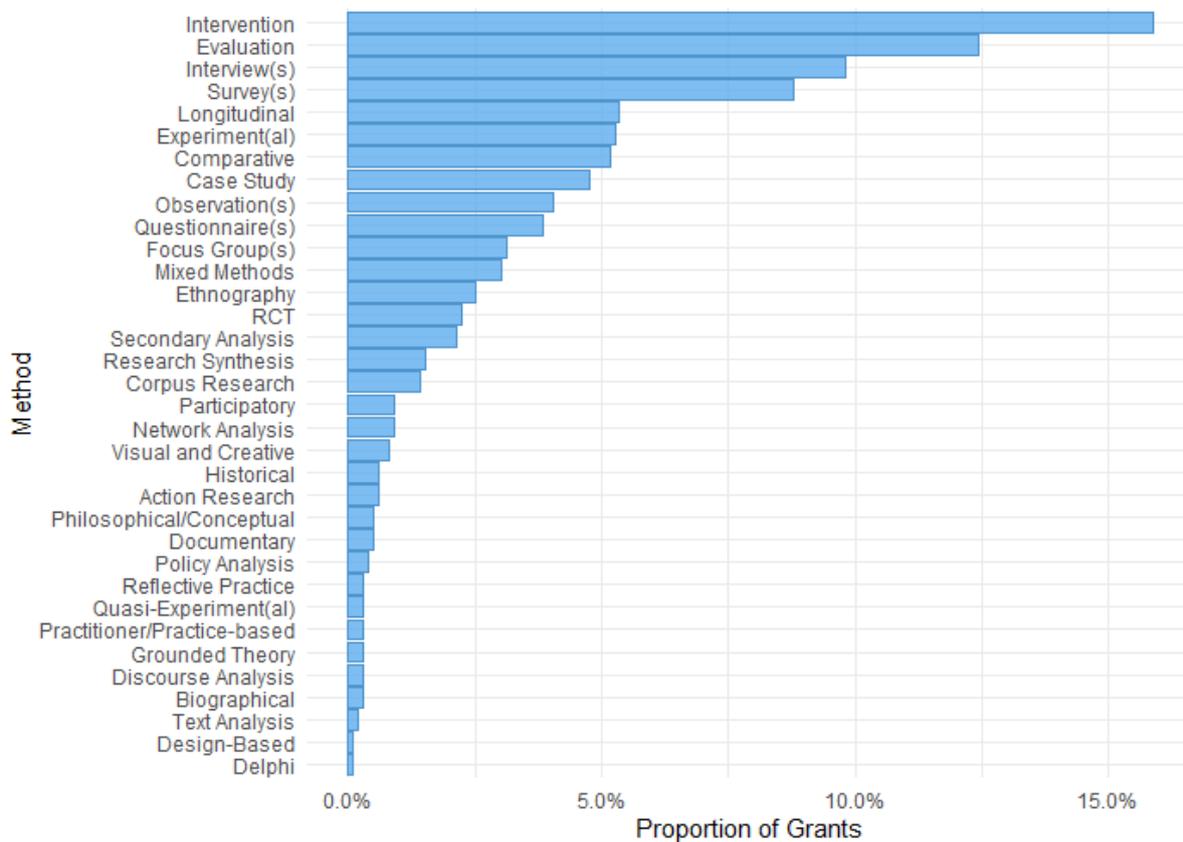


Figure 5.1.3. Prevalence of methodological terms throughout educational research grants (measured as the proportion of documents using the term or an associated variant)

6. KNOWLEDGE EXCHANGE, ENGAGEMENT AND IMPACT

KEI grants (all funders)

Volume; duration; funding bodies; institutions and collaborations; topics; methodological terms; disciplinary terms

Outcomes of UKRI KEI grants

Engagement activities

Impact sector

Policy influence

Outcomes of research grants (UKRI funded):

Engagement activities

Impact sector

Policy influence

6.1. KEI GRANTS (ALL FUNDERS)

This chapter presents findings from the analysis of the KEI grants dataset, and also from the analysis of the dataset on outcomes of research and KEI funding from UKRI-funded projects.

VOLUME OF FUNDING

The total funding for the 749 KEI⁷ projects identified in our dataset (of which 736 had information about the exact funding amount) is 353.7 million in GBP (£32.1m per year on average), among which projects with UK PIs account for 125.4 million in GBP (avg. £11.4m per year). Among all KEI projects, 648 are led by UK PIs, of which 635 had information available on funding size. The total funding size for KEI projects with UK PIs is only 35% (£125,359,515.2) of the total funding size for all KEI projects (Table 6.1.1).

Table 6.1.1. Funding scale of KEI grants in our dataset (UK and Non-UK PI)

	Number of Grants	Total Funding Amount (£)
All (UK institutions as PI or collaborations)	749	353,665,425.2
UK PI only	648	125,359,515.2

The total amount of KEI funding fluctuated considerably year-on-year over the period, with an overall increase in the nominal amount. The greatest amount of funding awarded in a single year was £50m in 2019 (the most recently completed calendar year), and the least amount of funding awarded in a single year was £14m awarded in 2011 (see Table 6.1.2). The amount of funding awarded during 2020 (year-to-date, October, £17m) is considerably less than that of the preceding year.

The average funding amount per grant is £480,510 across the 2010-2020 period (Table 6.1.2 and Figure 6.1.1; note that funding information was not available for 13 projects). Note, however, that

⁷ As explained in chapter 1, we use 'KEI grants' as an umbrella term including funding for knowledge exchange, knowledge transfer, impact acceleration, public engagement with research, innovation and enterprise, edtech development and other, similar projects.

this figure is skewed by the 11 KEI grants in the dataset with funding amounts between £5m and £10m, including two awarded in 2010, three in 2012, four in 2016, and two (including the largest grant in the dataset, of £9.99m) in 2019. This explains the peaks of the total funding amount in those years. In addition, 45 KEI grants in the dataset are between £2m and £5m, and 50 are between £1m and £2m in GBP (Figure 6.1.2). Therefore, the median funding amount, which is £69,096, may therefore better reflect the typical amount of funding educational KEI projects were awarded during the period of interest.

Both the mean and median amount of funding awarded for educational KEI grants which involve an investigator (PI, Co-PI, Co-I) with a UK institutional affiliation decreased over the period of interest (2010 to 2020), although with considerable year-to-year variation. Mean funding awarded for grants decreased from £837k in 2010 to £607k in 2019 (Figure 6.1.1), whilst the median funding awarded for grants decreased from £107k in 2010 to £84k in 2019. Notably, despite the increase in the number of grants awarded during 2020 (year-to-date, October), the typical funding awarded for these grants has decreased considerably (mean funding, £156k; median funding, £49k).

Table 6.1.2. Total and mean amount of funding for KEI grants awarded to research projects which involved a principal investigator (PI), co-principal investigator (Co-PI) or co-investigator (Co-I) with a UK institutional affiliation by year, for the period 2010 to 2020

Year	Total Funding Amount (GBP)	Mean Funding Amount (GBP)
2010	36,807,181	836,527
2011	14,203,767	373,783
2012	47,732,127	653,865
2013	25,763,927	384,536
2014	20,266,877	256,543
2015	35,025,134	507,611
2016	40,765,406	769,159
2017	42,091,618	592,840
2018	23,708,991	493,937
2019	49,790,087	607,196
2020 (Jan-Oct)	17,500,497	156,254

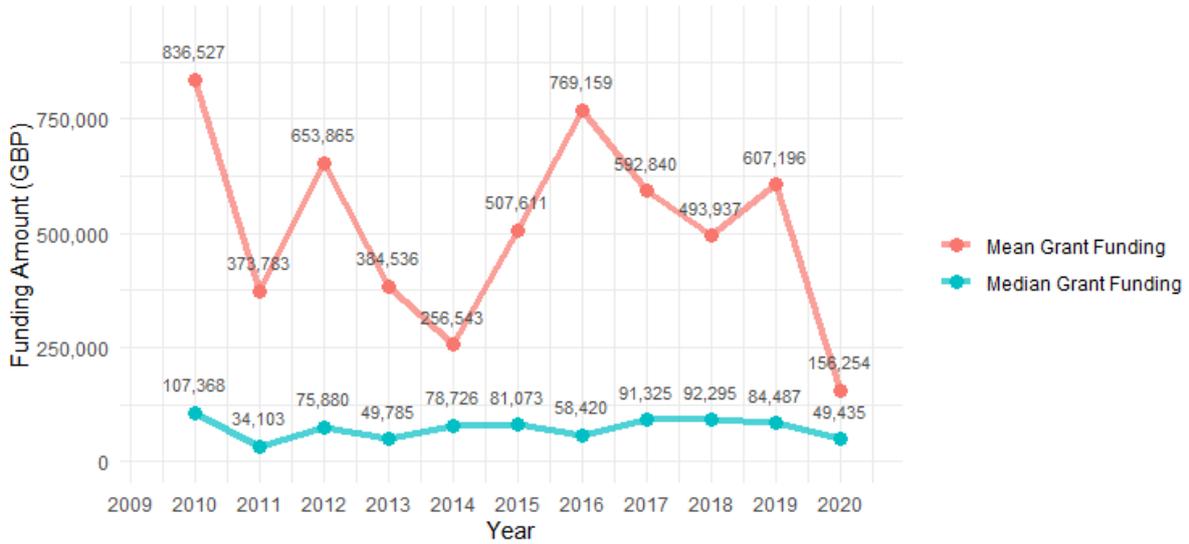


Figure 6.1.1. Mean and median amount of funding for KEI grants awarded to research projects which involved a principal investigator (PI), co-principal investigator (Co-PI) or co-investigator (Co-I) with a UK institutional affiliation by year, for the period 2010 to 2020

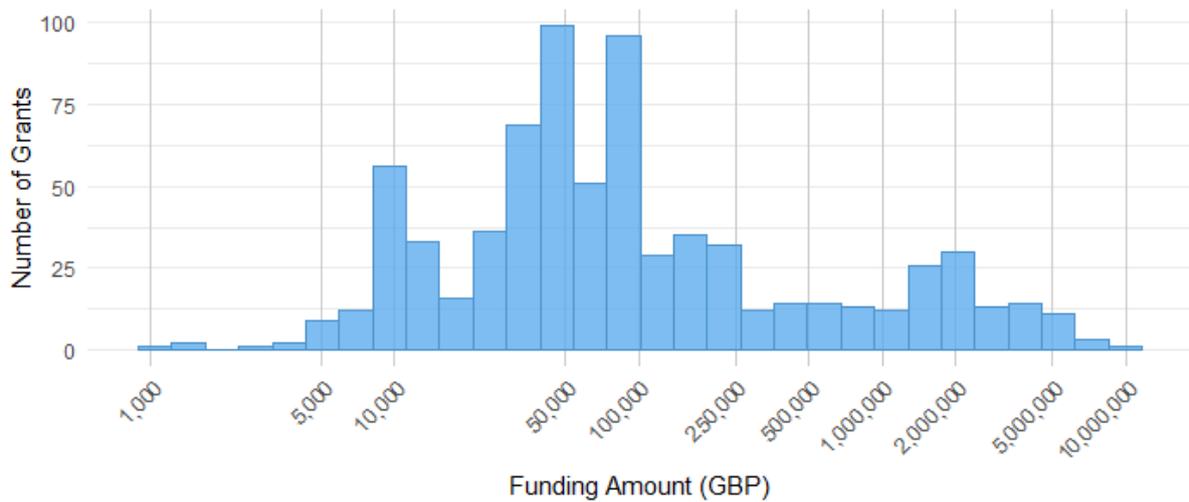
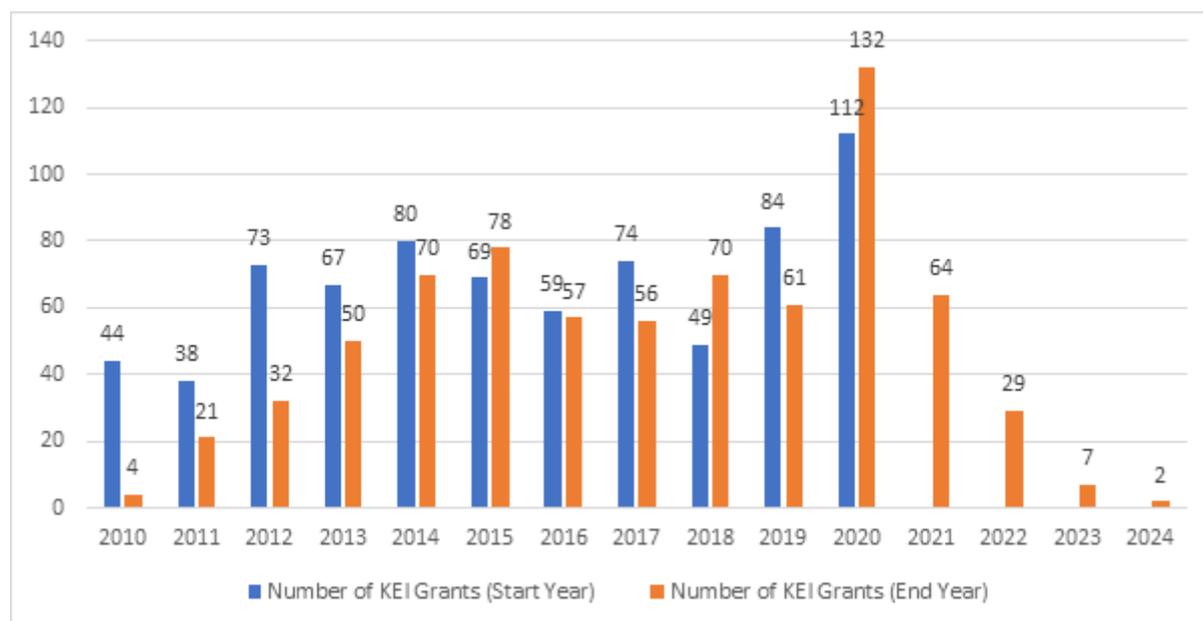


Figure 6.1.2. Histogram of the funding amount of KEI grants awarded to research projects which involved a principal investigator (PI), co-principal investigator (Co-PI) or co-investigator (Co-I) with a UK institutional affiliation between the years 2010 to 2020. Note, the x-axis, funding amount, has been log₁₀ transformed

Figure 6.1.3 summarises the number of KEI grants with a starting or ending date in each year. 2021 and 2020 are the years that most research grants ended. 2020 is the year when the largest number of KEI funding started and ended. A larger number of grants (112) were awarded throughout 2020 to the time of the dataset compilation (October) than in any single year throughout the preceding decade. Among the 112 grants, more than half (69) were funded by Innovate UK and focused on (ed)tech and technology innovation, followed by STFC (17 grants) and AHRC (14). 42 of the 2020 KEI grants had 'COVID' in the abstract.

Figure 6.1.3. Number of grants by start and end year (all KEI funding)



The number of KEI grants awarded to projects which involved a principal investigator (PI), co-principal investigator (Co-PI) or co-investigator (Co-I) with a UK institutional affiliation increased over the course of the period of interest (2010 to 2020), from 44 grants in 2010 to 84 in 2019 (the most recently completed calendar year; see Figure 6.1.4). On average, 68 projects involving an investigator (PI, Co-PI, or Co-I) with a UK institutional affiliation were awarded KEI grants each year.

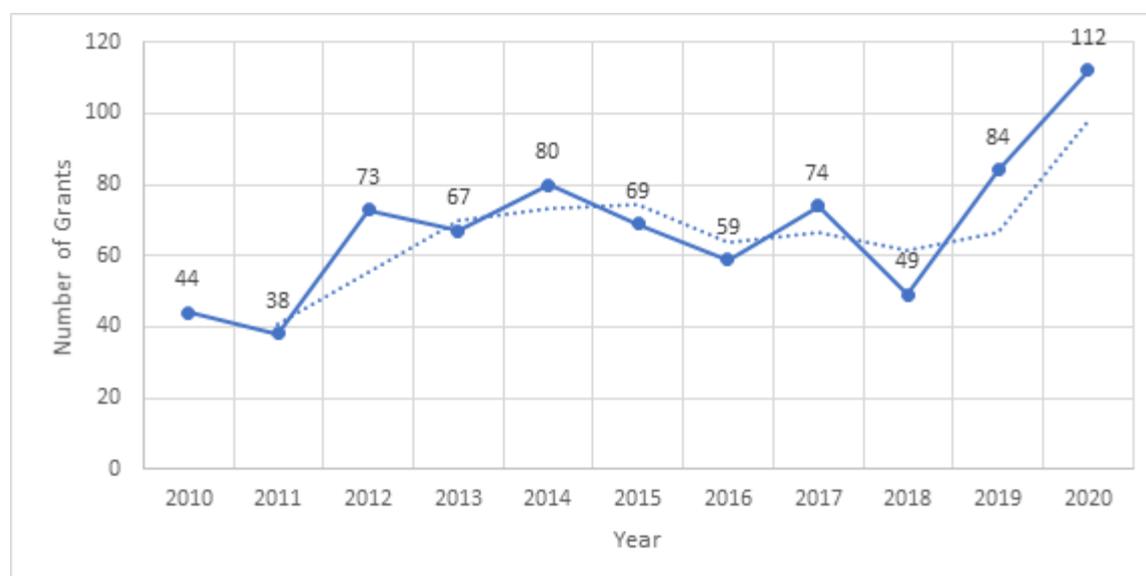


Figure 6.1.4. Number of KEI grants awarded to research projects which involved a principal investigator (PI), co-principal investigator (Co-PI) or co-investigator (Co-I) with a UK institutional affiliation by year, for the period 2010 to 2020

GRANT DURATION

Information on funding duration was calculated as explained in Chapter 2. In our dataset, 76% of KEI funding with UK and non-UK PIs lasted between one year and four years. KEI funding contains a higher proportion of less-than-one-year grants (18%) than do research grants (5%) and a lower proportion of grants lasting more than 4 years (4%) than research grants (11%) (Table 6.1.3).

Table 6.1.3. Funding duration of KEI grants awarded to research projects which involved a principal investigator (PI), co-principal investigator (Co-PI) or co-investigator (Co-I) with a UK institutional affiliation, for the period 2010 to 2020

Duration (D)	Number of Grants	Ratio
$D < 1$ year	132	18%
$1 \leq D < 2$ years	270	36%
$2 \leq D < 3$ years	155	21%
$3 \leq D < 4$ years	143	19%
$4 \leq D < 5$ years	29	4%
$5 \leq D < 6$ years	2	0%
$7 \leq D < 8$ years	2	0%
Info not available	16	2%

FUNDING BODIES AND COLLABORATIONS

KEI grants awarded to research projects which involved an investigator (PI, Co-PI, Co-I) with a UK institutional affiliation during the period 2010 to 2020 received funding from 26 different funding bodies, with the bodies funding the greatest number of grants including Innovate UK (171, 23%), Science and Technology Facilities Council (129, 17%), European Commission (117, 16%), Arts and Humanities Research Council (115, 15%), and Economic and Social Research Council (70, 9%) (see Table 6.1.4 and Figure 6.1.5).

Table 6.1.4. Funding bodies that awarded more than 10 KEI projects (UK and non-UK PI)

No.	Funders	Number of grants	Percentage (n=749)
1	Innovate UK	171	23%
2	Science and Technology Facilities Council	129	17%
3	European Commission	117	16%
4	Arts and Humanities Research Council	115	15%
5	Economic and Social Research Council	69	9%
6	Wellcome Trust	66	9%
7	Engineering and Physical Sciences Research Council	23	3%
8	British Council	12	2%

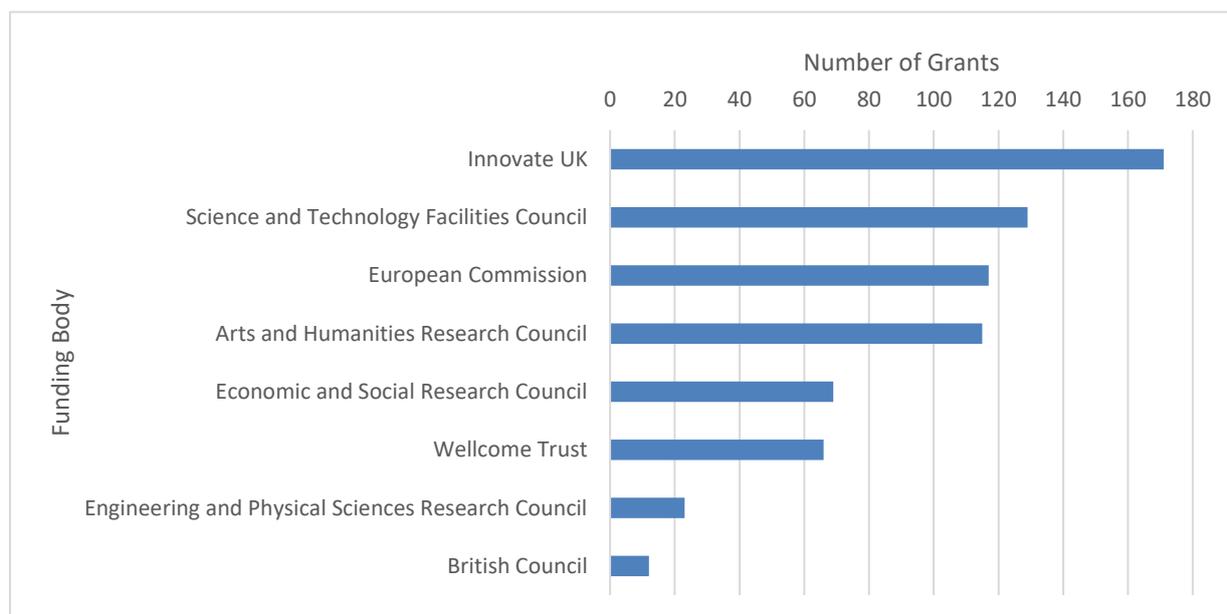


Figure 6.1.5. Number of KEI grants awarded to projects which involved an investigator (PI, Co-PI, Co-I) with a UK institutional affiliation during the period 2010 to 2020 by the funding bodies with more than 10 KEI grants awarded

The total amount of funding awarded for KEI grants involving an investigator (PI, Co-PI, Co-I) with a UK institutional affiliation during the period 2010 to 2020 varied between funding bodies, with the funding bodies awarding the greatest total funding including the European Commission (£258.9m across 117 grants, 73% of the total KEI funding), Innovate UK (£27m across 171 grants, 8% of the funding), AHRC (£15m across 115 grants, 4% of the total funding), and Economic and Social Research Council (4%) (see Table 6.1.5 and Figure 6.1.6).

Table 6.1.5. KEI funding bodies with total funding above £1m (UK and Non-UK PI)

No.	Funders	Total funding size (£)	Percentage (n=353,655,612.2)
1	European Commission	258,868,104	73%
2	Innovate UK	27,115,085	8%
3	Arts and Humanities Research Council	15,069,343	4%
4	Economic and Social Research Council	12,589,654	4%
5	Wellcome Trust	6,464,256	2%
6	Engineering and Physical Sciences Research Council	5,909,512	2%
7	John Templeton Foundation	5,871,528	2%
8	Biotechnology and Biological Sciences Research Council	5,093,897	1%
9	Science and Technology Facilities Council	3,974,509	1%
10	Templeton World Charity Foundation	3,408,730	1%
11	NIHR Evaluation Trials and Studies Coordinating Centre	3,337,254	1%
12	Medical Research Council	2,346,043	1%
13	Innovation and Technology Commission	1,174,741	0%

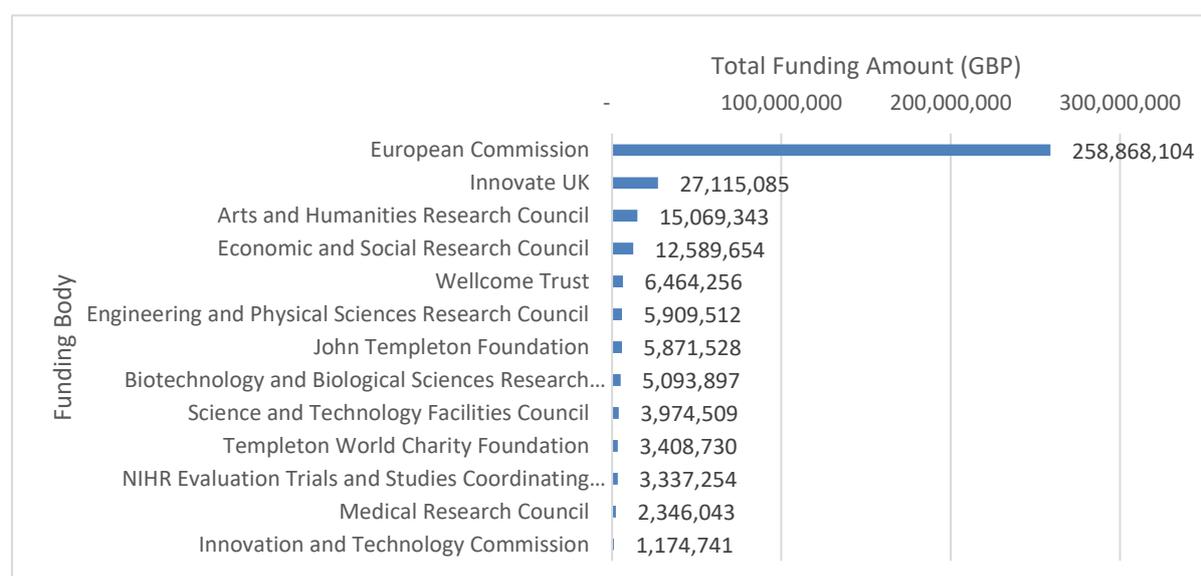


Figure 6.1.6. Total funding awarded to KEI projects that involved an investigator (PI, Co-PI, Co-I) with a UK institutional affiliation during the period 2010 to 2020 (by the funding bodies which awarded more than a total of £1m)

The bodies responsible for funding the highest number of KEI projects with an UK PI are: Innovate UK (171, 26%), Science and Technology Facilities Council (129, 20%), Arts and Humanities Research Council (115, 18%), Economic and Social Research Council (69, 11%), and Wellcome Trust (66, 10%).

In terms of total funding awarded to KEI projects led by UK PIs, the European Commission again is the largest funder, comprising 26% of the total KEI funding with UK PIs. Three other funders with more than one million GBP funding for KEI projects that have UK PIs are Innovate UK (22%), Arts and Humanities Research Council (12%), and Economic and Social Research Council (10%).

Table 6.1.6. Funding bodies that awarded more than 10 KEI projects (UK PI only)

No.	Funders	Number of grants	Percentage (n=648)
1	Innovate UK	171	26%
2	Science and Technology Facilities Council	129	20%
3	Arts and Humanities Research Council	115	18%
4	Economic and Social Research Council	69	11%
5	Wellcome Trust	66	10%
6	Engineering and Physical Sciences Research Council	23	4%
7	European Commission	23	4%
8	British Council	12	2%

Table 6.1.7. KEI funding bodies with total funding above £1m (UK PI only)

No.	Funders	Total funding amount (£)	Percentage (n=125,359,515.2)
1	European Commission	33,140,258	26%
2	Innovate UK	27,115,085	22%
3	Arts and Humanities Research Council	15,069,343	12%
4	Economic and Social Research Council	11,975,151	10%
5	Wellcome Trust	6,464,256	5%
6	Engineering and Physical Sciences Research Council	5,909,512	5%
7	John Templeton Foundation	5,871,528	5%
8	Biotechnology and Biological Sciences Research Council	5,093,897	4%
9	Science and Technology Facilities Council	3,974,509	3%
10	NIHR Evaluation Trials and Studies Coordinating Centre	3,337,254	3%
11	Templeton World Charity Foundation	3,150,687	3%
12	Medical Research Council	2,346,043	2%

For all KEI funding, funders from the UK account for 81% in terms of number of total projects, but only 23% in terms of the total funding size. EU accounts for 73% of the total KEI funding (Table 6.1.8). For KEI projects led by UK PIs, funders based in the UK and EU remain the top funding sources, which constitute 66% and 27% of the total funding respectively (Table 6.1.9).

Table 6.1.8. Countries/region of the funding bodies for KEI funding (UK and non-UK PIs)

Country/Region	Number of Grants	Percentage (n=749)	Total Funding Size (£)	Percentage (n=353,655,612.2)
United Kingdom	610	81%	82,837,781	23%
EU ⁸	121	16%	259,387,141	73%
Bahamas ⁹	7	1%	3,408,730	1%
United States	6	1%	6,326,256	2%
Japan	2	<1%	58,965	<1%
Australia	1	<1%	305,757	<1%
China	1	<1%	1,174,741	<1%
Switzerland	1	<1%	156,242	<1%

Table 6.1.9. Countries/region of the funding bodies for KEI funding (UK PI only)

Country/Region	Number of Grants	Percentage (n=648)	Total Funding Size (£)	Percentage (n=125,359,515.2)
United Kingdom	609	94%	82,223,278	66%
EU	27	4%	33,659,295	27%
Bahamas	6	1%	3,150,687	3%
United States	6	1%	6,326,256	5%

INSTITUTIONS IN RECEIPT OF KEI GRANTS

Among the 749 KEI grants, 734 had information about the institutions. Our pilot analysis showed that projects with non-UK PIs included various collaborator institutions such as schools and SMEs from a range of countries that participated in the projects as partners, but which skewed the results of the analysis. To ensure validity, we only focused the final institutional analysis on UK PI institutions for KEI projects.

12 UK organisations hosted more than ten KEI grants with UK PIs each. The five UK PI institutions that hosted the highest numbers of KEI grants are: University College London (20 grants), University of

⁸ In Tables 6.1.8-6.1.9, 'EU' includes both the European Commission and the European Research Council.

⁹ Note that the Templeton World Charity Foundation was coded as headquartered in the Bahamas and is the funding body for the projects included here and in Table 6.1.9.

Oxford (16), University of Cambridge (16), University of York (16), University of Birmingham (14), and University of Glasgow (14). The institutional shares of KEI funding in the UK demonstrate less geographical concentration than was the case with the distribution of research grants. Among the 12 institutions with more than ten research grants, ten are based in England, two are based in Scotland (table 6.1.10 and Figure 6.1.7).

Table 6.1.10. UK PI institutions with more than ten of KEI grants

No.	UK PI Institutions	Number of KEI Projects	Country
1	University of Oxford	20	England
2	University College London	16	England
2	University of Cambridge	16	England
2	University of York	16	England
5	University of Birmingham	14	England
5	University of Glasgow	14	Scotland
7	University of Bristol	13	England
7	University of Edinburgh	13	Scotland
8	University of Leeds	13	England
10	Gallomanor (United Kingdom) ¹⁰	11	England
10	The Open University	11	England
10	University of Manchester	11	England

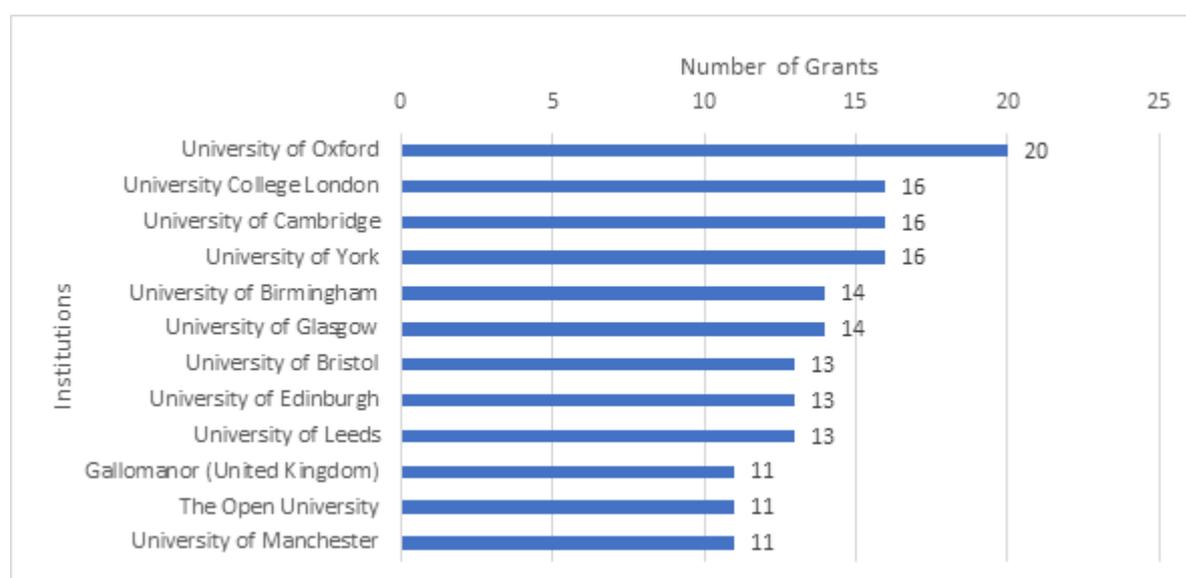


Figure 6.1.7. Number of educational research projects with PI from institutions KEI grants throughout the period of 2010 to 2020 (institutions with more than 10 KEI grants awarded to projects with UK PIs)

¹⁰ This is a commercial organisation focused on student-led online engagement and science communications.

Six UK PI institutions hosted KEI projects totalling more than 5 million funding in GBP over the period. All are based in England and include five universities and one university hospital: University of Bristol, University Hospital Coventry NHS Trust, University of Birmingham, University College London, Open University, and Coventry University (Table 6.1.11).

Table 6.1.11. UK PI institutions with total KEI grant amounts of more than £5m

No.	UK PI Institutions	Total KEI Funding in GBP	Country
1	University of Bristol	10,022,619	England
2	University Hospital Coventry NHS Trust	9,999,261	England
3	University of Birmingham	7,670,737	England
4	University College London	7,612,561	England
5	Open University	6,725,553	England
6	Coventry University	5,274,459	England

198 (26.2%) KEI grants awarded to research projects which involved an investigator (PI, Co-PI, Co-I) with a UK institutional affiliation during the period 2010 to 2020 indicated collaboration between investigators with different institutional affiliations. The most productive institutional collaboration, in terms of number of KEI grants, was between investigators affiliated with University of Nottingham and Norwegian University of Science and Technology (5 grants). Several institutional collaborations (5 collaborations) indicated collaboration on 4 grants. The chord diagram below (Figure 6.1.8) illustrates the collaborations between those institutions with which the greatest number of investigators involved in projects awarded KEI grants were affiliated.

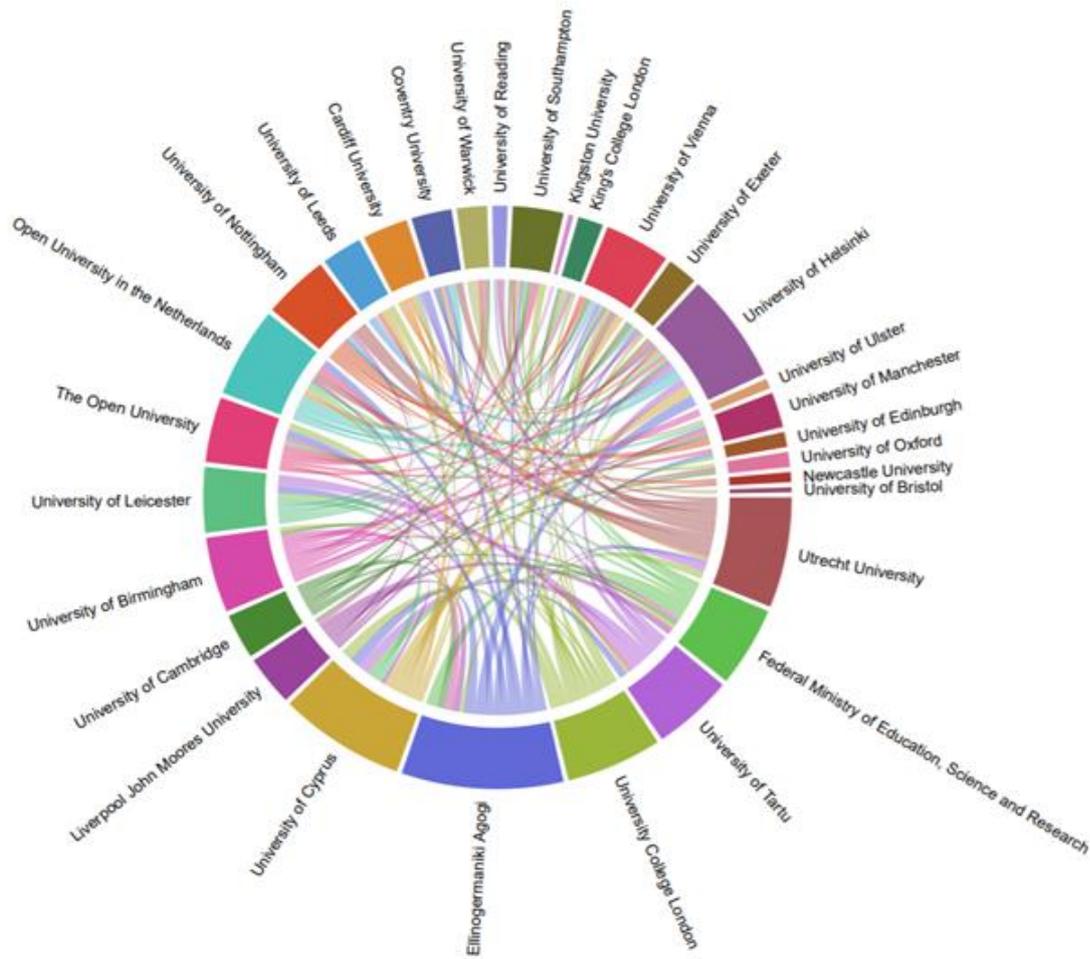


Figure 6.1.8. Chord diagram illustrating the most productive inter-institutional collaborations in terms of educational research projects awarded KEI grants involving an investigator (or investigators) affiliated with a UK institution between the years 2010 and 2020. Sectors and chords weighted by number of collaborations. Only those institutions with which investigators in seven or more projects awarded grants were affiliated are included (30 institutions).

FOCUS OF KEI GRANTS (TOPIC MODELLING)

The KEI grants corpus¹¹ was examined in order to identify a range of probable numbers of latent topics present. HDBSCAN clustering of documents based on their similarity (calculated as cosine distance) as determined by the extent to which documents shared terms, themselves weighted by their relative importance (tf-idf), indicated 25 distinct clusters of documents within the corpus (353 noise points, $R2 = .484$, $BIC = 2863.51$; see Appendix 18 for plot of clustering results). Subsequent evaluation of a range of numbers of topics based on several proposed metrics intended for identification of the natural number of latent topics (Arun, Suresh, Veni Madhavan, & Narasimha Murthy, 2010; Juan, Tian, Jintao, Yongdon, & Sheng, 2009; Deveaud, SanJuan, & Bellot, 2014; Griffiths & Steyvers, 2004; Nikita, 2020) and the mean topic coherence of fitted LDA models indicated several probable numbers of topics (21, 22, 26).

LDA models were generated for suggested numbers of topics, and subsequently evaluated based on topic diagnostic measures (topic coherence, distance from corpus, document prominence, topic exclusivity) and inspection of top-loading terms and documents. Through this process, 21 topics was determined to be the optimal number of topics for modelling of the corpus.

The final, 21 topic model generated clusters of documents which ranged in size from 14 documents (“Language Education”) to 89 documents (“Learning Analytics and Adaptive Learning Systems”; see Figure 6.1.9). Here, it is worth noting that documents were deemed to address a topic, and were consequently assigned to that topic, based on the topic identified as most probable or prominent within the document – this is not to say that documents solely addressed this topic. Indeed, it is an accepted assertion of topic modelling that documents, in fact, address a mixture of topics simultaneously to varying extents. Therefore, whilst some topics may be quite large in terms of the number of documents in which that topic appeared as the most probable or prominent topic addressed, it may be that the prevalence of that same topic throughout the corpus is limited, appearing relatively infrequently or to negligible extents within the mixture of topics addressed by other documents (examples of such topics include the “Engaging Young People Through Art, Music, Media, and Performances” topic). Conversely, some topics may be, on average, relatively prevalent throughout the corpus, frequently appearing to some extent within the mixture of topics addressed by documents, but appear relatively seldomly as the dominant or primary topic addressed (examples of such topics include the “Science Engagement – Secondary Schools” topics). See Appendix 19 for the relative prevalence of topics throughout the corpus – that is, the average extent to which corpus documents addressed a given topic.

The model failed to allocate 15 documents to a single topic, with these documents demonstrating equal probability of addressing two or more topics (or, in alternate terms, documents concerned two or more topics to an equal extent). Topic allocation of unassigned documents was investigated through k-nearest neighbours (k-NN) clustering (or classification) of documents - based on topic probability amongst documents, represent in vector space through dimensionality reduction (t-SNE) of the model’s document-topics matrix - intended to allocate documents to topics based on the topic most prominent amongst neighbouring documents (that is, documents with the most similar topic distributions). However, inspection of resulting topic allocations were found to be of varying accuracy – that is, whilst some documents appeared to have been assigned to an appropriate topic, others were erroneously allocated to non-relevant topics – and it was therefore decided that documents which the initial LDA model failed to allocate would be considered “noise”. As such, these documents are excluded from analysis involving allocation of

¹¹ Note that the analysis includes 6 grants that were borderline research grants/KEI, i.e. a total of 755 documents.

documents to a topic (that is, the primary topic addressed; e.g. Figure 6.1.9), but are included in analysis concerning relative prevalence of topics throughout the corpus as a whole.

Generated topics were labelled following evaluation of topic content, based on the twenty terms with the greatest probability of occurring in each topic and the thirty (or, in some instance, more) documents with the greatest likelihood of addressing each topic (See Appendix 20 for topic labels, as well as the ten terms most associated with each topic). As previously noted, topic labels therefore reflect a subjective judgement of topic content and represent a consensus “best fit” label intended to broadly communicate the thematic content of terms and documents associated with topics.

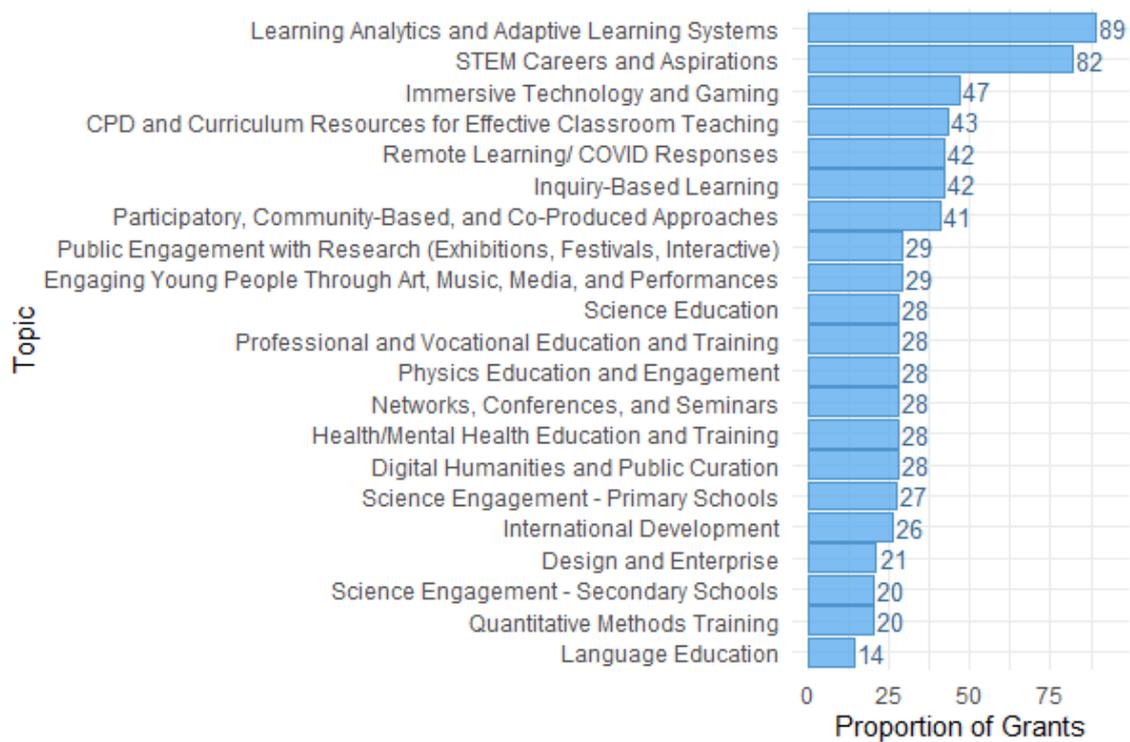


Figure 6.1.9. Number of KEl grants allocated to each topic (i.e. number of documents primarily addressing a given topic)

The similarity between topics derived through the LDA model was investigated through hierarchical clustering of the Hellinger distance (the similarity between two probability distributions) – here, similarity describes the degree to which topics co- occur within documents. Figure 6.1.10 presents a dendrogram illustrating the results of this hierarchical clustering of topics. The Hellinger distance scale here indicates similarity between topics, with smaller distances between topics (i.e. at the point of confluence between the respective branches of topics) indicative of greater similarity in terms of distribution throughout documents in comparison with those topics which meet at a greater distance. Consequently, topics clustered together indicate topics which are often combined or co-occur within research. Thus, this hierarchical clustering illustrates “different ‘islands’ in the field of research” on education (Daenekindt & Huisman, 2020, p. 581). A number of relatively distinct clusters of topics, or ‘islands’, were subsequently identified.

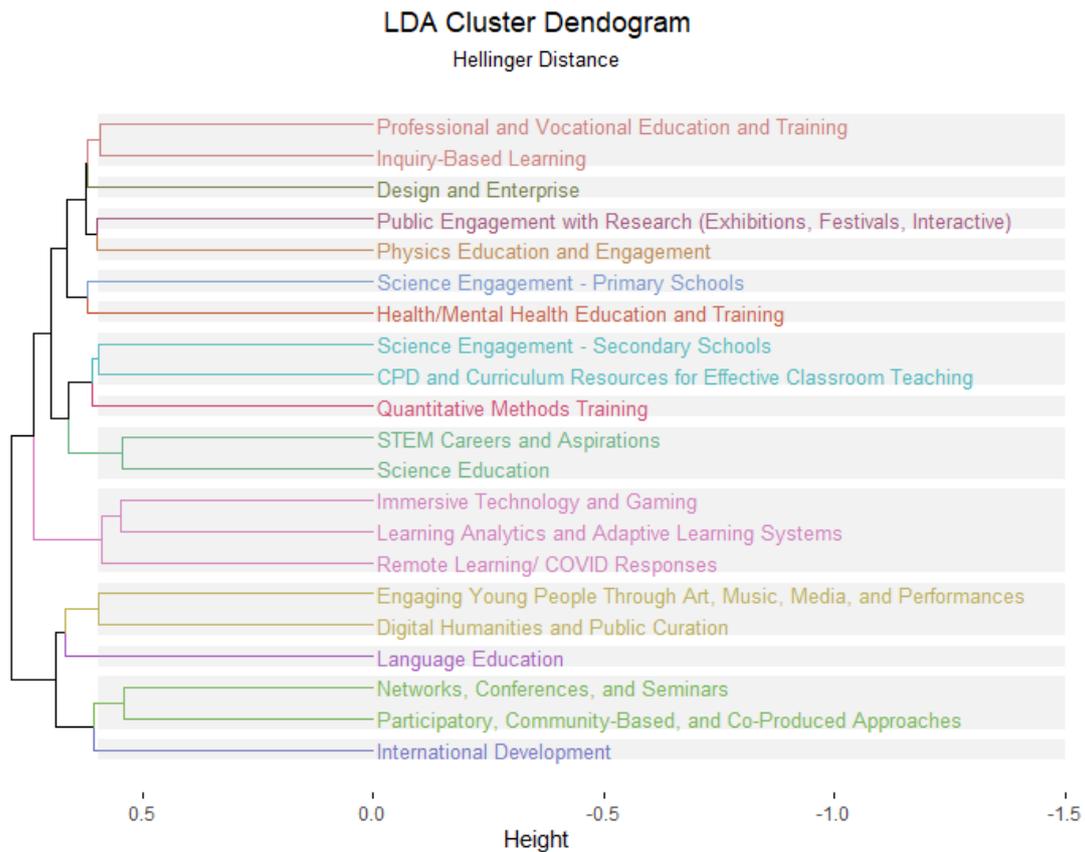


Figure 6.1.10. Dendrogram illustrating hierarchical clustering (using Ward's method) of topics based on Hellinger distance, with ten clusters indicated.

The relative prevalence of topics over time was examined based on the proportion of published research outputs each year allocated to topics (that is, primarily addressing a given topic)/ based on the extent to which published research outputs, as a whole, addressed each topic on an annual basis (that is, the average extent to which research outputs in a given year addressed a given topic). Relative prevalence here refers to the mean probability, across all published research outputs in a given year, of documents concerning a given topic, with greater relative prevalence indicative of a topic appearing to a greater extent amongst documents. Figure 6.1.11 illustrates changes in the relative prevalence of topics throughout published research outputs over the course of the period of interest (2010 to 2020). To ensure clarity of presentation, topics are presented across two separate plots – the grouping of topics into these plots is arbitrary.

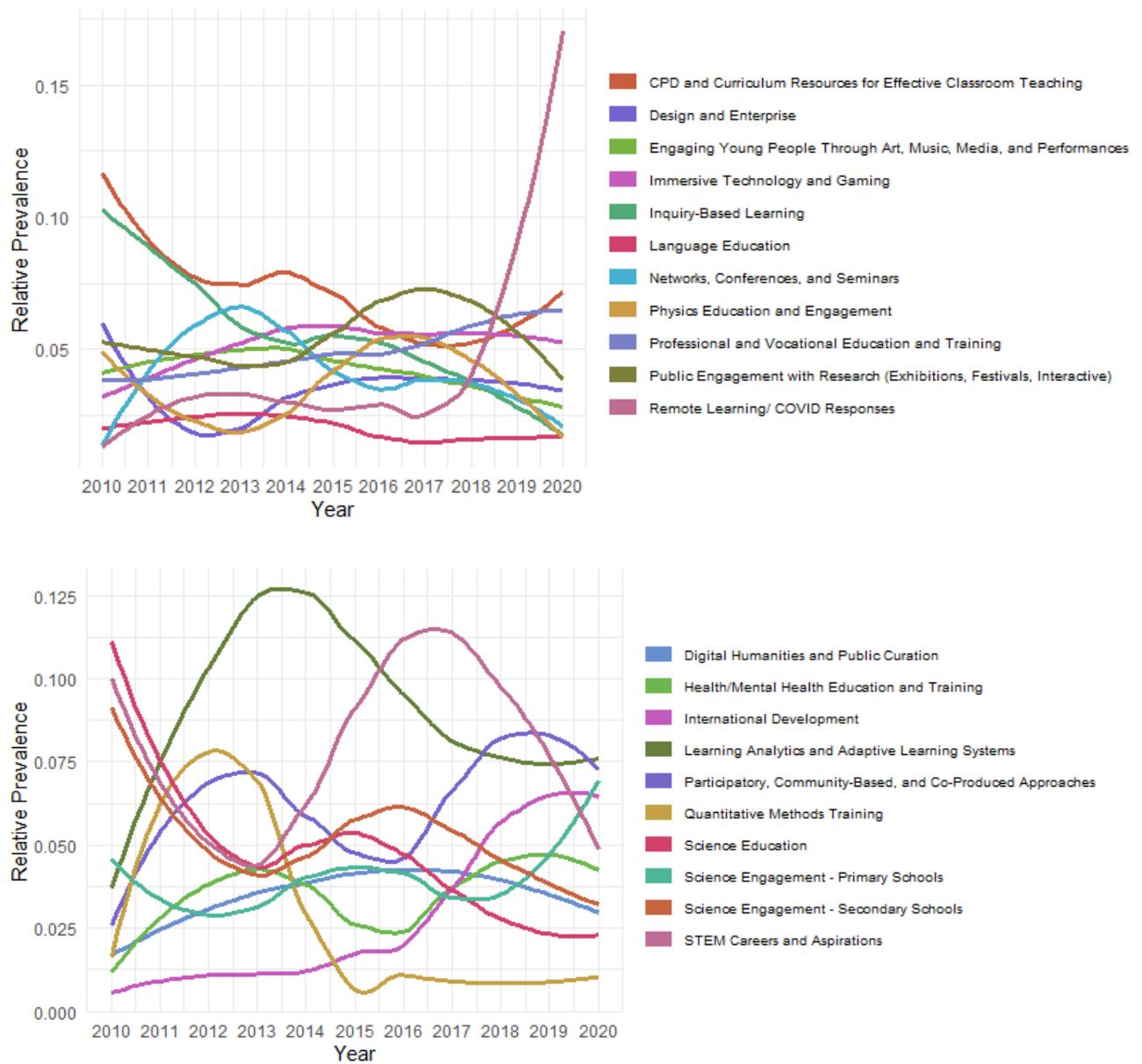


Figure 6.1.11. Change in the relative prevalence of identified topics throughout the period of interest, 2010 to 2020. Trajectories are estimated using Locally Estimated Scatterplot Smoothing (LOESS; $\alpha = 0.7$)

KEI FUNDING AMOUNT FOR DIFFERENT TOPICS

The total funding amount awarded by funding bodies to KEI grants differed between identified topics (as generated by topic modelling, with documents allocated to the topic most prominent or probable therein), with funding bodies frequently prioritising funding for research grants addressing specific research topics (see Table 6.1.12). Notwithstanding this apparent tendency to prioritise certain research areas (here identified as topics), it is evident that funding bodies (particularly larger funding bodies) awarded funding to research grants addressing a diverse array of research areas to varying extents. For example, of the 21 identified topics addressed throughout research grants, the European Commission funded grants found to primarily address 17 topics, AHRC funded grants addressing 14 of the identified topics, ESRC funded grants addressing 13 topics, and the Innovate UK funded grants addressing 12 topics (see Figure 6.1.12).

Funding Body	Research Grant Topic	Funding Amount (GBP)
European Commission	Inquiry-Based Learning	102,288,794
Innovate UK	Professional and Vocational Education and Training	11,374,227
John Templeton Foundation	Networks, Conferences, and Seminars	7,641,932
AHRC	International Development	7,151,819
ESRC	Participatory, Community-Based, and Co-Produced Approaches	5,999,467
BBSRC	Professional and Vocational Education and Training	4,045,618
NIHR Evaluation Trials and Studies Coordinating Centre	Health/Mental Health Education and Training	3,337,254
EPSRC	Public Engagement with Research (Exhibitions, Festivals, Interactive)	2,235,449
MRC	Health/Mental Health Education and Training	1,949,677
STFC	Physics Education and Engagement	1,707,120
Wellcome Trust	Science Education	1,701,680
Templeton World Charity Foundation	CPD and Curriculum Resources for Effective Classroom Teaching	1,377,923
Innovation and Technology Commission	Learning Analytics and Adaptive Learning Systems	1,174,741
NERC	Science Engagement - Primary Schools	470,300
National Institute of Food and Agriculture	Professional and Vocational Education and Training	380,545
Australian Research Council	CPD and Curriculum Resources for Effective Classroom Teaching	305,757
Versus Arthritis	Learning Analytics and Adaptive Learning Systems	156,316

Swiss National Science Foundation	Networks, Conferences, and Seminars	156,242
European Research Council	Professional and Vocational Education and Training	137,854

Table 6.1.12. KEI grant topics to which funding bodies awarded the greatest amount of total funding during the period 2010 to 2020. Note, only those funding bodies which awarded total funding of more than £100k to a single topic are displayed.

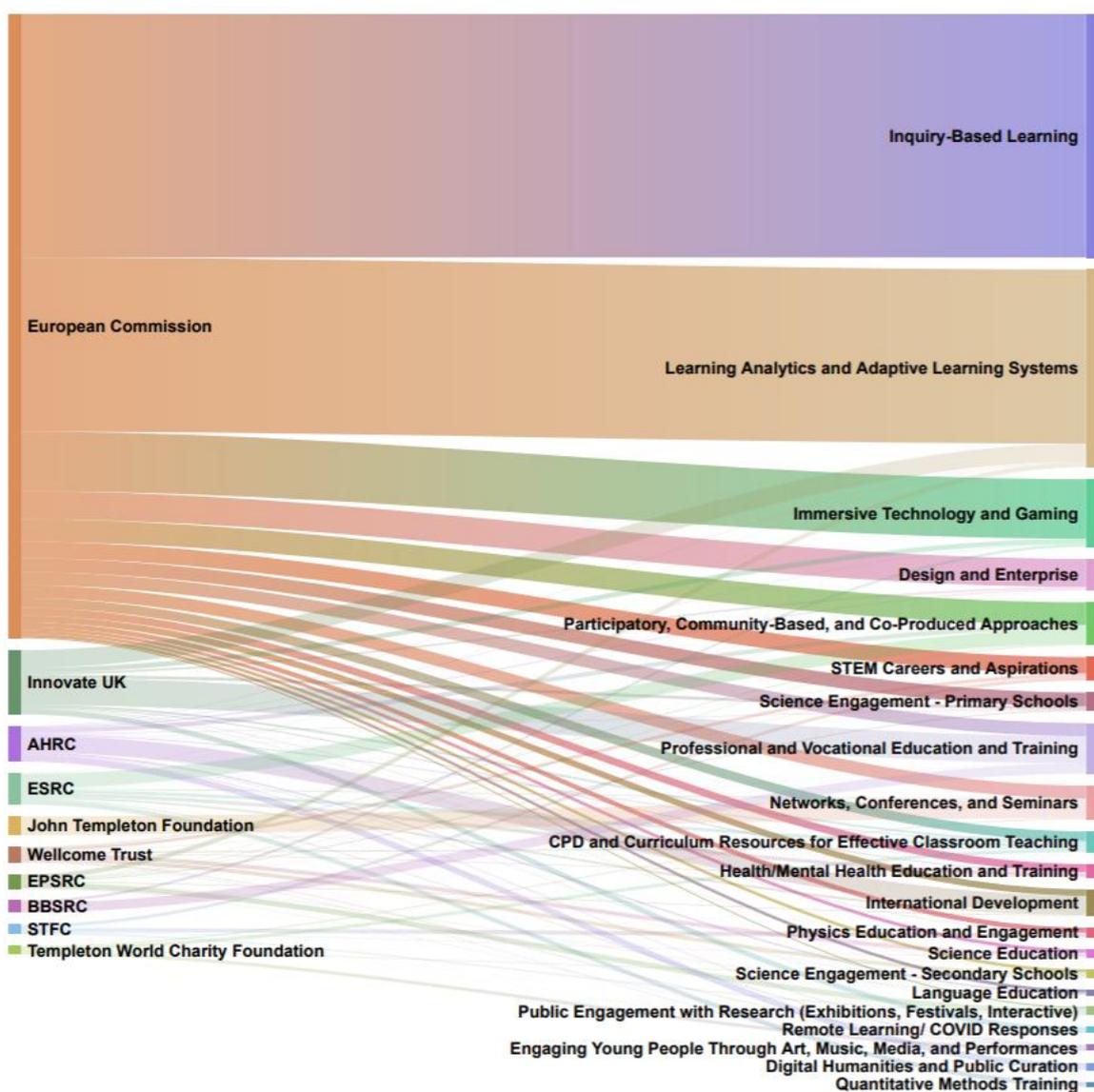


Figure 6.1.12. Total funding amount awarded by funding bodies KEI grants by topic addressed. Nodes and links weighted by funding amount. Note, only the ten funding bodies which awarded the greatest amount of funding over the period of interest (see Figure) are included.

The total funding amount awarded for KEI grants varied between topics (as generated by topic modelling, with documents allocated to the topic most prominent or probable therein), ranging from

£102m total funding awarded across grants addressing the topic of “Inquiry-Based Learning” (42 grants) to £2m awarded across grants addressing the topic of “Quantitative Methods Training” (20 grants). Apart from “Inquiry-Based Learning”, the topics awarded the greatest amount of funding across research grants included the topics of “Learning Analytics and Adaptive Learning Systems” (£84.5m across 89 grants), “Immersive Technology and Gaming” (£28.6m across 47 grants), “Professional and Vocational Education and Training” (£21.8m across 28 grants), “Participatory, Community-Based and Co-Produced Approaches” (£18.2m across 41 grants), and “Networks, Conferences, and Seminars” (£14.4m across 28 grants) (Figure 6.1.13).

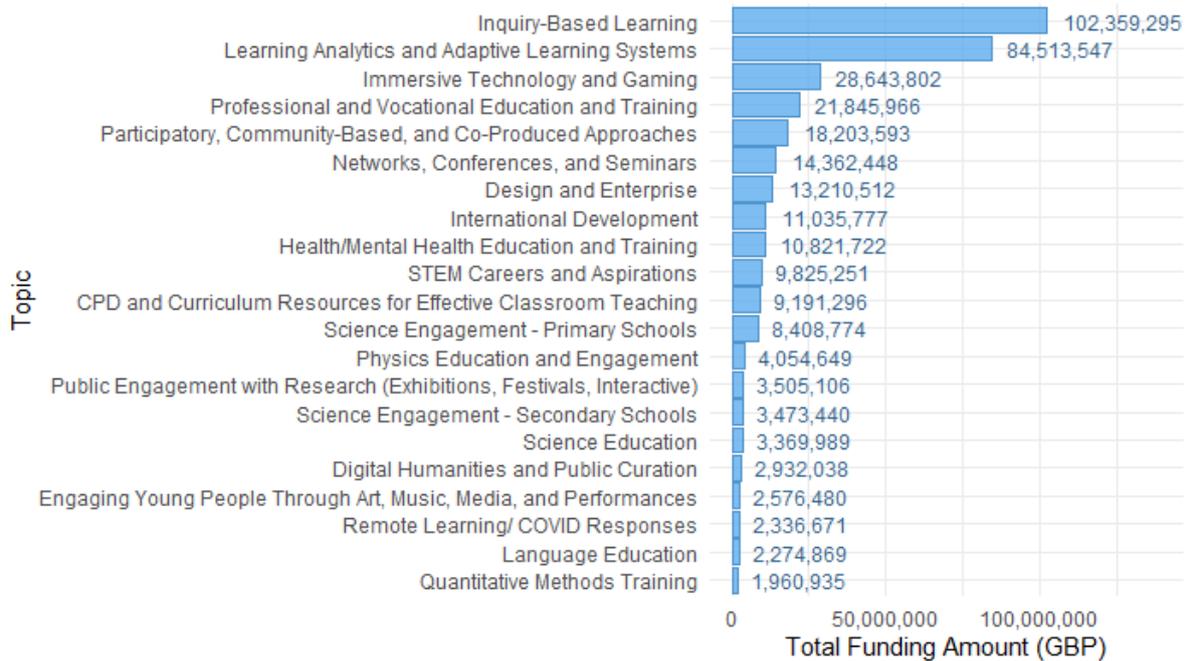


Figure 6.1.13. Total amount of funding awarded for KEI grants addressing each topic (based on allocation of documents to the most prominent topic therein) between 2010 and 2020.

PREVALENCE OF METHODOLOGICAL TERMS IN KEI GRANTS

Planned systematic searches of document text content (here, title and abstract) for methodological terms identified at least one such methodological term in 46.2% (349) of KEI grants and two or more different methodological terms in 16.3% (123) of grants. Methodological terms ranged in prevalence from variants of “Evaluation” mentioned in 152 (20.1%) outputs, to variants of “Text Analysis”, “Design-Based”, “Network Analysis”, “Quasi-Experiment(al)”, and “Research Synthesis”, each mentioned in 1 (0.1%) grant (see Figure 6.1.14). Note, however, that several methods – narrative, conversation analysis, policy analysis, grounded theory, discourse analysis, reflective practice, and Delphi - were not identified as being mentioned in any grants. In addition to evaluation, the most commonly mentioned methods included experiment (10.5%), intervention (7%), interview (5%), survey (4.4%), and case study (3.8%).

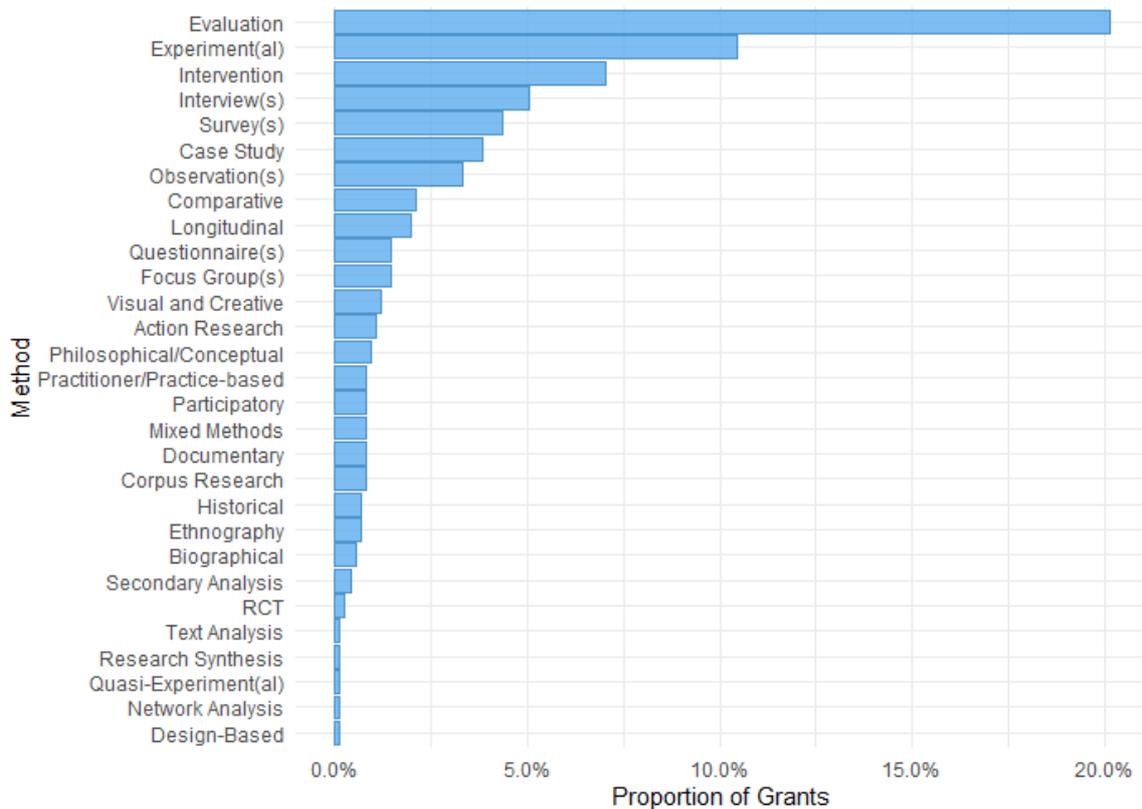


Figure 6.1.14. Prevalence of methodological terms throughout KEI grants (measured as the proportion of documents using the term or an associated variant)

PREVALENCE OF DISCIPLINARY TERMS IN KEI GRANTS

Planned systematic searches of document text content (here, title and abstract) for disciplinary terms identified at least one such disciplinary term in 53.7% (406) of KEI grants and two or more different disciplinary terms in 18.3% (138) of grants. Disciplinary terms ranged in prevalence from variants of “Business and Management”, mentioned in 113 (15%) grants, to variants of “International Development” and “Anthropology”, each mentioned in 4 (0.5%) grant (note, “Organisational Theory” was not mentioned in any grant; see Figure 6.1.15). In addition to business and management, the most commonly mentioned disciplines included history (9.5% of grants), physical education (9%), interdisciplinary (8.3%), engineering (8%), mathematics (6.1%), psychology (3.5%), multidisciplinary (3.1%), chemistry education (2.8%), statistics (2.7%), geography (2.5%), sociology (2.4%), healthcare education (2.3%), computer science (2.2%), linguistics (1.8%), legal education (1.7%), economics (1.5%), philosophy (1.4%), international development (0.5%), and anthropology (0.5%).

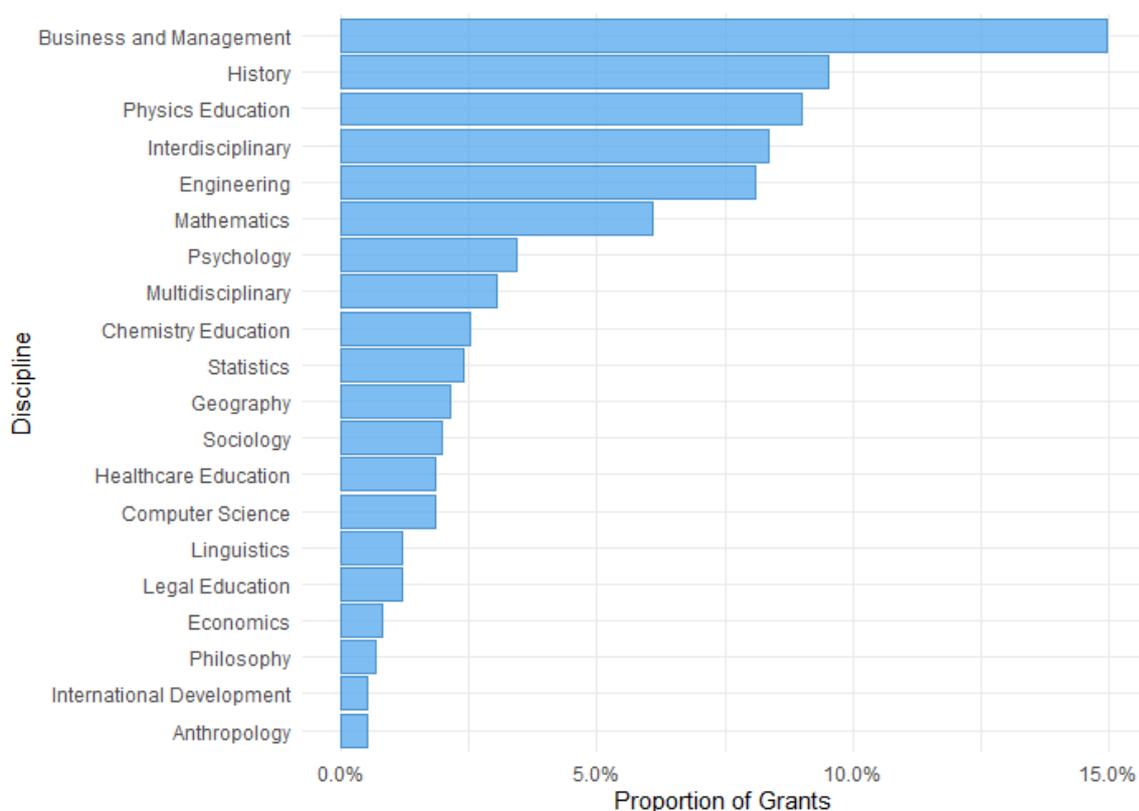


Figure 6.1.15. Prevalence of disciplinary terms throughout KEI grants (measured as the proportion of documents using the term or an associated variant)

6.2. OUTCOMES OF UKRI-FUNDED KEI GRANTS

Of the identified KEI grants awarded to research projects which involved an investigator (PI, Co-PI, Co-I) with a UK institutional affiliation during the period 2010 to 2020, 527 (69.8%) grants were UKRI funded. The outcomes associated with these UKRI-funded grants, as documented in the UKRI's Gateway to Research database, are further explored.

ENGAGEMENT ACTIVITIES

2,074 engagement activities were reported across 204 (38.7%) UKRI-funded KEI grants, with the majority of these grants (173 grants, 84.8%) reporting participation in multiple engagement activities. The number of engagement activities reported by research grants differed between identified topics (as generated by topic modelling, with documents allocated to the topic most prominent or probable therein), ranging from 228 total engagement activities reported across grants which addressed the topic of “Participatory, Community-Based, and Co-Produced Approaches” (18 grants) to 1 engagement activity reported across grants addressing the topic of “Remote Learning/ COVID Responses” (1 grant; see Figure 6.2.1) – note, however, that UKRI-funded grants addressing the topic of “Inquiry-Based Learning” (of which there was one) reported no engagement activities. In addition to “Participatory, Community-Based, and Co-Produced Approaches”, topics with the greatest number of total engagement activities reported across grants included the topics of “STEM Careers and Aspirations” (223 activities across 31 grants), “Digital Humanities and Public Curation” (205 activities, 21 grants), “Health/Mental Health Education and Training” (173 activities, 10 grants), and “Physics Education and Engagement” (171 activities, 12 grants).

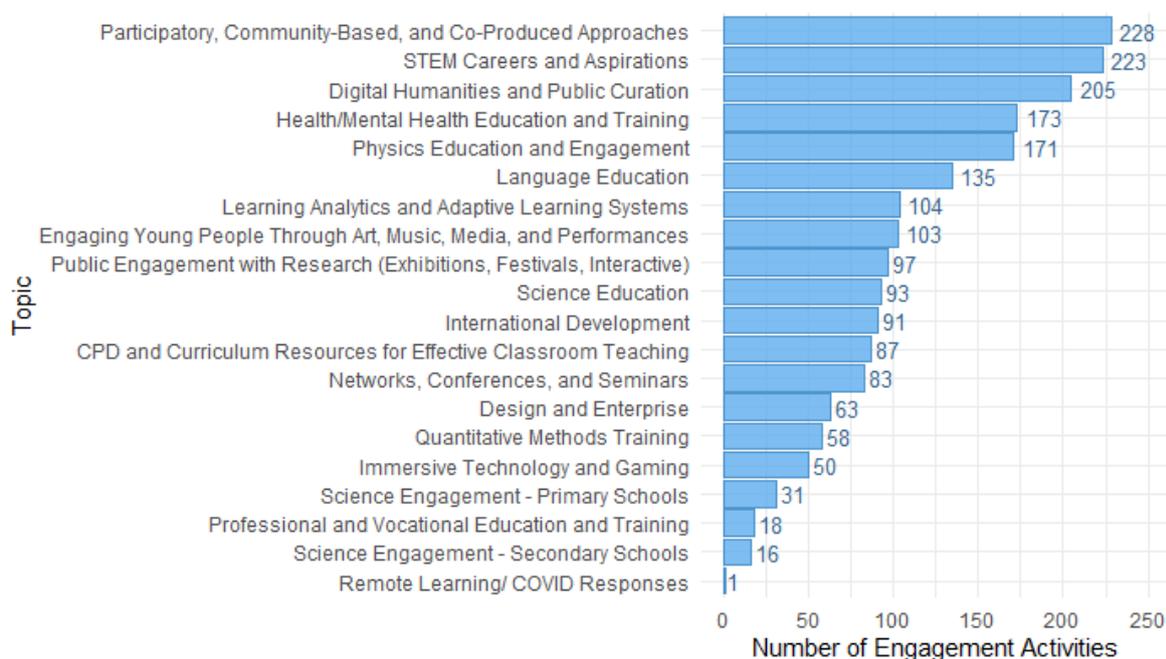


Figure 6.2.1. Total number of engagement activities reported for UKRI-funded KEI grants addressing each topic (based on allocation of documents to the most prominent topic therein) between 2010 and 2020. Note, topic of “Inquiry-Based Learning” not shown due to no relevant engagement activities reported.

The most commonly reported engagement activities amongst grants included “Participation in an activity, workshop or similar” (160 grants, 30.4%; 1,013 activities of this type in total), “A talk or

presentation” (119 grants, 22.6%; 683 total activities), and “Formal working group, expert panel or dialogue” (55 grants, 10.4%; 105 total activities; see Figure 6.2.2).

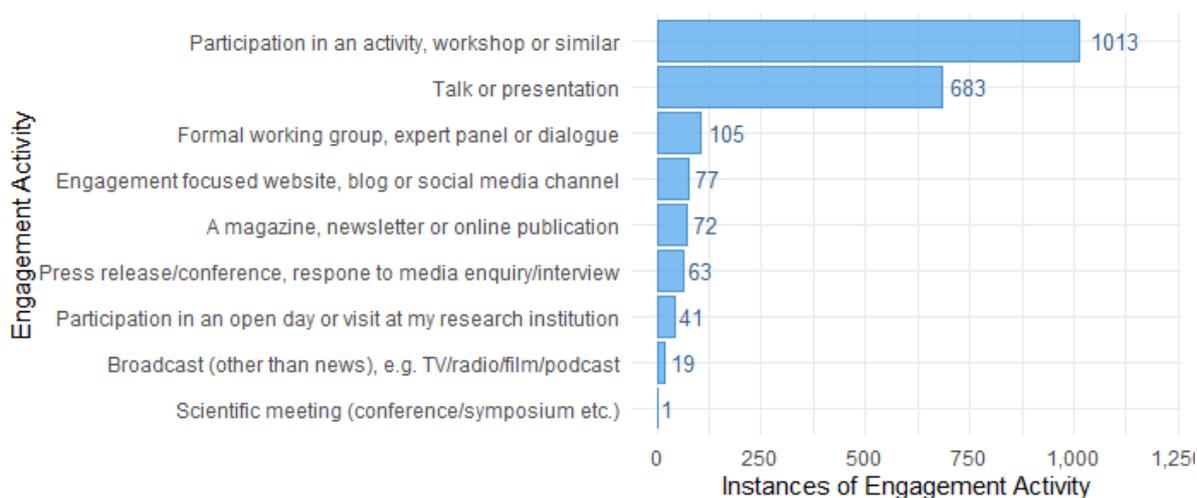


Figure 6.2.2. Total number of instances of engagement activities reported across UKRI-funded KEI grants involving investigators (PI, Co-PI, Co-I) from UK institutions throughout the period 2010-2020

The reported geographical reach of engagement activities undertaken by educational research projects awarded UKRI-funded research grants was most commonly “International” (676 activities, 32.6%), followed by “National” (487, 23.5%), “Regional” (478, 23%), and “Local” (412, 19.9%; see Figure 6.2.3).

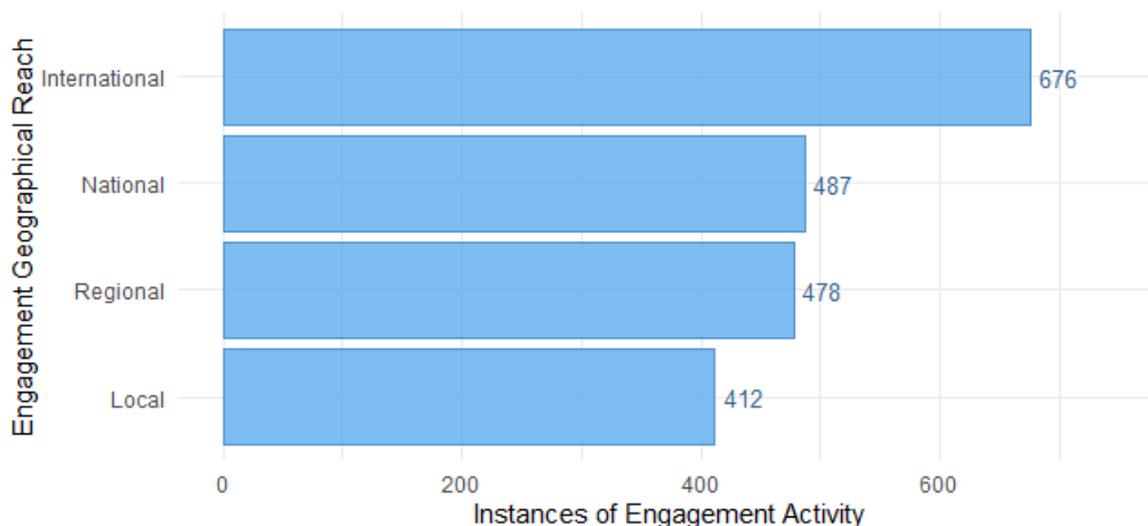


Figure 6.2.3. Total number of instances of engagement activities with a given geographical reach across UKRI-funded KEI grants involving investigators (PI, Co-PI, Co-I) from UK institutions throughout the period 2010-2020

For all identified topics amongst KEI grants - with the exception of those addressing the topic of “Remote Learning/ COVID Responses” (1 grant) - the most commonly reported engagement activity was, invariable, either “Participation in activity, workshop, or similar” (e.g. 154 instances amongst

grants concerning “STEM Careers and Aspirations”) or “A talk or presentation” (e.g. 72 instances amongst grants addressing “Health/Mental Health Education and Training”; see Figure 6.2.4). However, despite these general trends there were instances of grants addressing certain topics reporting disproportionately high instances of other engagement activities (relative to other topics), such as instances of “Engagement focused website, blog or social media channel” reported by grants concerning “Digital Humanities and Public Curation” (15 activities) or “Participatory, Community-Based, and Co-Produced Approaches” (14 activities), instances of “A formal working group, expert panel or dialogue” reported by grants concerning “Participatory, Community-Based, and Co-Produced Approaches” (25 activities) or “Health/Mental Health Education and Training” (19 activities), and instances of “A press release, press conference or response to a media enquiry/interview” reported by grants concerning “Health/Mental Health Education and Training” (14 activities).

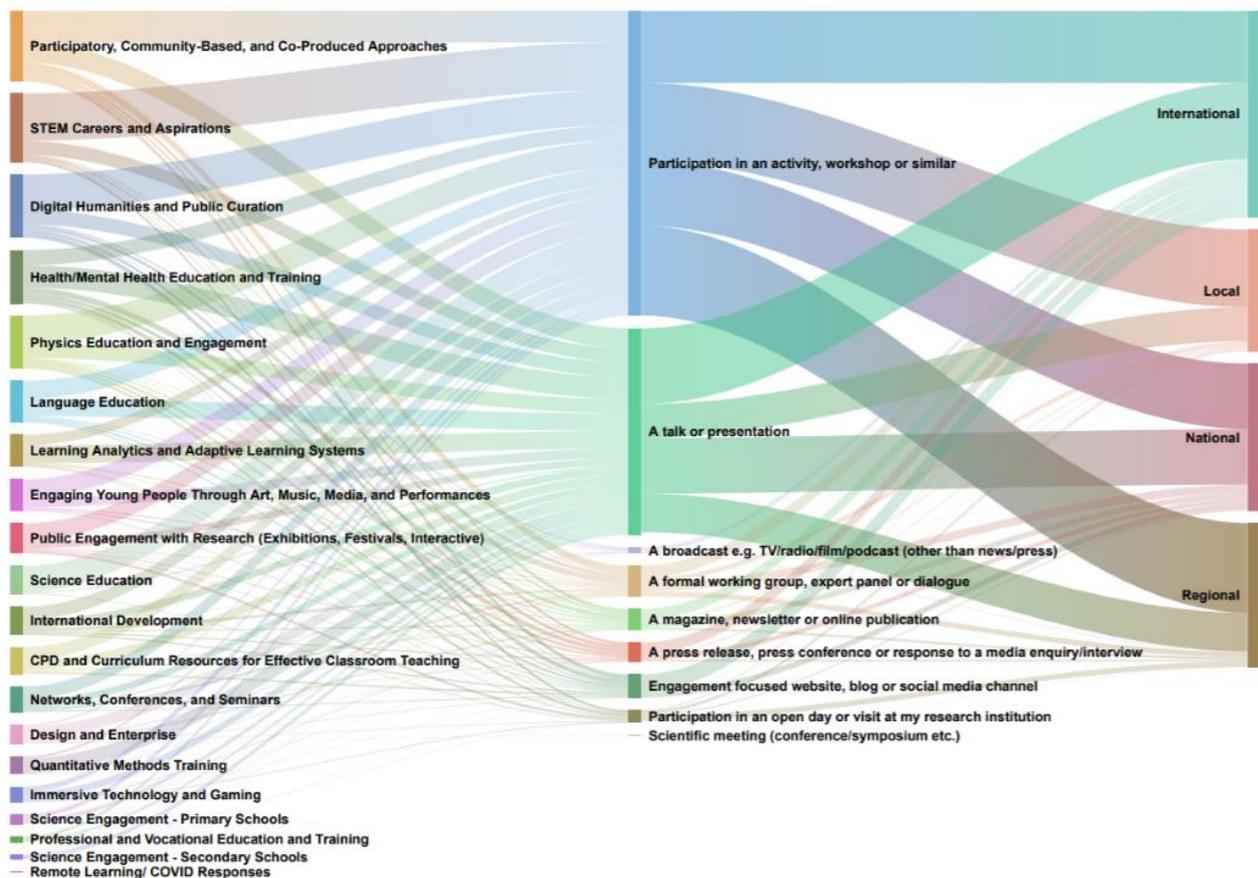


Figure 6.2.4. Total number of engagement activities, and the geographical reach of activities, reported for UKRI-funded KEI grants by topic addressed. Nodes and links weighted by number of engagement activities (not number of grants)

IMPACT SECTORS

159 (30.2%) educational research projects awarded a UKRI-funded KEI grant detailed impact by way of an impact summary, with one of these grants (0.6%) providing two impact summaries. The instances of impact – here calculated as the number of domains or sectors a project reportedly impacted, with impact summaries frequently indicating impact across multiple sectors – reported by KEI grants differed between identified topics (as generated by topic modelling, with documents

allocated to the topic most prominent or probable therein), ranging from 65 total instances of impact reported across grants which addressed the topic of “Participatory, Community-Based, and Co-Produced Approaches” (18 grants) to 1 total instances of impact reported across grants addressing the topic of “Science Engagement – Secondary Schools” (1 grant; see Figure 6.2.5) – note, however, that UKRI-funded grants addressing the topics of “Inquiry-Based Learning” (of which there was one) and “Science Education” (of which there were seven) reported no instances of impact (i.e. failed to report an impact summary). In addition to “Participatory, Community-Based, and Co-Produced Approaches”, topics with the greatest number of total instances of impact reported across grants included the topics of “Digital Humanities and Public Curation” (42 instances across 15 grants), “International Development” (32 instances, 11 grants), “Networks, Conferences, and Seminars” (27 instances, 15 grants), and “Immersive Technology and Gaming” (27 instances, 9 grants).

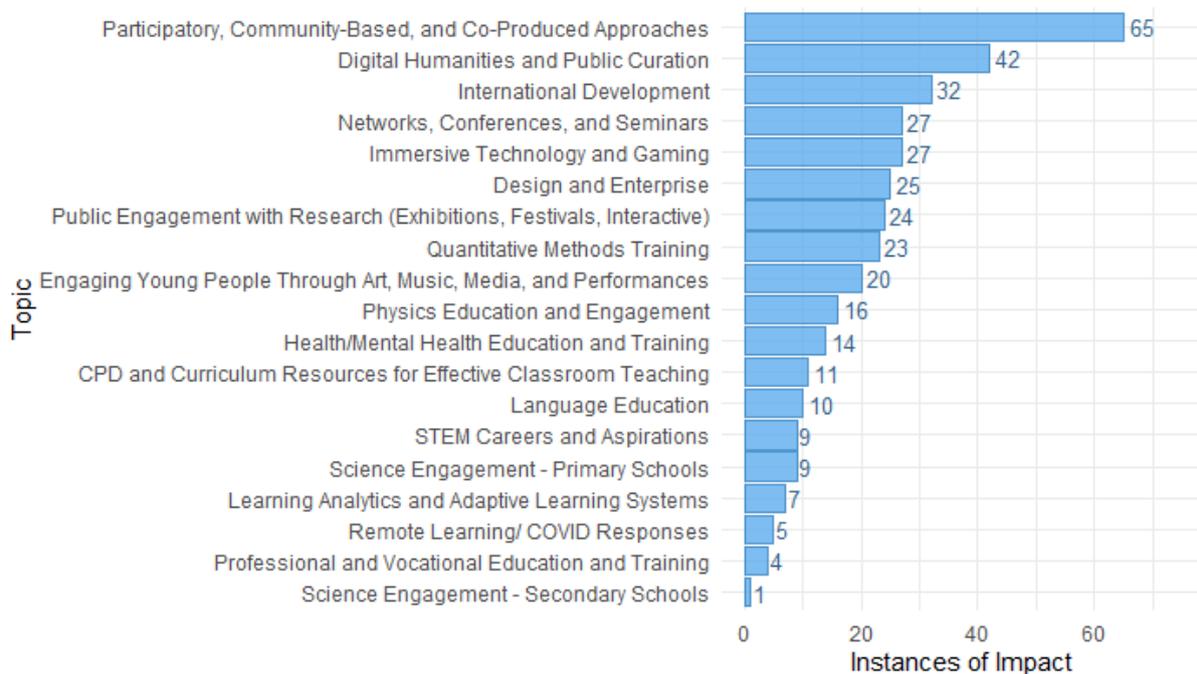


Figure 6.2.5. Total number of impacts (or instances of impact) reported for UKRI-funded KEI grants addressing each topic (based on allocation of documents to the most prominent topic therein) between 2010 and 2020. Note, topics of “Science Education” and “Inquiry-Based Learning” not shown due to no relevant engagement activities reported

The most commonly reported domain (or sector) impacted amongst grants included “Education” (138 instances across 137 grants, 25.9%), “Heritage, Museums and Collections” (56 grants, 10.6%), “Culture” (56 grants, 10.6%), “Communities and Social Services/Policy” (25 grants, 4.7%), and “Creative Economy” (22 grants, 4.2%; see Figure 6.2.6).

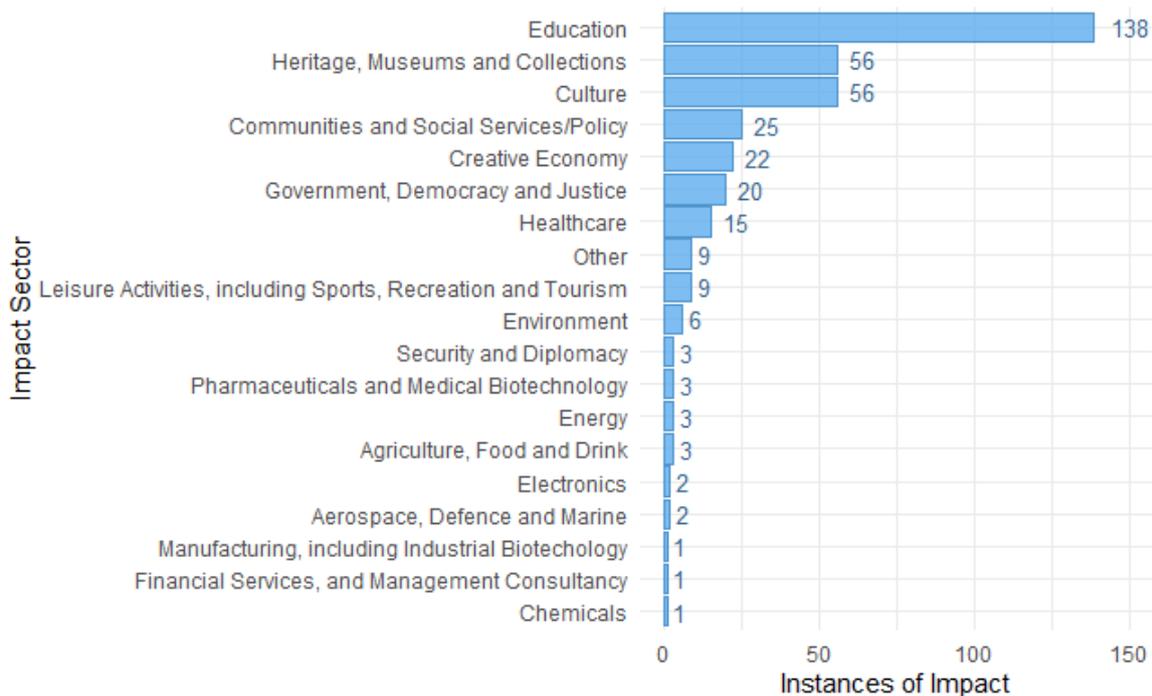


Figure 6.2.6. Total number of instances of impact in given domains reported across UKRI-funded KEI grants involving investigators (PI, Co-PI, Co-I) from UK institutions throughout the period 2010-2020

The reported type of impact associated with educational research projects awarded UKRI-funded research grants was most commonly “Societal” (121 grants, 76.1%), followed by “Cultural” (91, 57.2%), “Policy & public services” (54, 34%), and “Economic” (26, 16.4%; see Figure 6.2.7).

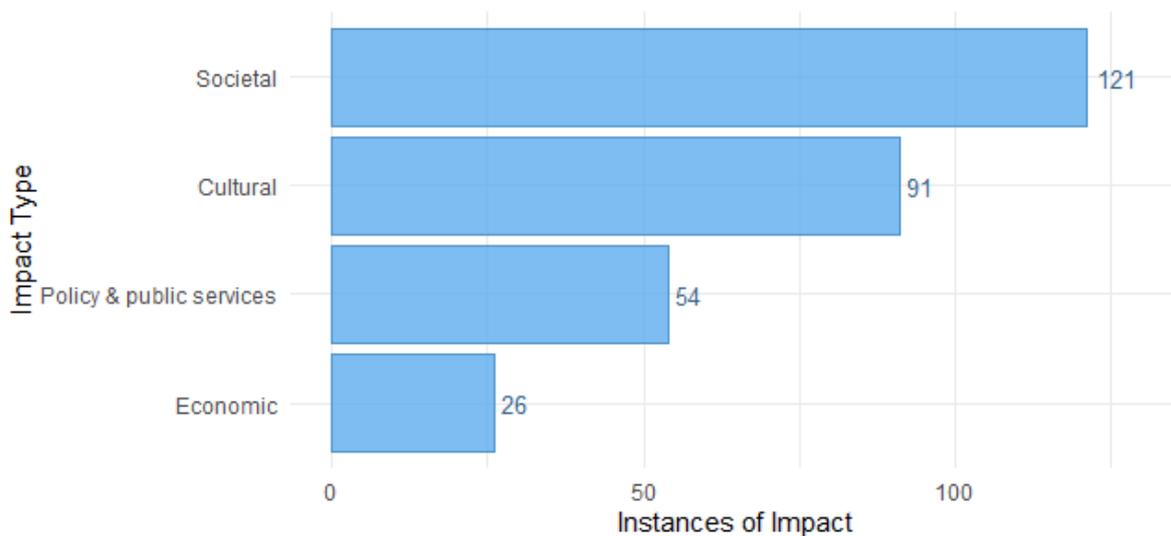


Figure 6.2.7. Total number of instances of a given type of impact across UKRI-funded other KEI grants involving investigators (PI, Co-PI, Co-I) from UK institutions throughout the period 2010-2020

For all identified topics amongst KEI grants the most commonly reported sector (or domain) impacted was “Education” (e.g. 14 instances amongst grants addressing “Participatory, Community-Based, and Co-Produced Approaches”), with the exception of the topic of “Digital Humanities and Public Curation” for which the most commonly reported sectors impacted were “Culture” and “Heritage, Museums and Collections”. Reports of impacts in sectors (or domains) beyond education were generally sparse, with topics seldom demonstrating more than 6 instances of impact in any other sector, with some exceptions related to topics of “Participatory, Community-Based, and Co-Produced Approaches” – which demonstrated 11 instances of impact in the sectors of “Culture” and “Heritage, Museums and Collections”, 8 instances of impact in the sector of “Communities and Social Services/Policy”, and 7 instances of impact in the sector of “Creative Economy” – and “International Development” – which demonstrated 7 instances of impact in the sectors of “Heritage, Museums and Collections” and “Culture” (Figure 6.2.8).

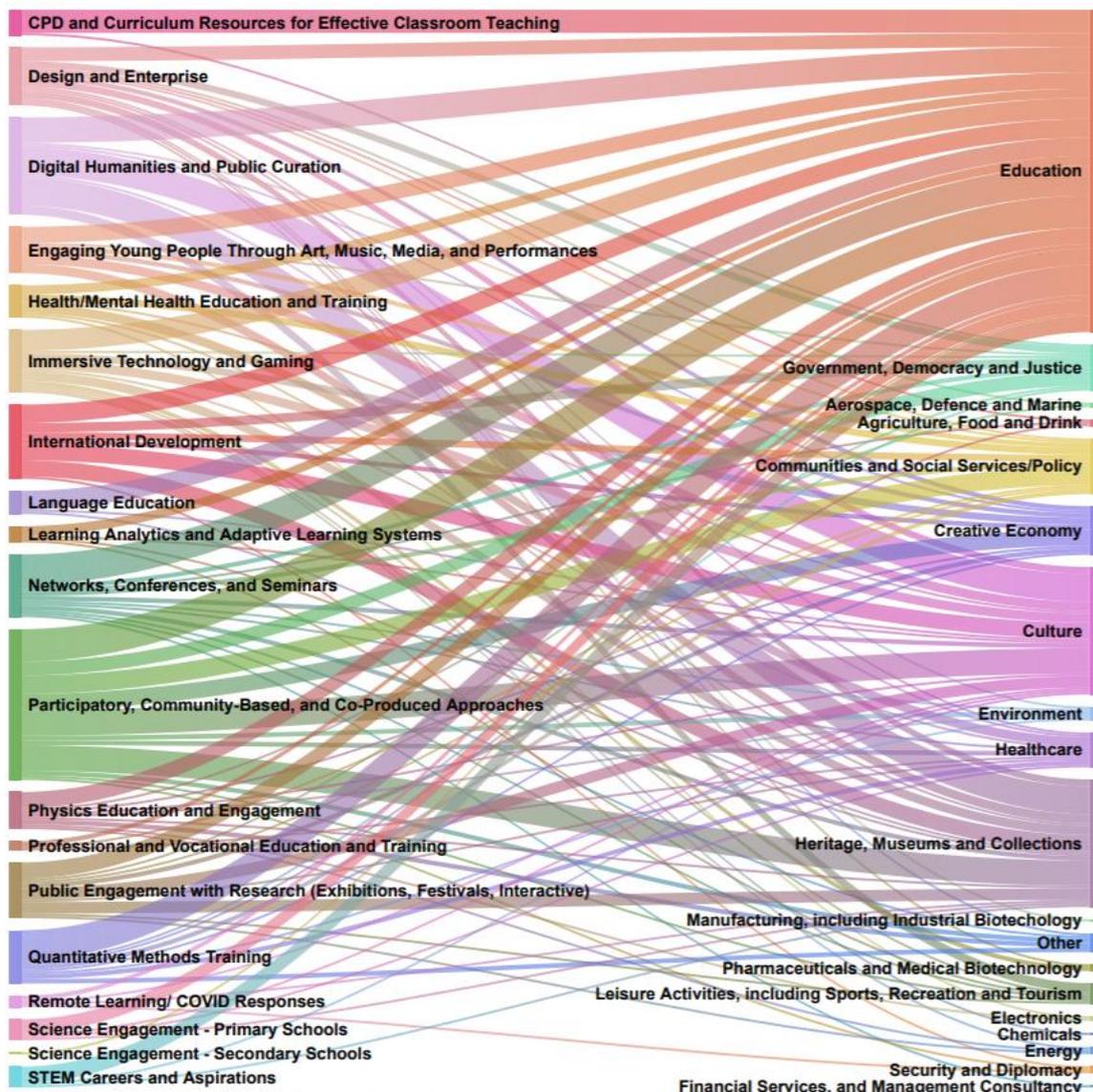


Figure 6.2.8. Instances of impact across different sectors reported for UKRI-funded KEI grants by topic addressed. Nodes and links weighted by instances of impact

POLICY INFLUENCE

128 instances of policy influence were reported across 48 (9.1%) UKRI-funded KEI grants in the dataset, with 22 (45.8%) of these grants reporting multiple instances of policy influence. This particular segment of reporting seems to have been underused in the grant reports represented in our dataset. A potential explanation may have to do with the maturity of policy impacts for the more recent grants; another, with the complex attribution chains that may be required in order to claim such impacts.

The number of instances of policy influence reported by KEI grants differed between the identified topics (as generated by topic modelling, with documents allocated to the topic most prominent or probable therein). Of the 21 identified topics, grants addressing only 14 of these had indicated at least one instance of policy influence, with the number of instances of policy influences amongst these topics ranging from 29 total instances of policy influence reported across grants which addressed the topic of “Health/Mental Health Education and Training” (1 grant) to 2 instance of policy influence reported across grants addressing the topic of “Language Education” (1 grant; see Figure 6.2.9). In addition to “Health/Mental Health Education and Training”, topics with the greatest number of total instances of policy influence reported across grants included the topics of “Participatory, Community-Based, and Co-Produced Approaches” (28 instances of policy influence across 9 grants), “Public Engagement with Research (Exhibitions, Festivals, Interactive)” (13 instances of policy influence, 2 grants), and “International Development” (10 instances of policy influence, 6 grants).

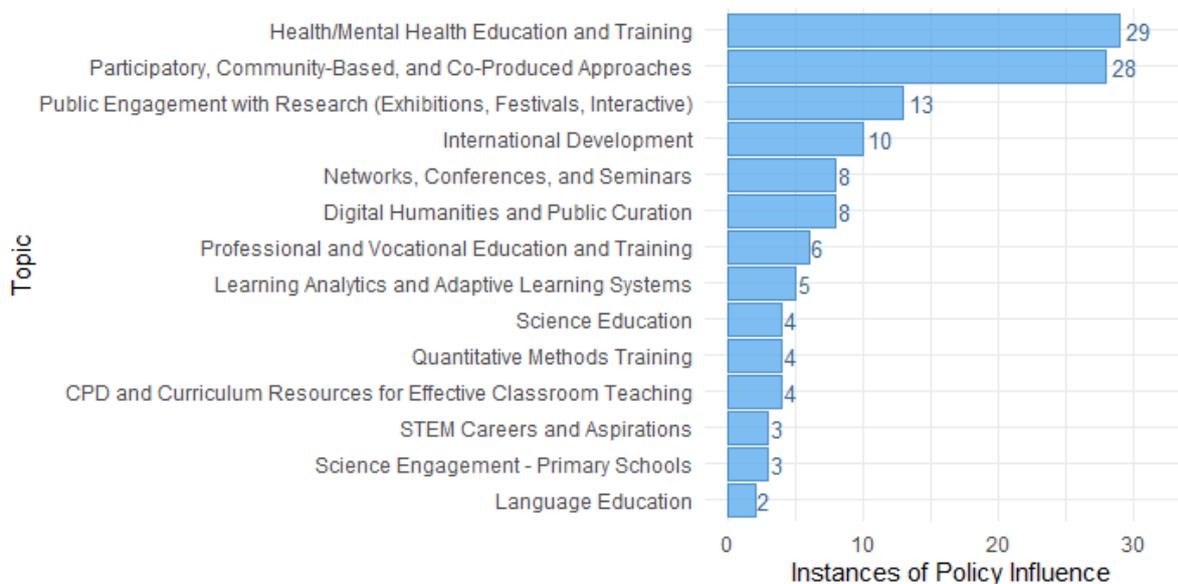


Figure 6.2.9. Total number of instances of policy influence reported for UKRI-funded other KEI grants addressing each topic (based on allocation of documents to the most prominent topic therein) between 2010 and 2020

The most commonly reported types of policy influence amongst grants included “Influenced training of practitioners or researchers” (34 grants, 6.5%; 58 instances of this type of influence in total), “Participation in a national consultation” (7 grants, 1.3%; 19 total instances), and “Participation in an advisory committee” (11 grants, 2.1%; 18 total instances; see Figure 6.2.10).



Figure 6.2.10. Total number of instances of types of policy influence reported across UKRI-funded KEI grants involving investigators (PI, Co-PI, Co-I) from UK institutions throughout the period 2010-2020

The reported geographical reach of instances of policy influence associated with educational research projects awarded UKRI-funded research grants was most commonly “National” (57 instances, 44.5%) and “Local/Municipal/Regional” (45, 35.2%), followed at some distance by “Multiple continents/international” (10, 7.8%), and “Europe” (5, 3.9%; see Figure 6.2.11).

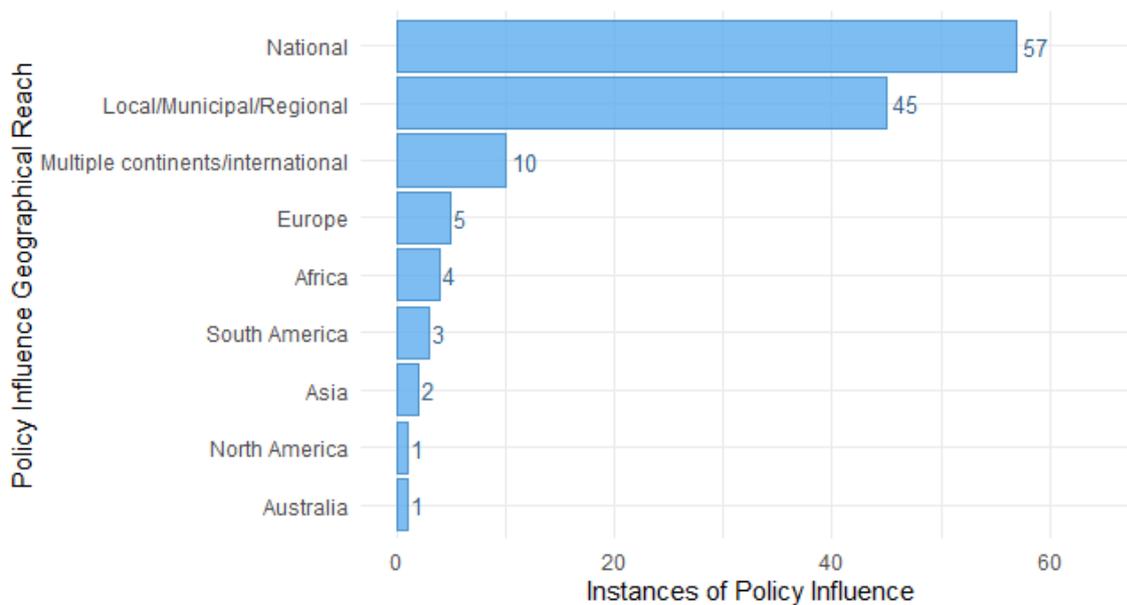


Figure 6.2.11. Total number of instances of policy influence with a given geographical reach across UKRI-funded KEI grants involving investigators (PI, Co-PI, Co-I) from UK institutions throughout the period 2010-2020

Identified topics amongst KEI grants differed in the most commonly reported types of policy influence, with the most common type of policy influence, depending on topic, being one of “Influenced training of practitioners or researchers” (e.g. 11 instances amongst grants concerning “Participatory, Community-Based, and Co-Produced Approaches”), “Participation in a national consultation” (e.g. 11 instances amongst grants concerning “Health/Mental Health Education and Training”), or “Participation in an advisory committee” (e.g. 3 instances amongst grants concerning “Learning Analytics and Adaptive Learning Systems”; see Figure 6.2.12). Other notable trends amongst grants, whereby grants addressing certain topics reported high instances of other types of policy influence (relative to other topics), include instances of “Citation in other policy documents” reported by grants addressing “Health/Mental Health Education and Training” (5 instances), and instances of “Gave evidence to a government review” reported by grants addressing “Participatory, Community-Based, and Co-Produced Approaches” (4 instances).

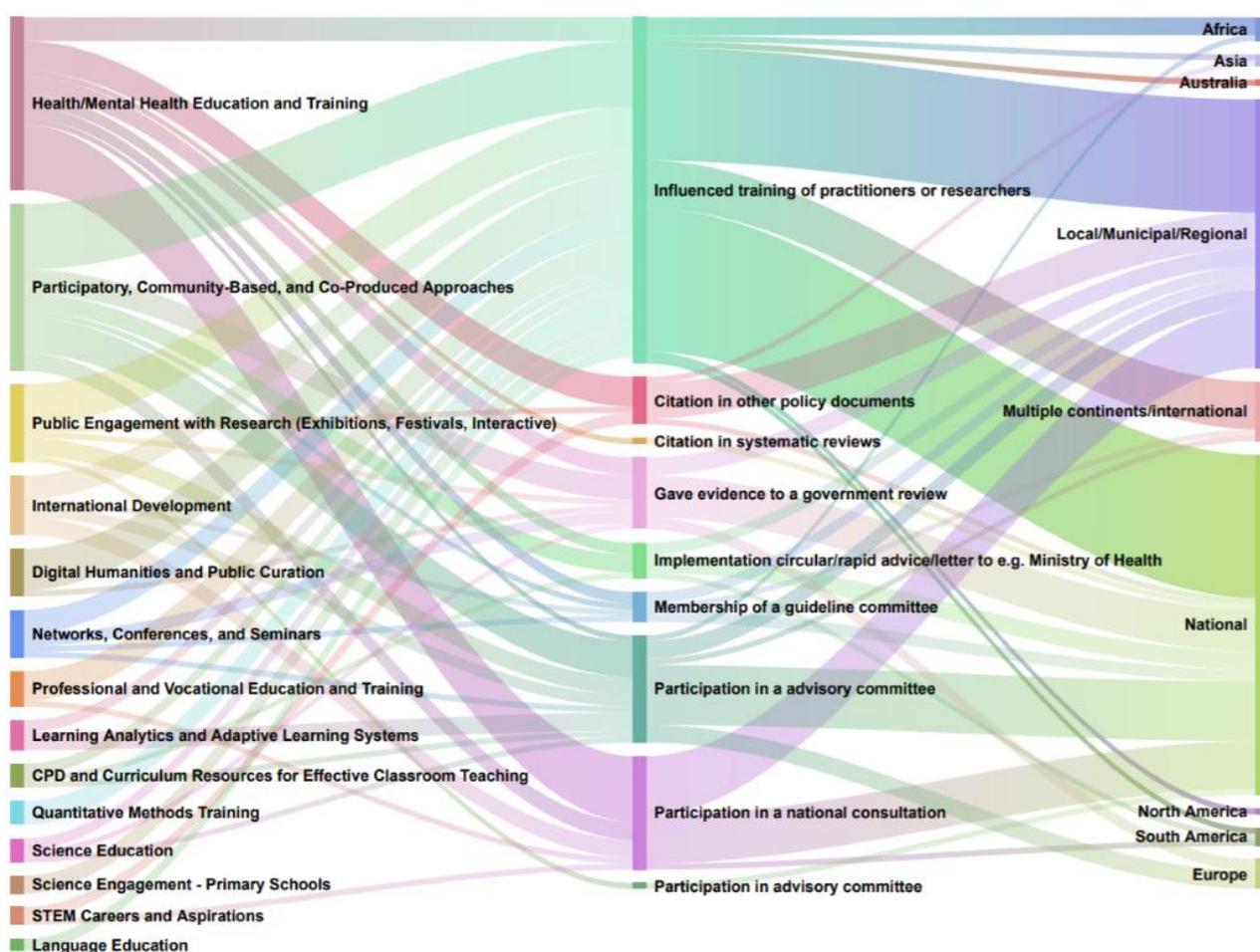


Figure 6.2.12. Total number of instances of types of policy influence, and the geographical reach of influence, reported for UKRI-funded KEI grants by topic addressed. Nodes and links weighted by number of instances of policy influence (not number of grants).

6.3. OUTCOMES OF UKRI RESEARCH GRANTS

Of the identified educational research grants awarded to research projects which involved an investigator (PI, Co-PI, Co-I) with a UK institutional affiliation during the period 2010 to 2020, 385 (38.9%) UKRI-funded were included in the analysis of outcomes. A selection of reported outcomes associated with these UKRI-funded grants, as documented in the UKRI’s Gateway to Research database, are explored below.

ENGAGEMENT ACTIVITIES

6,761 engagement activities were reported across 247 (64.2%) UKRI-funded educational research grants, with the majority of these grants (221 grants, 89.5%) reporting participation in multiple engagement activities. The number of engagement activities reported by research grants differed between identified topics (as generated by topic modelling, with documents allocated to the topic most prominent or probable therein), ranging from 1,598 total engagement activities reported across grants which addressed the topic of “Educational Participation and Mobility” (13 grants) to 42 total engagement activities reported across grants addressing the topic of “School-Based Interventions/ Effective teaching” (6 grants; see Figure 6.3.1). In addition to “Educational Participation and Mobility”, topics with the greatest number of total engagement activities reported across grants included the topics of “Policy and Multiculturalism” (751 activities across 18 grants), “Conflict/ Peace and Culture” (716 activities, 25 grants), “Higher Education and Employment” (694 activities, 16 grants), and “Applied Linguistics” (640 activities, 21 grants).

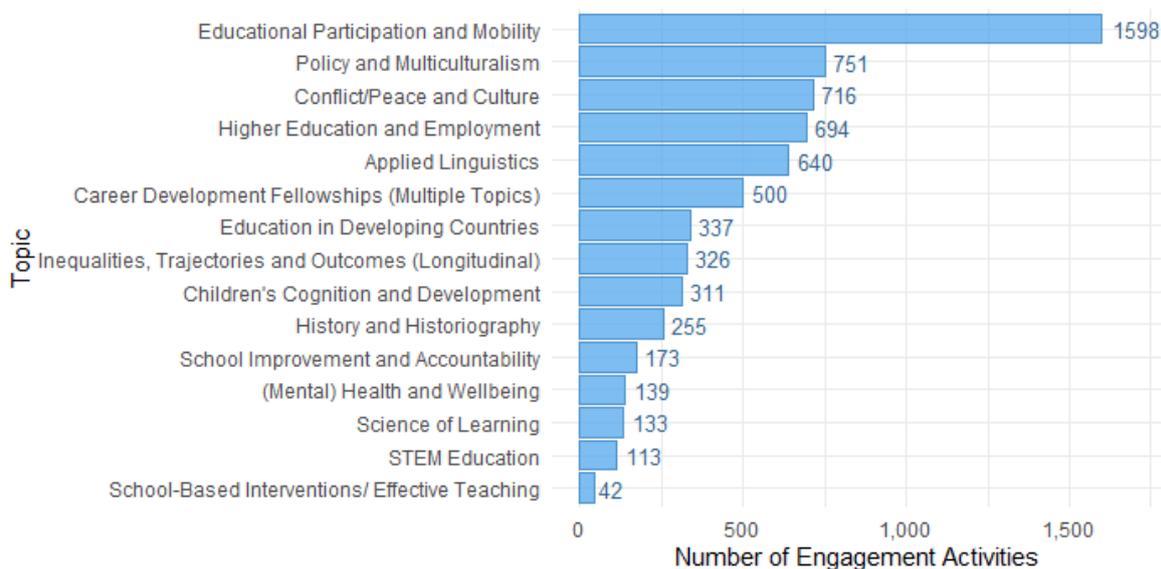


Figure 6.3.1. Total number of engagement activities reported for UKRI-funded educational research grants addressing each topic (based on allocation of documents to the most prominent topic therein) between 2010 and 2020

The most commonly reported engagement activities amongst grants included “A talk or presentation” (196 grants, 51%; 2,882 activities of this type in total), “Participation in an activity,

workshop or similar” (189 grants, 49.1%; 1,380 total activities), and “A formal working group, expert panel or dialogue” (124 grants, 32.2%; 679 total activities; see Figure 6.3.2).



Figure 6.3.2. Total number of instances of engagement activities reported across UKRI-funded educational research grants involving investigators (PI, Co-PI, Co-I) from UK institutions throughout the period 2010-2020

The reported geographical reach of engagement activities undertaken by educational research projects awarded UKRI-funded research grants was most commonly “International” (3,284 activities, 48.8%), followed by “National” (2,042, 30.2%), “Regional” (760, 11.2%), and “Local” (671, 9.9%; see Figure 6.3.3).

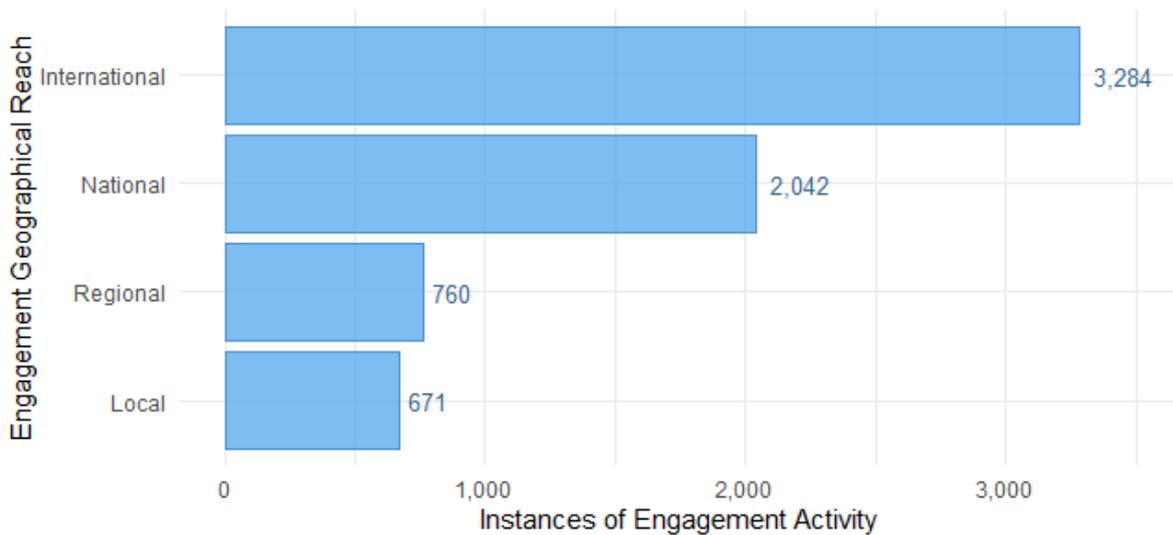


Figure 6.3.3. Total number of instances of engagement activities with a given geographical reach across UKRI-funded educational research grants involving investigators (PI, Co-PI, Co-I) from UK institutions throughout the period 2010-2020

For all identified topics amongst research grants the most commonly reported engagement activity was, invariable, either “Participation in activity, workshop, or similar” (e.g. 239 instances amongst grants concerning “Conflict/ Peace and Culture”) or “A talk or presentation” (e.g. 686 instances

amongst grants addressing “Educational Participation and Mobility”), whilst the least common engagement activity was one of “A broadcast e.g. TV/radio/film/podcast (other than news/press)”, “Participation in an open day or visit at my research institution”, or “Scientific meeting (conference/symposium etc.)” (see Figure 6.3.4). However, despite these general trends there were instances of grants addressing certain topics reporting disproportionately high instances of other engagement activities (relative to other topics), such as instances of “A magazine, newsletter or online publication” reported by grants concerning “Educational Participation and Mobility” (457 activities), instances of “A formal working group, expert panel or dialogue” reported by grants concerning “Higher Education and Employment” (200 activities), instances of “Engagement focused website, blog or social media channel” reported by grants concerning “Conflict/ Peace and Culture” (122 activities), and instances of “Participation in an open day or visit at my research institution” reported by grants concerning “Career Development Fellowships (Multiple topics)” (17 activities).

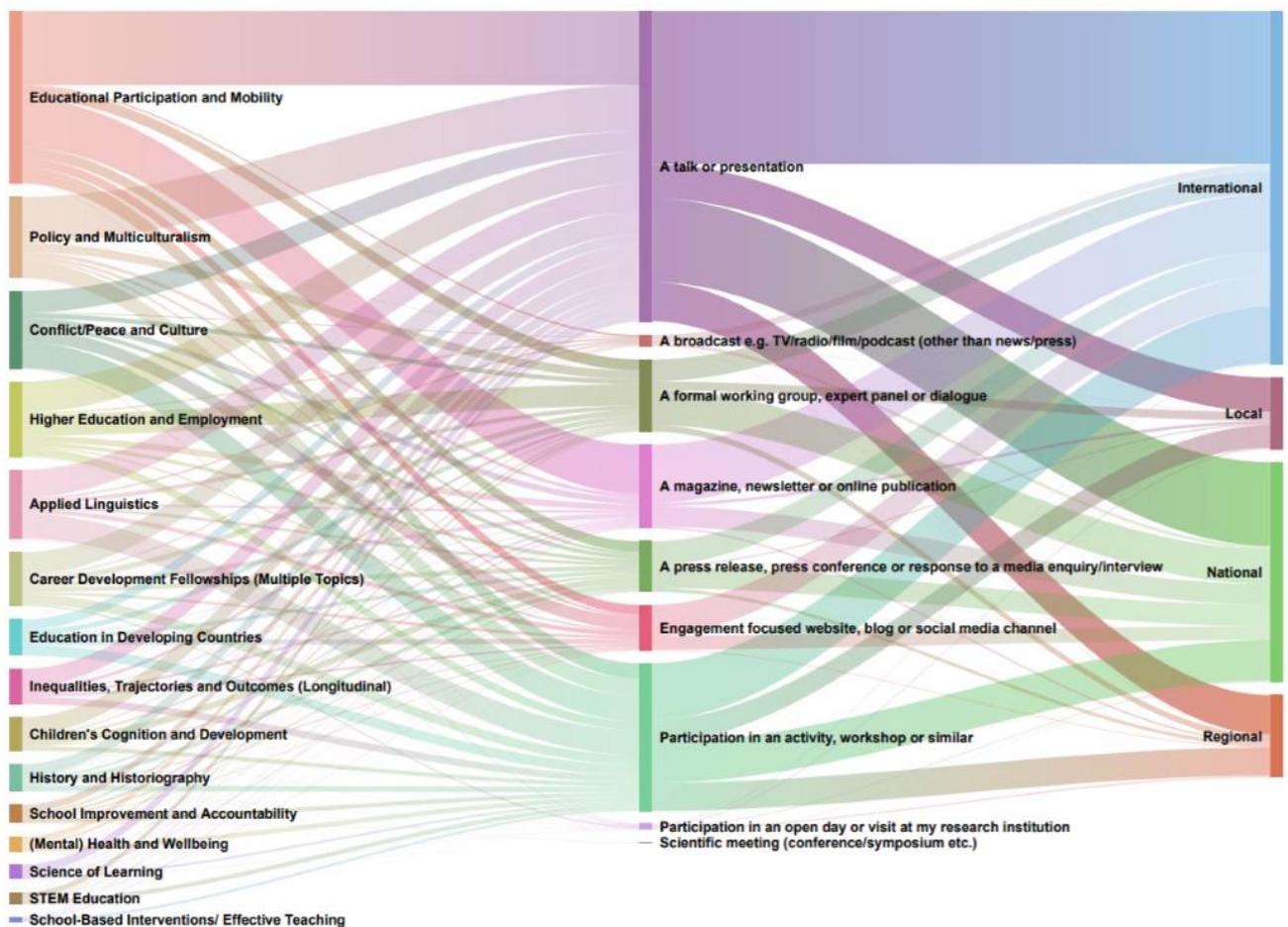


Figure 6.3.4. Total number of engagement activities, and the geographical reach of activities, reported for UKRI-funded research grants by topic addressed. Nodes and links weighted by number of engagement activities (not number of grants)

IMPACT SECTORS

175 (45.5%) educational research projects awarded a UKRI-funded research grant detailed impact by way of an impact summary. The instances of impact – here calculated as the number of domains or sectors a project reportedly impacted, with impact summaries frequently indicating impact across multiple sectors – reported by research grants differed between identified topics (as generated by topic modelling, with documents allocated to the topic most prominent or probable therein), ranging from 51 total instances of impact reported across grants which addressed the topic of “Conflict/Peace and Culture” (16 grants) to 3 total instances of impact reported across grants addressing the topic of “School-Based Interventions/ Effective teaching” (3 grants; see Figure 6.3.5). In addition to “Conflict/Peace and Culture”, topics with the greatest number of total instances of impact reported across grants included the topics of “Policy and Multiculturalism” (36 instances across 13 grants), “Career Development Fellowships (Multiple Topics)” (34 instances, 14 grants), “Higher Education and Employment” (33 instances, 14 grants), and “Applied Linguistics” (31 instances, 16 grants).

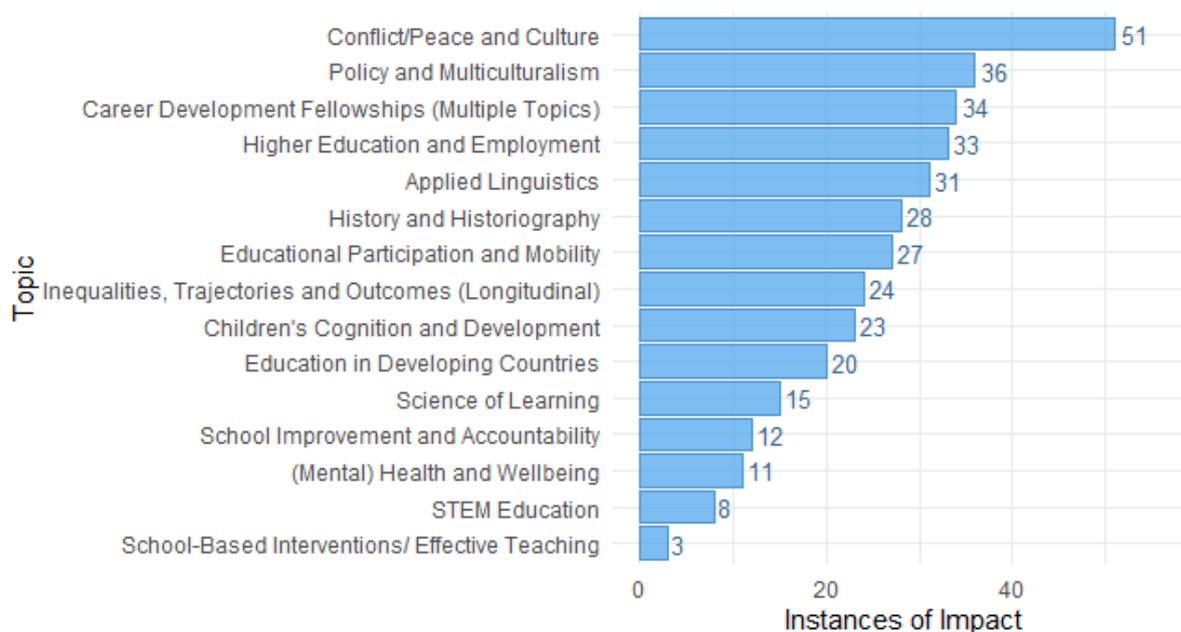


Figure 6.3.5. Total number of impacts (or instances of impact) reported for UKRI-funded educational research grants addressing each topic (based on allocation of documents to the most prominent topic therein) between 2010 and 2020

The most commonly reported domain (or sector) impacted amongst grants included “Education” (159 grants, 41.3%), “Government, Democracy and Justice” (43 grants, 11.2%), “Communities and Social Services/Policy” (36 grants, 9.4%), “Culture” (23 grants, 6%), and “Heritage, Museums and Collections” (23 grants, 6%; see Figure 6.3.6).

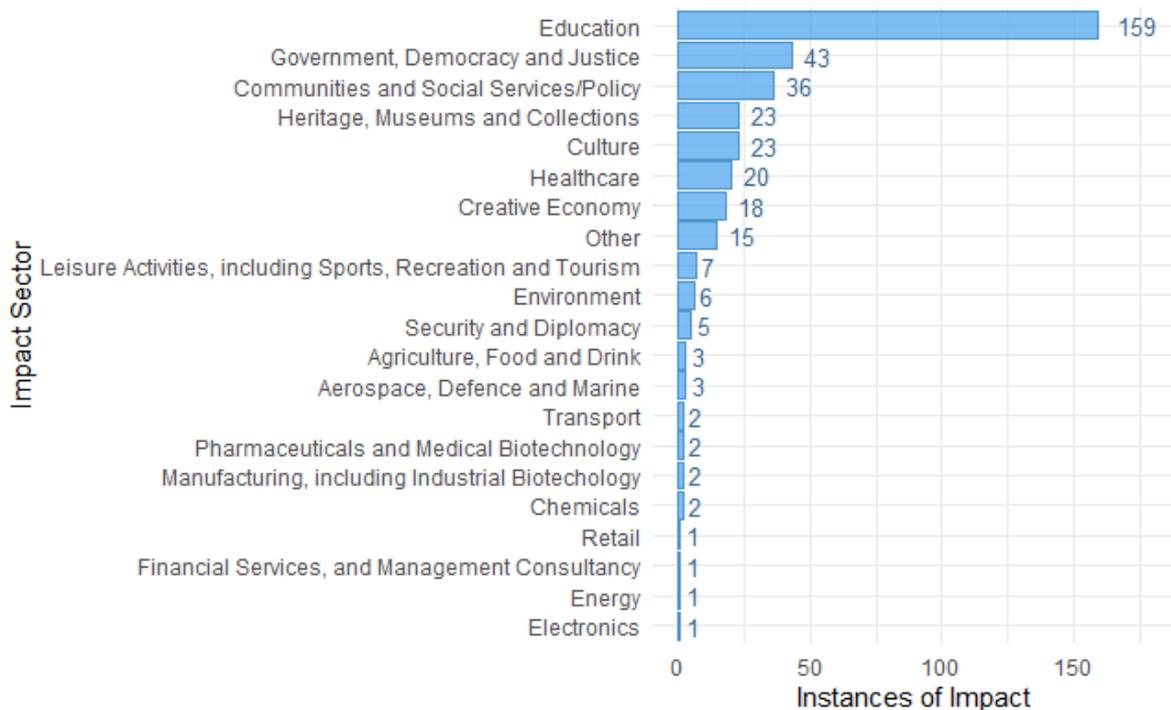


Figure 6.3.6. Total number of instances of impact in given domains reported across UKRI-funded educational research grants involving investigators (PI, Co-PI, Co-I) from UK institutions throughout the period 2010-2020

The reported type of impact associated with educational research projects awarded UKRI-funded research grants was most commonly “Societal” (130 grants, 74.3%), followed by “Policy & public services” (100, 57.1%), “Cultural” (57, 32.6%), and “Economic” (26, 14.9%; see Figure 6.3.7).

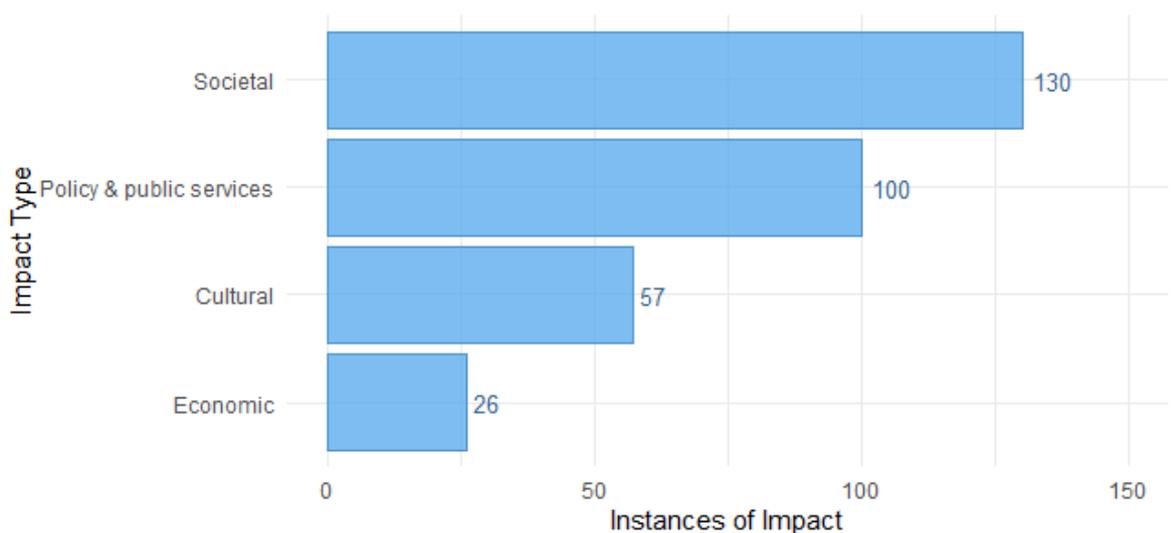


Figure 6.3.7. Total number of instances of a given type of impact across UKRI-funded educational research grants involving investigators (PI, Co-PI, Co-I) from UK institutions throughout the period 2010-2020

For all identified topics amongst research grants the most commonly reported sector (or domain) impacted was “Education” (e.g. 16 instances amongst grants addressing “Applied Linguistics”). Reports of impacts in sectors (or domains) beyond education were generally sparse, with topics seldom demonstrating more than 5 instances of impact in any other sector, with some exceptions related to topics of “Conflict/Peace and Culture” – which demonstrated 7 instances of impact in the sectors of “Creative Economy”, “Culture”, and “Heritage, Museums and Collections” – and “Policy and Multiculturalism” – which demonstrated 8 instances of impact in sector of “Government, Democracy and Justice” and 7 instances of impact in the sector of “Communities and Social Service/Policy” (Figure 6.3.8).

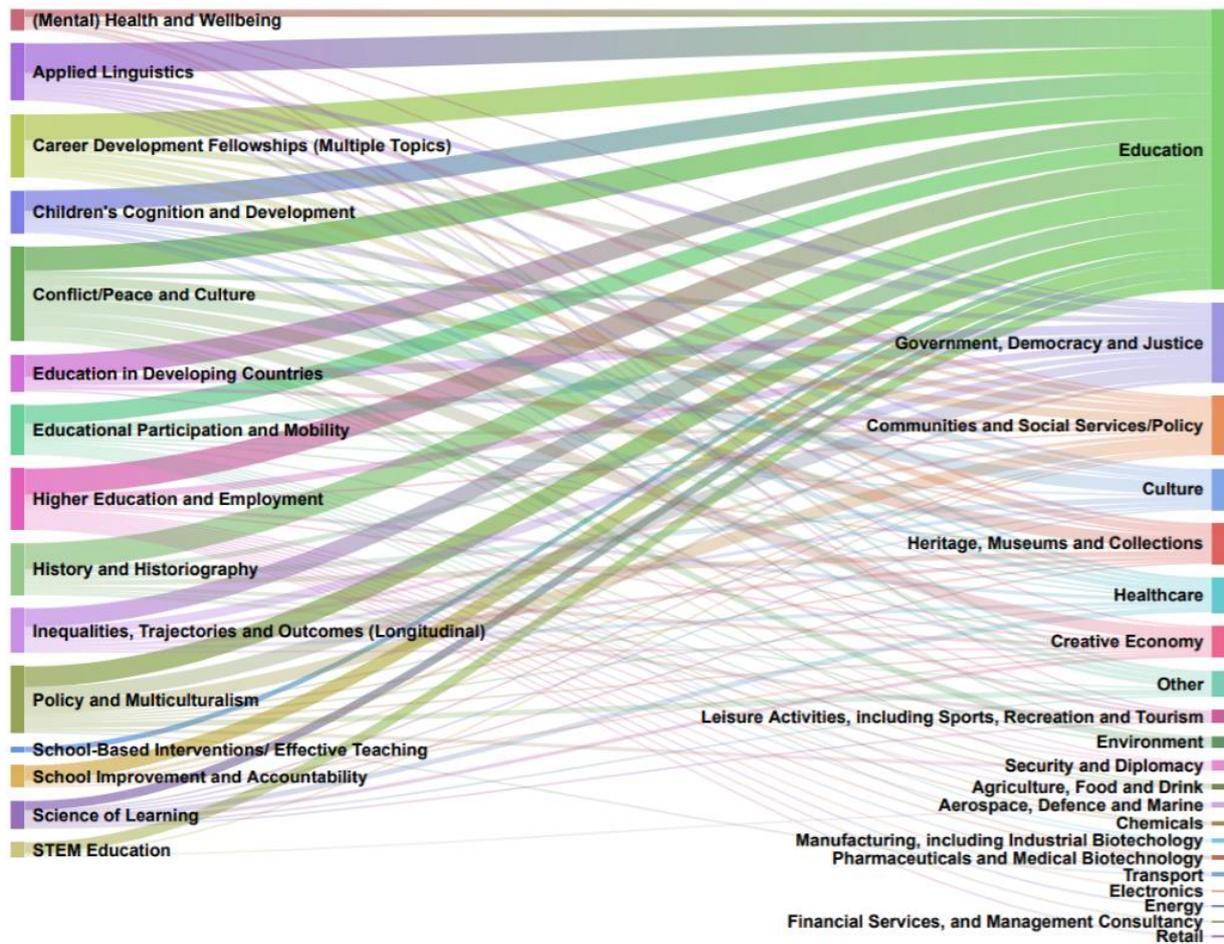


Figure 6.3.8. Instances of impact across different sectors reported for UKRI-funded research grants by topic addressed. Nodes and links weighted by instances of impact

POLICY INFLUENCE

708 instances of policy influence were reported across 122 (31.7%) UKRI-funded educational research grants, with the majority of these grants (77 grants, 63.1%) reporting multiple instances of policy influence. The number of instances of policy influence reported by research grants differed between identified topics (as generated by topic modelling, with documents allocated to the topic most prominent or probable therein), ranging from 140 total instances of policy influence reported across grants which addressed the topic of “Educational Participation and Mobility” (9 grants) to 1 instance of policy influence reported across grants addressing the topic of “School-Based Interventions/ Effective teaching” (1 grants; see Figure 6.3.9). In addition to “Educational Participation and Mobility”, topics with the greatest number of total instances of policy influence reported across grants included the topics of “Higher Education and Employment” (129 instances of policy influence across 11 grants), “Policy and Multiculturalism” (93 instances of policy influence, 11 grants), “Career Development Fellowships (Multiple Topics)” (79 instances of policy influence, 8 grants), and “Applied Linguistics” (62 instances of policy influence, 10 grants).

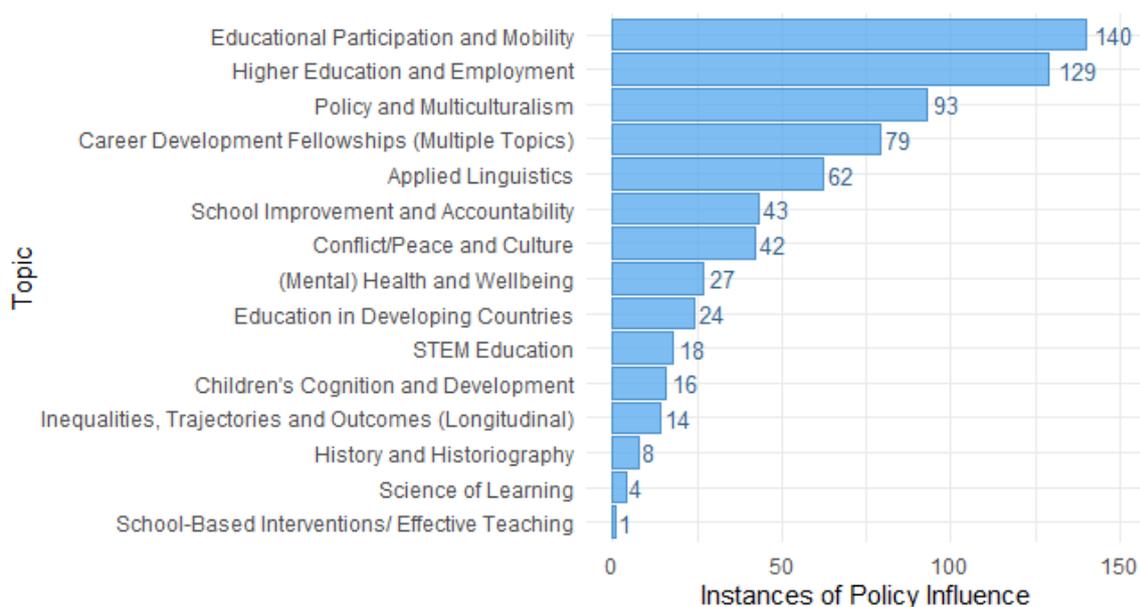


Figure 6.3.9. Total number of instances of policy influence reported for UKRI-funded educational research grants addressing each topic (based on allocation of documents to the most prominent topic therein) between 2010 and 2020

The most commonly reported types of policy influence amongst grants included “Influenced training of practitioners or researchers” (77 grants, 20%; 191 instances of this type of influence in total), “Participation in an advisory committee” (41 grants, 10.6%; 149 total instances), and “Citation in other policy documents” (31 grants, 8.1%; 92 total instances; see Figure 6.3.10).

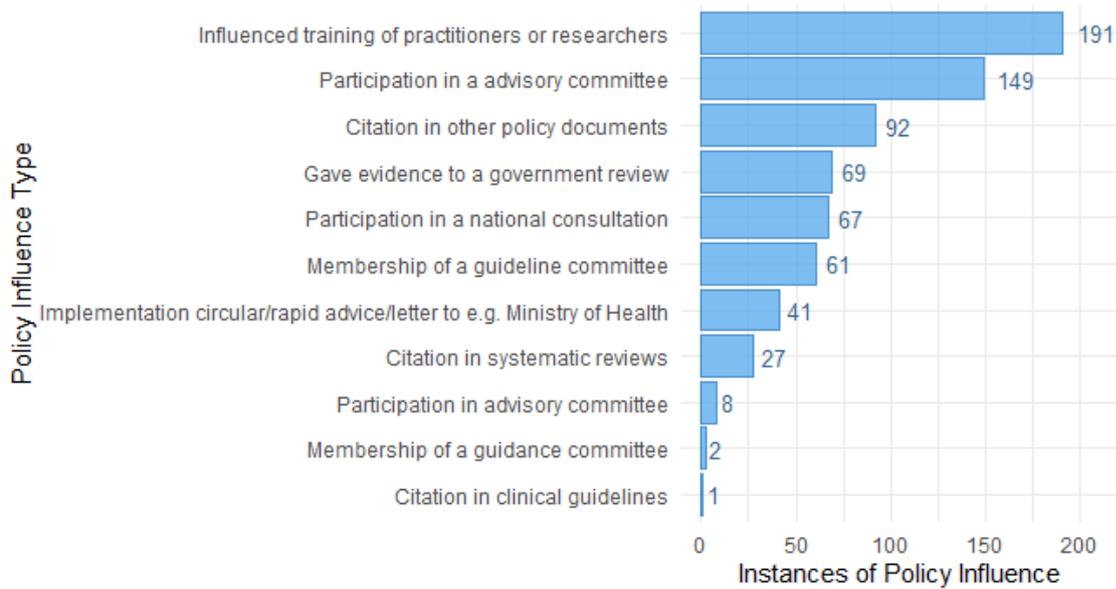


Figure 6.3.10. Total number of instances of types of policy influence reported across UKRI-funded educational research grants involving investigators (PI, Co-PI, Co-I) from UK institutions throughout the period of 2010 to 2020

The reported geographical reach of instances of policy influence associated with educational research projects awarded UKRI-funded research grants was most commonly “National” (442 instances, 62.4%), followed at some distance by “Multiple continents/International” (87, 12.3%), “Local/Municipal/Regional” (73, 10.3%), and “Europe” (36, 5.1%; see Figure 6.3.11).

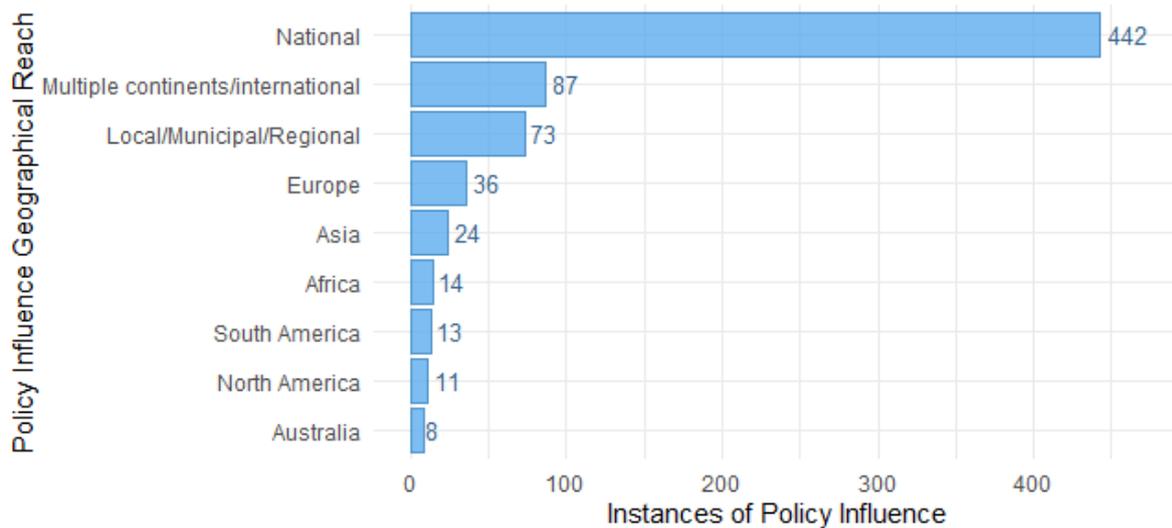


Figure 6.3.11. Total number of instances of policy influence with a given geographical reach across UKRI-funded educational research grants involving investigators (PI, Co-PI, Co-I) from UK institutions throughout the period of 2010 to 2020

Identified topics amongst research grants differed in the most commonly reported types of policy influence, with the most common type of policy influence, depending on topic, being one of “Participation in an advisory committee”(e.g. 45 instances amongst grants concerning

“Educational Participation and Mobility”), “Influenced training of practitioners or researchers” (e.g. 31 instances amongst grants concerning “Policy and Multiculturalism”, “Higher Education and Employment”, and “Applied Linguistics”), “Citation in other policy documents” (e.g. 8 instances amongst grants concerning “(Mental) Health and Wellbeing”), or “Gave evidence to a government review (e.g. 5 instances amongst grants concerning “Inequalities, Trajectories and Outcomes (Longitudinal)”; see Figure 6.3.12). Other notable trends amongst grants, whereby grants addressing certain topics reported high instances of other types of policy influence (relative to other topics), include instances of “Implementation circular/rapid advice/letter to e.g. Ministry of Health” reported by grants addressing “Higher Education and Employment” (17 instances) and “Applied Linguistics” (10 instances), instances of “Gave evidence to a government review and “Participation in a national consultation” reported by grants addressing “Educational Participation and Mobility” (22 instances of each type), and instances of “Citation in systematic reviews” reported by grants addressing “Policy and Multiculturalism” (17 instances).

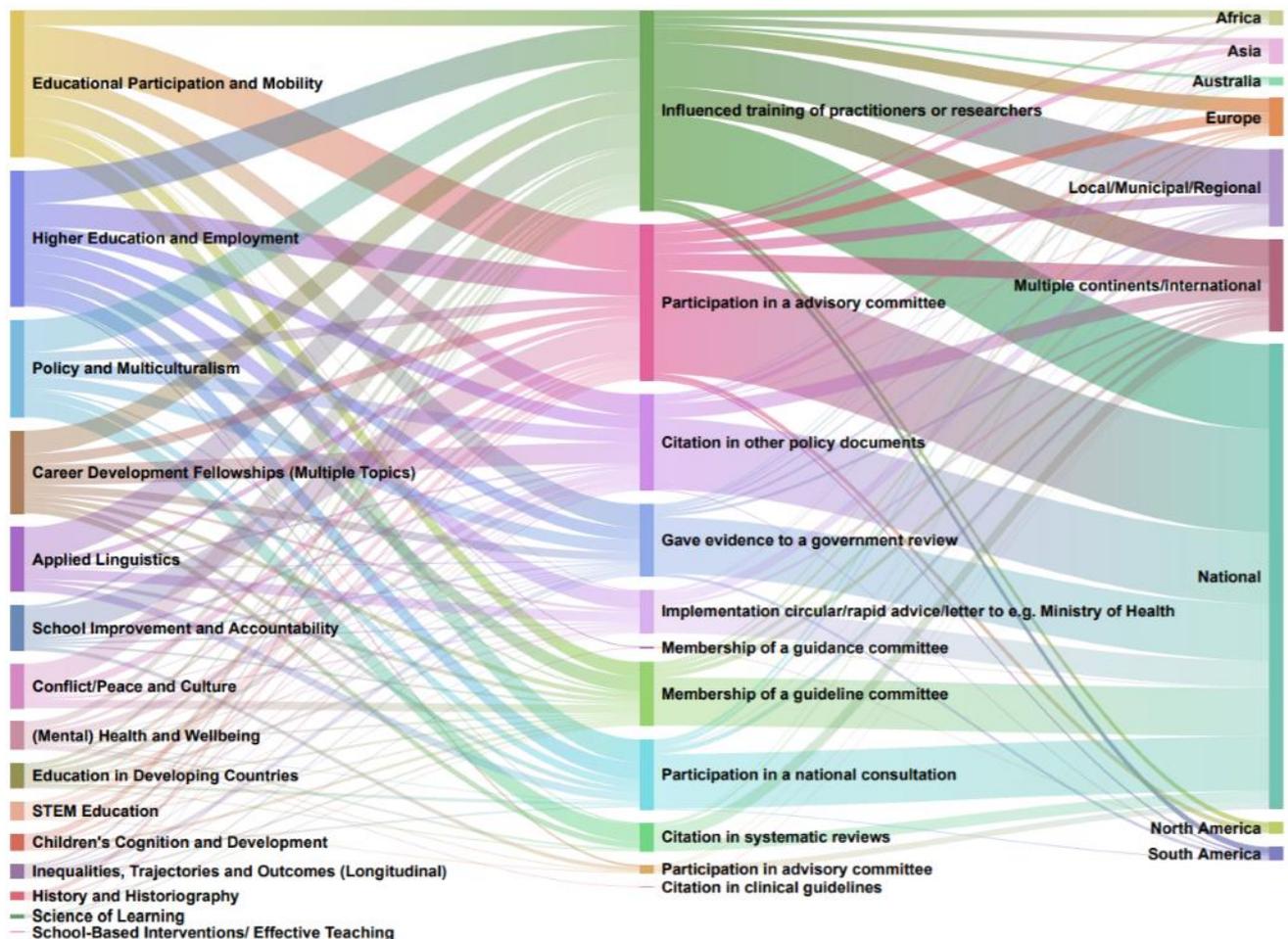


Figure 6.3.12. Total number of instances of types of policy influence, and the geographical reach of influence, reported for UKRI-funded research grants by topic addressed. Nodes and links weighted by number of instances of policy influence (not number of grants).

6.4. UKRI FUNDING VIGNETTE (KEI)

UKRI FUNDING FOR KEI PROJECTS WHOLLY/PARTIALLY IN THE FIELD OF EDUCATION, 2010-20

UKRI councils funded 522 KEI grants, of which 521 have UK PIs. For all UKRI-funded KEI projects, the total funding is £72.66 million. For all UK PI KEI projects, the total funding from UKRI councils is around £72.04 million (Table 6.4.1).

Table 6.4.1. UKRI-funded KEI Projects

Research Projects	Total Number	Total Funding
All UKRI-funded research projects	523	£72.66 million
UKRI-funded research projects with UK PI	522	£72.04 million

Table 6.4.2 shows the distribution of different types of KEI funding across UKRI research councils. Innovate UK contributed the largest sum of funding for (ed)tech and technology innovation funding. ESRC and AHRC were the largest funders for academic networks and events. STFC funded the largest number of grants for PER, KT, KE and outreach, but AHRC led the funding for this category.

Table 6.4.2 Different types of KEI Funding by UKRI Councils [UK PI only]

UKRI Councils	Total funding (£) and total number of grants			
	(Ed)tech and technology innovation	Academic networks and events	PER, KT, KE, and Outreach	Grand Total
AHRC	282,096 (3)	5,522,042 (35)	9,265,205 (77)	15,069,343 (115)
BBSRC	1,028,196 (3)	0 (0)	4,065,701 (2)	5,093,897 (5)
ESRC	1,194,636 (5)	6,406,304 (20)	4,374,211 (44)	11,975,151 (69)
EPSRC	874,919 (5)	437,739 (3)	4,596,854 (15)	5,909,512 (23)
Innovate UK	27,115,085 (171)	0 (0)	0 (0)	27,115,085 (171)
MRC	0 (0)	655,769 (2)	1,690,274 (6)	2,346,043 (8)
NERC	0 (0)	470,300 (1)	87,464 (1)	557,764 (2)
STFC	34,582 (3)	0 (0)	3,939,927 (126)	3,974,509 (129)
Grand Total	30,529,514 (190)	13,492,154 (61)	28,019,636 (271)	72,041,304 (522)

The average duration of UKRI-funded KEI grants (UK PI) is 1.3 years, shorter than the average duration of UKRI-funded research grants. Table 6.4.3 and Figure 6.4.1 show the year by year trend of UKRI-funded KEI grants, with a peak in 2019 in terms of total funding and a peak in 2020 for the number of grants.

Table 6.4.3. UKRI Funding for KEI grants by starting year (UK PI only)

Start Year	Number of Grants	Total Funding Amount in GBP	Average of Funding Amount in GBP	Average of Duration (years)
2010	16	1,601,031	100,064	1.6
2011	22	930,731	42,306	1.4
2012	54	9,856,650	182,531	1.5
2013	51	4,929,577	96,658	1.5
2014	54	3,698,341	68,488	1.2
2015	38	4,401,399	115,826	1.6
2016	34	2,353,588	69,223	1.4
2017	47	4,894,934	106,412	1.4
2018	33	5,460,367	165,466	1.7
2019	68	22,735,552	334,346	1.4
2020	105	11,179,134	106,468	0.5
Total	522	72,014,304	138,275	1.3

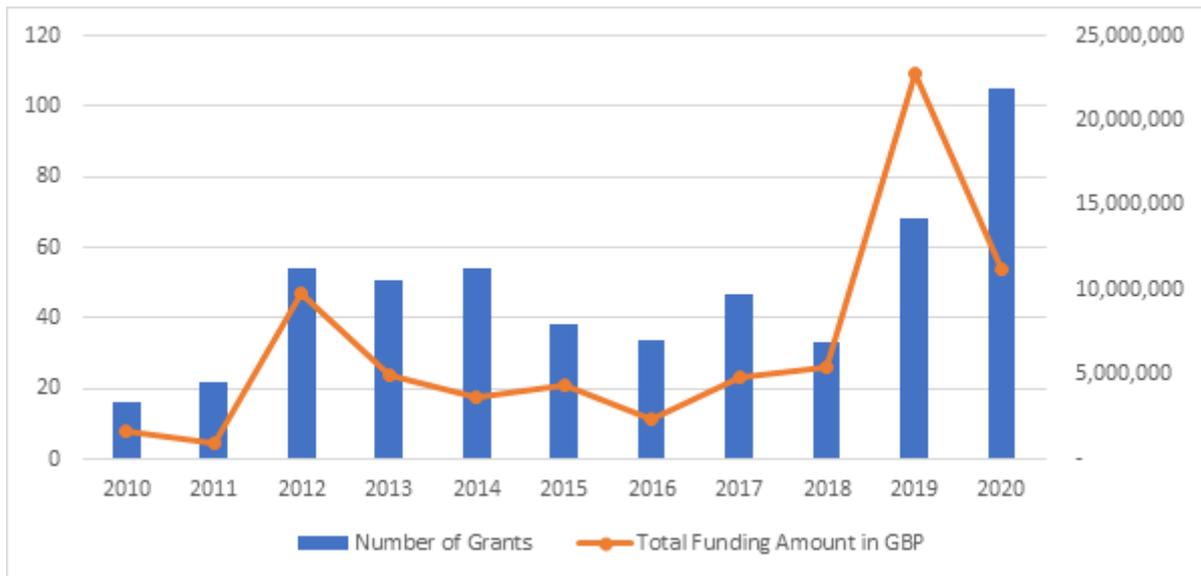


Figure 6.4.1. UKRI Funding for KEI Grants by Starting Year (UK PI only)

For institutions leading UKRI KEI grants as PI institutions, only University of Bristol received more than 10 million funding. Institutions that led UKRI KEI grants totalling more than one million in GBP are shown in Table 6.4.4.

Table 6.4.4. Recipients of UKRI KEI funding (UK PI only; total funding over £1m)

No.	UK PI Institutions	Total Funding Amount in GBP	Average of Funding Amount in GBP	Number of Research Grants	Average of Duration (years)
1	University of Bristol	10,022,619	770,971	13	2.1
2	University Hospital Coventry	9,999,261	9,999,261	1	3.0
3	University of Nottingham	4,405,536	734,256	6	2.0
4	University of the West of England	2,126,104	531,526	4	1
5	University of Ulster	2,023,437	1,011,719	2	2.5
6	University of Lincoln	1,948,035	974,018	2	2.5
7	University of Edinburgh	1,724,987	143,749	12	1.8
8	University of Oxford	1,413,006	88,313	16	1.3
9	University College London	1,379,708	106,131	13	1.4
10	Queen's University Belfast	1,171,170	234,234	5	2.0
11	University of Cambridge	1,099,093	137,387	8	2.0
12	King's College London	1,069,536	267,384	4	2.5

6.5. EC FUNDING VIGNETTE (KEI)

EC FUNDING FOR KEI PROJECTS WHOLLY/PARTIALLY IN THE FIELD OF EDUCATION, 2010-20

EU agencies funded 121 KEI grants, of which 27 have UK PIs. For all EU-funded KEI projects, the total funding is £259.39 million (Table 6.5.1). For all UK PI KEI projects, the total funding from EU councils is around £33.66 million. Table 6.5.2 and Table 6.5.3 show the breakdown of KEI grants (all-PI and UKPI) into different types.

Table 6.5.1. EU-funded KEI projects

KEI Projects	Total Number	Total Funding (£) (EC and ERC)	EC Funding (£)	ERC Funding (£)
All EU-funded KEI projects	121	259.39 million	258.87 million	0.52 million
EU-funded KEI projects with UK PI	27	33.66 million	33.14 million	0.52 million

Table 6.5.2. Number of EU-funded KEI projects in different categories

EU Councils	(Ed)tech and technology innovation	Academic networks and events	PER, KT, KE, and Outreach	Total
European Commission	42 (with 10 UK PI)	9 (1 UK PI)	66 (12 UK PI)	117 (23 UK PI)
European Research Council	3 (3 UK PI)	0	1 (1 UK PI)	4 (4 UK PI)
Grand Total	45 (13 UK PI)	9 (1 UK PI)	67 (13 UK PI)	121 (27 UK PI)

Table 6.5.3. Different types of KEI Funding by EU Councils [UK PI only]

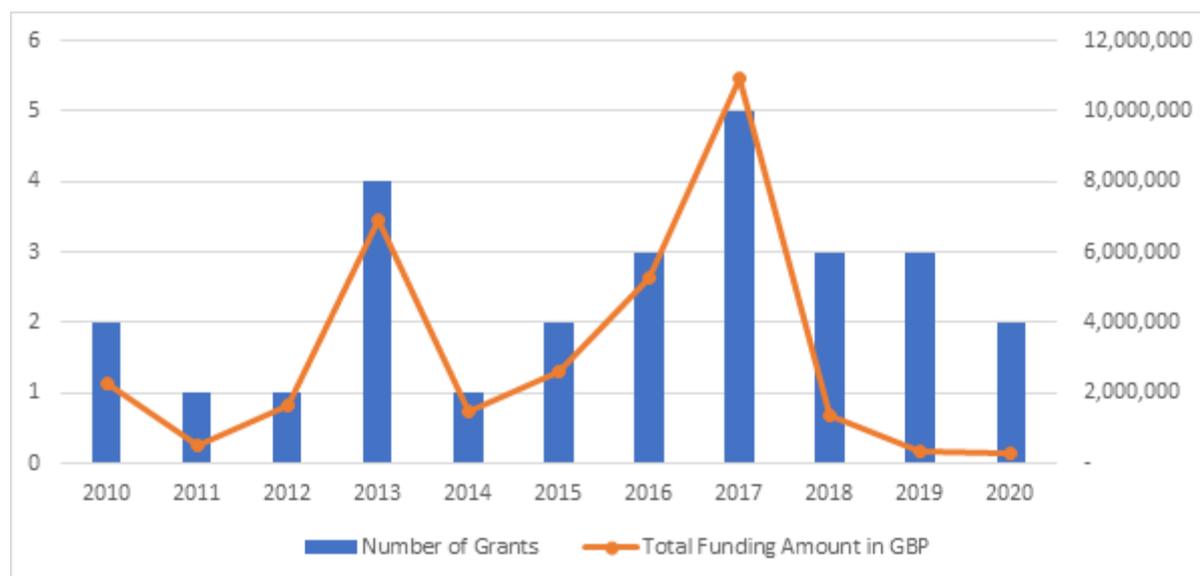
EU Councils	(Ed)tech and technology innovation (£)	Academic networks and events (£)	PER, KT, KE, and Outreach (£)	Grand Total (£)
European Commission	18,367,778	224,609	14,547,871	33,140,258
European Research Council	391,496	-	127,541	519,037
Total	18,759,273	224,609	14,675,412	33,659,295

Table 6.5.4 and Figure 6.5.1 display the trends of EU-funded KEI grants (UK PI only) based on their starting years. The average duration of these grants is 2.1 years. The peak for EU KEI funding was in 2017, with both the highest number of KEI grants and highest total funding amount.

Table 6.5.4. EU funding for KEI grants by starting year (UK PI only)

Start Year	Number of KEI Grants	Total Funding Amount in GBP	Average of Funding Amount in GBP	Average of Duration (years)
2010	2	2,253,172	1,126,586	2.5
2011	1	501,958	501,958	3.0
2012	1	1,669,126	1,669,126	3.0
2013	4	6,902,935	1,725,734	3.0
2014	1	1,503,203	1,503,203	2.0
2015	2	2,629,409	1,314,705	1.5
2016	3	5,252,405	1,750,802	1.3
2017	5	10,933,307	2,186,661	2.4
2018	3	1,362,907	454,302	2.0
2019	3	339,765	113,255	1.3
2020	2	311,108	155,554	1.0
Grand Total	27	33,659,295	1,246,641	2.1

Figure 6.5.1. EU funding for KEI grants by starting year (UK PI only)



Among institutions leading EU grants as PI institutions, 10 institutions hosted grants totalling more than one million funding in GBP (shown in Table 6.5.5).

Table 6.5.5. Recipients of EU KEI funding (UK PI only; total funding over £1m)

No.	UK PI Institutions	Total Funding Amount in GBP	Average of Funding Amount in GBP	Number of Research Grants	Average Duration (years)
1	The Open University	6,075,388	1,518,847	4	3
2	Coventry University	5,085,578	5,085,578	1	3
3	University College London	4,447,751	4,447,751	1	4
4	EXUS (United Kingdom)	4,284,038	4,284,038	1	2
5	Sheffield Hallam University	3,818,482	1,909,241	2	2
6	Queen Mary University of London	2,498,042	2,498,042	1	3
7	Heriot-Watt University	2,025,752	2,025,752	1	3
8	Newcastle University	1,503,203	1,503,203	1	2
9	University of Birmingham	1,316,364	658,182	2	2.5
10	Cardiff University	1,136,383	1,136,383	1	3

7. STATE OF THE FIELD AND FUTURE PROSPECTS

This section provides a combined analysis of expert interviews and stakeholder workshops. While structured initially around deductive themes to shape the analytical approach, some of the issues that were highlighted by the participants and resonated across the data were surprising and challenged some of the initial expectations framing the project. This findings section has therefore been structured around the issues that participants particularly emphasised within the interviews and workshops and structured as a critical narrative.

As highlighted in the methodology, the workshop participants were key stakeholders in educational research: researchers (primarily based in universities) across a range of subject areas and sectors of interest; practitioners (across a range of subject areas and sectors) and CPD providers; key funders and policy makers (across the UK jurisdictions). These different stakeholders provided distinctive perspectives on educational research based on their positions and roles. Each workshop focused on a specific group of stakeholders to ensure these distinctive perspectives could be explored in depth. Although there was a great deal of consensus across the groups of stakeholders, the different workshops provided in-depth insight into specific issues facing researchers, practitioners, funders and policy makers. As such, where appropriate, the different perspectives have been highlighted in the following presentation of findings to highlight synergies and divergences of opinion.

7.1. THE COMPLEX SPACE OF EDUCATIONAL RESEARCH

Participants emphasised the complexity of the educational research ecosystem¹², highlighting a number of tensions within the core structures that have developed over the last decade: tensions within academic institutions; the emergence, and increasing dominance, of alternative research producers, distinct from universities, and the growing prominence of organisations that sit across traditional boundaries of funder, research producer, and political advocacy; and the growth in the prominence of alternative and charitable funders, distinct from public funding.

Several participants emphasised the long-running, and frequently analysed dynamics within the educational academic community, particularly between those involved in teacher education, whose research focus is often oriented toward educational practice (in all sectors and settings), and those who are not directly involved in teacher education programmes, whose interests may gravitate towards a wide range of general educational research issues. One participant even described these groups as two fundamentally ‘different research activity systems’ within the educational research landscape. The former group was viewed by participants as ‘remaining very committed to evidence-informed professional judgement and to the role of research in improving teaching quality’ while the latter tended to focus on generating large scale, in-depth, often social science-oriented research.

There was general consensus across interview and workshop participants that these two groups had been increasingly moving apart (or been pulled apart) over the last decade – a process of ‘reluctant divergence’, as one participant put it. It was suggested that, ‘whereas ten years ago there was a significant amount of crossover, increasingly there is a reduced crossover’, evident both across different institutional priorities and within research intensive institutions. Participants suggested several key drivers for this increasing divergence, and particularly highlighted different accountability measures for each group – notably Ofsted and the REF – which shifted priorities and

¹² We use the term ‘ecosystem’ in this report to reflect its use by both the two Academies and the participants in our interviews and workshops. This usage was largely consistent with that of the BA/RS (2018) ‘Harnessing Educational Research’ report, i.e. as a living complex of interacting but distinctive actors, among which there are sustained flows of people, funding and information.

exacerbated differences. This was seen as having led to divergent discursive structures within the academic landscape that prioritise different values and models of research within each group and prioritise particular kinds of research questions and methodologies. Those involved in teacher education were more readily linked by participants with practice-oriented and applied ‘research *for* educational practice’, while members of the other group were more frequently described as doing ‘research *about* education’, for example through a sociological or other disciplinary lens.

An additional group of researchers is situated at the crossovers between education and other academic and professional areas, such as science, engineering, medical and health-related professions, law, business and management, social work, and so on. They generate a large body of mostly pedagogical research related to academic and professional education in their fields of interest. Some of the most active journals in the datasets we analysed in this report also indicate the productivity of this work, although often it struggles for legitimacy in both its parent discipline and ‘mainstream’ educational research.

Moving beyond the higher education sector, one of the most commonly discussed issues in both interviews and workshops was the emergence of key new stakeholders in the educational research ecosystem that had taken place over the last decade. These include the growing prominence of teacher-led, ground-up organisations such as ResearchEd and the Chartered College for Teaching, as well as the growing importance of the charitable sector as both research funders and research producers. A number of organisations were highlighted as increasingly straddling the ‘third space’ between funding research, producing research, and being active as political advocates with specific educational or social agendas. As such, the ‘ecosystem’ was viewed as a highly complex space where delineations between traditional organisational roles (funder, research producer, practitioner) were becoming increasingly blurred and the drivers and mechanisms of research production were becoming increasingly rooted in a complex range of organisational agendas, often shaped by politics or the trust deeds of charitable funders.

At the same time, several participants emphasised this shift in research production from a previous model, which they described as largely comprising university-based researchers, to an increasing number of non-university based ‘alternative research organisations’. These kinds of ‘contract research organisations’, undertaking educational research, were highlighted as increasingly competing with universities for funding. As one representative from a key funder acknowledged: ‘there is more competition for funding than ever before and more competitors to academic research’. While these ‘alternative organisations’ are currently unable to apply for research council funding, participants (particularly those involved in research funding) emphasised that such organisations increasingly dominate the charitable funding space, as well as the procurement space. As such they are often in direct competition with universities for commissioned research, including specific research projects funded by the state or even research councils. As one charitable funder commented: ‘it’s noticeable how quickly these organisations are able to fill spaces and grab opportunities’. Research participants expressed some concern that such organisations were often successful in competitive research bids as they could work in a very agile and responsive way to prepare and submit a tender, often had core capacity in the form of permanently employed research teams that could easily be moved across projects, and could operate more cheaply than universities and so could undercut university-led bids.

Participants indicated that these kinds of organisations not only diversified the modes of research production, but were in the process of reshaping traditional pathways of research dissemination, with outputs from these kinds of organisations tending not to be published in academic journals. Participants suggested that, instead, outputs from these organisations tended to take the form of reports shared directly with funders, commissioning organisations, or policy makers, or in some instances, being shared directly with practitioners through blogs, online reports or CPD. The research may not feature in an obvious way across the ecosystem and, as a consequence, some participants were concerned that this kind of research rarely contributed to the growth of knowledge in a holistic

manner. Therefore, attendees of the researcher-oriented workshop expressed discomfort that this kind of research, while attracting funding within the UK educational research ecosystem, rarely moves the field forward.

However, several participants also noted that the increasing prominence of these organisations may be a reflection of changes in the underlying ecology of education research, rather than a driver of change. Instead many participants highlighted changing funding structures in the educational research ecosystem (as noted above), particularly the prominence of the Education Endowment Foundation (EEF). This change was traced back by one participant to a:

lack of governmental funding, especially in the early years of the coalition period, and the gradual belt tightening at the ESRC... there had to be some innovation in relation to research applications... characterised by growth in applications for charitable funding beyond research councils and government.

The EEF was consequently seen as playing a key role, emerging at the time of a depressed funding landscape, providing an alternative funding stream. This alternative funding stream was repeatedly discussed in interviews and workshops as one of the key developments in the educational research ecosystem over the last decade.

As shown across the data of this study, the EEF has become increasingly prominent within the research production and dissemination parts of the educational research landscape. Nonetheless, several participants were critical of this change, suggesting, as will be discussed below, that it may have had a narrowing effect on the paradigms and methodologies that make up the field. However, many participants also highlighted the benefits to rigour and integrating research with practice that the EEF's focus on the 'what works agenda', along with significant amounts of funding, have brought to the research ecosystem.

7.2. DISCIPLINES AND METHODOLOGIES

A key feature of all the interviews and workshops was a discussion of the disciplinary make-up of the educational research ecosystem, the methodologies and methods that featured most prominently, and potential gaps. Most participants explicitly linked paradigms, disciplines and methodologies together so they are discussed holistically here.

Inevitably, participants touched on the long running debates over whether educational research should be considered a discipline in its own right or whether it is a field made up of multiple disciplines. Many participants in this study tended to view educational research as a field, but acknowledged that the debate was important and continued to be relevant. However, both interview and workshop participants tended to be more interested in discussing the way different paradigms and disciplines related to each other within the so-called ecosystem. While many emphasised the wide range of disciplinary perspectives that made up the field, there was also general consensus that, as one participant put it, at a disciplinary level, 'educational research has become more fractured' with researchers becoming entrenched in particular disciplinary perspectives and not enough work taking place across paradigms, disciplines or methods. As such, participants emphasised that, despite the diversity of disciplines within the field, there was scope for more meaningful interdisciplinary or multidisciplinary working. This point was strongly made in one of the workshops where a participant stated that

most of us are members of a particular tribe... for most people it's the tribe that matters... there is lots of it [of the research ecosystem] that ...is just not what we do.

One participant illustrated this point with reference to the increasing specialisation of the field, with multiple sub-fields catered to by special interest groups and specialist journals that are, largely, seen as 'only read by those firmly embedded in the subfield'. From this perspective, the diversity of disciplines and multiplicity of research areas was not equated with health, but with fragmentation.

This fracturing and disciplinary entrenchment was seen as increasing despite analysis of publication patterns suggesting prominence of interdisciplinary work and despite a discursive emphasis on the importance of interdisciplinary working (particularly from some funders). As one participant from a research background suggested:

there's the challenge to make all the rhetoric about multidisciplinary or interdisciplinarity real and to get people from different disciplines talking in a meaningful way... do psychologists talk to sociologists? Do the people doing initial teacher training talk to anyone in a more theoretical terrain... in a pressurised and time-poor environment, the answer is often no.

Alongside participants emphasising the challenges around inter- and multidisciplinary working, some also raised concerns about the increasing prominence of sociology ('most people would agree that the field has come to be dominated by sociology') and more broadly, of the social sciences within the educational research ecosystem. This was summarised clearly by one interview participant:

[The field] is increasingly dominated by a social science model... obviously a very important part but it also needs something which also draws in other different perspectives from humanities and from arts and from subject specialisms... while we move from strength to strength in the social sciences... that has been at the expense of other forms of research that are actually really important in informing the day-to-day practice of education... there is a disconnect between [the focus on the social sciences] and the things that are always needed in the school sector... There are important philosophical questions, historical questions, but there are also important questions within say the nature of English or the nature of mathematics which don't always lend themselves to social sciences in the analysis.

Several participants identified this prominence of the social sciences as a narrowing of the field and linked it, in part with the Research Excellence Framework, which, to a certain extent, was seen as reinforcing disciplinary silos. However, this narrowing was also explicitly linked with changes in both the discursive and funding landscape which emphasise particular epistemologies and types of educational research questions. One participant summed this perspective up:

because of the EEF and other forces like that, we have seen the narrowing of what counts as an educational research question... organisations like the Royal Society would be alarmed if they really understood... how narrow that has become.

The EEF's focus on the 'what works' agenda, foregrounding quantitative data, experimental design and randomised control trials, is overt within the ecosystem. One representative from the EEF was explicit about this, stating:

The EEF has reintroduced positivism to the UK educational research... for many years the UK educational research was dominated by qualitative methods and interpretivist paradigms. The EEF has had a very strong role in supporting the re-emergence of a positivist lens.

Given the prominence of the organisation in both policy and practitioner contexts, as well as the amount of funding it can provide, it is unsurprising that the EEF is seen as having had an impact on the disciplinary and methodological make-up of the educational research ecosystem. However, the majority of the participants did not frame this impact in terms of a narrowing of disciplines or epistemologies. Rather, the EEF's influence was more frequently described positively in terms of building research capacity:

We're definitely seeing capacity building around the ability to run and manage large scale randomised trials and the development of the methodology, particularly in the analytic frames for that which are more robust and sophisticated than they were ten years ago... the ability to run and manage that kind of research is now more common across the research landscape.

Similarly, while several participants critiqued the dominance of the ‘what works agenda’ as being reductive at a paradigmatic, disciplinary and methodological level, a large number of participants argued that a focus on ‘what works’ was becoming increasingly nuanced within educational research:

What works is a hopelessly naive question. [It’s really about] under what circumstances different approaches work, for which sub-populations... Trials themselves are becoming more complex, moving from ‘does x work’ to more ‘under what circumstances does x work, for whom and what’. This is the direction of travel.

At the same time, while acknowledging the increasing prominence of positivist paradigms and methodological approaches associated with experimental design and RCTs over the last decade, many participants (agreeing with the assertion of the participant from the EEF) suggested that this was a form of rebalancing a previous emphasis on qualitative and interpretivist approaches. In fact, several individuals suggested that qualitative research had also seen extensive developments, driven in part by the focus on rigour brought with more quantitative approaches, such that ‘it’s healthier than it’s ever been’, with increased work being done on conceptualising rigour within the field and developing a wide range of innovative and creative qualitative data collection methods.

7.3. UNDERREPRESENTED AREAS OF RESEARCH

Interview and workshop participants discussed the areas of research that feature in the educational research ecosystem, with a particular focus on identifying gaps or areas that are potentially underrepresented. In general, the majority emphasised the clear breadth of topics covered, as evidenced by our bibliometric analysis. However, several participants highlighted the following areas as potentially needing more work:

CURRICULUM

Several participants particularly highlighted the areas of curriculum design, introduction, and evaluation as issues that appears to be surprisingly underrepresented in the field. A policy maker participating in the workshops emphasised that

there isn’t sufficient research being done... that can help us and guide us on introducing a new curriculum... there are comparatively few academics that work on curriculum... a couple of high-profile ones but I suppose there’s a gap around what should be a huge area of education policy.

Similarly, a funder suggested that there was clearly a potential need for work across the four nations focused on updating the Nuffield review examining ‘a secondary curriculum for the 21st century’.

ARTIFICIAL INTELLIGENCE

AI was raised by several participants as being a key emergent field. Participants highlighted a need for increasing critical discussion of the educational affordances of AI. At the same time, several participants highlighted the way in which AI, and more broadly increased digitalisation and automation, was changing the nature of work and the skills young people and students will need in the labour market. Several suggested this was an important emerging area of work that needed more research attention.

EDUCATIONAL TECHNOLOGY

Although it was noted by participants that our bibliometric analysis highlighted educational technology as a relatively strong field, it was emphasised that Covid-19 had illustrated that a great deal of research is still required. It was felt there was a need for further research into the design, implementation and evaluation of online learning and particularly the way in which technology intersects with socio-economic status and other forms of disadvantage at a structural level and across geographic regions.

INITIAL TEACHER EDUCATION/TRAINING

Relating back to the two research activity systems mentioned above, several participants highlighted a clear gap in large scale rigorous research on initial teacher education and training. One funder summed this up: 'research on and by initial teacher training remains ill attended and with very grave consequences for education as a sector'.

YOUNG PEOPLE'S VOICES

Although overlapping with discussions related to methods and methodology, several participants suggested that there were gaps in the research ecosystem related to research that prioritised and amplified the voices of young people. It was suggested that the perspectives of these key stakeholders in the education dynamic are all too often overlooked and not included in research, often due to the challenges associated with engaging with young people – practically and ethically. Several participants emphasised that more should be done to focus on young people's experiences and bring young people's voices into all research areas. A small number of participants particularly highlighted the importance of young people's voices in the also under-researched area of climate change education, emphasising that research that empowers young people to have a voice in the debates about the future of the world should become a core priority.

LONGITUDINAL RESEARCH

Again, overlapping with methodological discussions, several participants suggested there was an insufficient amount of rigorous longitudinal research:

what matters for education is what the medium and long-term impacts are, not what kids appear to learn in the short term. We want to know whether they can harness that three, five years down the line in a different context with a different application

Consequently, there was an overt call for more longitudinal research and data collection approaches that enabled researchers to look at young people's learning trajectories over the course of their childhood.

RESPONSIVENESS TO SOCIETAL NEEDS

Although not a specific gap in the areas focused on by researchers, several funders in the workshops suggested that the educational research ecosystem was not always as responsive as it should be to the big issues within the educational world or, more generally, in society. One participant used Covid-19 as an example to illustrate this point, suggesting that funders put out calls for pandemic research, but the responses were 'far from satisfying' and were overtly driven by 'researchers' own specific interests and pre-existing projects rather than the needs of the context'. It was suggested that open calls are similarly 'characterised by myriad individual academic interests' rather than core questions or issues. One participant suggested this tendency within the educational research

landscape could be characterised by ‘lots of interesting things discovered around the edges, but the gaping hole of the core question remains unanswered’.

7.4. KNOWLEDGE EXCHANGE AND DISSEMINATION

Participants emphasised the importance of knowledge exchange and dissemination and workshop participants particularly reflected on the prevalence of engagement activities in the landscape as was shown in the interim findings. One researcher participant suggested that this was ‘driven by funding bodies wanting to see engagement, wanting to see pathways to impact... executed throughout projects.’ The participant suggested that while this could be traced back to the Teaching and Learning Research Programme 20 years ago, when it felt new, it has now become increasingly normalised, with engagement being seen as a vital part of raising awareness of research and having impact.

In general participants thought that the mechanisms for knowledge exchange were varied and embedded coherently within the ecosystem. However, several highlighted concerns related to the challenges of linking research with practitioners, as one participant put it: ‘practitioners don’t read academic journals... most of the research that’s published at all isn’t read by practitioners’. This issue was emphasised by another participant, who stated that a lack of meaningful knowledge exchange with practitioners means that ‘a lot of good research that’s done, really important findings, doesn’t go anywhere really... that’s a waste of public money’. This, of course, is an ongoing and much documented and debated concern within educational research and an issue that has driven activity in universities and particularly by the EEF, the Chartered College and ResearchEd as well as being a key focus of BERA over the last decade.

A less discussed and researched issue that several participants raised in the workshops was the importance of research produced in policy contexts in the educational research ecosystem – i.e. research done by governments or commissioned by policy makers. Several participants suggested that research is increasingly undertaken ‘in house’ by governments across the jurisdictions or commissioned by them and undertaken by contract research organisations. Although participants suggested that the ‘quality is varied’, several emphasised the potential value of this kind of research and the role it can play in wider educational discussions, arguing that it should be conceptualised as a key part of the educational research knowledge infrastructure. However, it was argued that few university-based educational researchers engage with this kind of policy research or are even able to access it. Participants, therefore, recommended that more work should be done to ensure that research undertaken within policy contexts should be explicitly shared with academic researchers through partnership working and a meaningful process of knowledge exchange: ‘there’s a need for meaningful two-way dialogue between academic researchers and policy makers where policy research is shared’.

7.5. FUTURE ISSUES; FUTURE AGENDAS

All participants were keen to discuss the future and many highlighted a range of issues that they felt would drive, shape or feature prominently in the educational research ecosystem. These can be summarised as follows:

FUNDING

Funding, perhaps unsurprisingly, was an issue that many participants raised. The research funding situation during and following the pandemic was of particular concern. Several participants emphasised the increasing pressures on public funding and the restructuring of the UKRI as a

potential factor in limiting the amount of money available for educational research. It was suggested that this would be compounded by the fact that charitable funders have become increasingly prominent. With many likely to see reduced income from endowment as the recession impact the stock market, it was suggested educational research will face increasing challenges in accessing funding. At the same time, as large tech companies increasingly feature in the funding landscape participants expressed concerns that educational research will likely become at risk of being embedded in commercial agendas and at risk of losing independence:

I think the finance will drive it [educational research] and we'll probably all be fighting over diminishing resources... public funds are going to be much harder to get... that's going to put the emphasis on particular funders of research who are more politicised, charities with their own particular interests and values.

Several participants suggested that there is, therefore, an urgent need for coordination across educational research. This was seen as requiring key stakeholders (funders, researchers, practitioners and policy makers) acting together to analyse key issues that need addressing (research topics, capacity issues and structural concerns), and, most importantly, ensure adequate funding is made available for these critical issues. This was seen as a means of ensuring educational research avoids the challenge of being 'a leaf in the wind' blown in the direction of whatever issues prominent funders, in a financially stretched context, may be interested in.

SUSTAINABLE, ACCESSIBLE NETWORKING

Several participants emphasised the way in which Covid-19 has reshaped the way in which those in the educational research ecosystem could engage with each other. The affordances of digital communication have meant that many conferences have moved online, that online CPD opportunities for practitioners have become more accessible, and that more opportunities for engagement between researchers, practitioners and policy makers have become available. As concerns over the climate crisis become increasingly overt, the shifts in communication, precipitated by the pandemic will be critical to reducing academic travel and general travel associated with networking and knowledge exchange.

Therefore, many participants were keen to emphasise the importance of a future agenda within the educational research ecosystem to think creatively about sustainable and accessible networking that uses the affordances of digital technologies. One participant described this: 'there's the potential to change networks... that's unpredictable, but very exciting'.

RESEARCH CAPACITY AND HE STRUCTURES

Several interview and research participants highlighted the challenges of HE staffing structures for research capacity building, particularly the increasing reliance on casual contracts for teaching and research staff in university-based education departments. One researcher participant reflected on a study they had done of an education department:

What struck me was the casualisation of the education provision... one institution had 80% of its teaching staff on hourly paid contracts... that is mirrored in many, many places... and that undermines the ability for people to get involved in research... they are not involved in the scholarly culture.

This kind of casualisation was highlighted as a particular problem in relation to teacher education, with precarious ITE staff contracts seen as further detaching teacher education from 'scholarly culture'. However, the growth of precarious employment within funded research projects was also emphasised as limiting capacity in the educational research ecosystem to build teams that grow

knowledge in a sustained, systematic and long-term manner. This issue was particularly linked with concerns over a lack of long-term research agendas. One participant summed this up:

you need to be able to assemble a research team and at least maintain the core of it over relatively long periods of time... that gives you the chance to do some long-term projects and maintain consistent knowledge development.

Although it was acknowledged that issues of casualisation are embedded in wider structures of the academic and non-academic labour markets, several participants highlighted that the nature of research funding was exacerbating this issue, with an increasing reliance on short term research grants with limited resources provided for staff development beyond the immediate foci of the project. One research participant expressed this point clearly:

If you get a research grant that lasts 9 months, which is most of them now... you haven't got the resources to maintain a research team or focus... you're desperately trying to get the next six months of funding... [it might be] for something completely different to the work you were doing last week... you lack cumulative learning... you lack coherent staffing.

This issue was seen by many participants as critical to the future research capacity of the ecosystem. They emphasised the importance of universities and funders actively opposing increased reliance on precarious employment and ensuring more funding opportunities emphasise the development of long-term research agendas, cumulative knowledge generation *within* research teams, and the development of early and mid-career academic and research staff in equitable and inclusive environments.

8. RESEARCH ON EDUCATIONAL RESEARCH

8.1. SCOPING THE FIELD

Over the period of interest there has been continued interest in, and production of, research on educational research, as indicated in Table 8.1. Although, compared with the previous 10-15 years, the tone of the debates around educational research has become a lot more measured and there are signs of increased recognition and visibility of the field, systemic barriers related to capacity, funding, assessment and equity have continued to stimulate interest and critiques.

Table 8.1.1. Studies in our review corpus, by year of publication

Year of publication	Number of studies
2010	14
2011	11
2012	7
2013	6
2014	9
2015	12
2016	5
2017	22
2018	14
2019	9
2020	15
Total	124

Thematically (see Table 8.1.2), the largest proportion of research on educational research in our corpus focuses on the entire field, either UK-wide or in a home country, with particular emphasis on: research assessment, research impact and evidence-informed policy and practice, research capacity, and research in teaching and teacher education; historical, expert and participant accounts of developments in the field and of specific initiatives, programmes, or organisations and networks; thematic analyses of the field or of its subfields using bibliometric data, website and digital data, surveys and interviews; and, to a lesser extent, comparative analyses placing the UK in an international context. The themes explored at whole-field level are also reflected in some of the papers addressing sub-fields or disciplines of educational research, which in our corpus included reviews of professional education areas such as medical education, engineering education and accounting education; studies of subject research such as geography education, science education, mathematics education, physical education, humanities education; reviews of 'disciplines of education' (sociology, philosophy, psychology, history, economics); and studies of sub-fields such as comparative and international education, higher education research, educational administration, and school effectiveness research. Some of the outputs we reviewed also focused on research on

specific sectors – aside from higher education, ITE and school research, we came across work on educational research in further education, vocational education, and SEND research. A number of papers also addressed the state of close-to-practice research (and, cognately, of practitioner research, including action research). Note that, aside from whole-field analyses, most of the other foci were associated with under five publications each.

Table 8.1.2. The focus of publications in our review corpus

Focus of papers	Frequency
Whole field in the UK or at least two home countries	44
Whole field in international comparison	16
Whole field in home country	5
Sub-field (sector)	9
Sub-field (paradigm)	15
Sub-field (discipline)	20
Other	15
Total	124

Methodologically (Tables 8.1.3 and 8.1.4), this literature shows a balance between research involving new data collection (predominantly, purposive survey and interview data); secondary data analysis and documentary analysis; and theoretical and conceptual pieces. Literature reviews, including systematic reviews, historical, comparative and experiential accounts were less prevalent. The primary studies were largely dominated by qualitative approaches (particularly interviews and documentary analyses). Samples for interviews, surveys and focus groups tended to be purposive or self-selected, not representative.

Table 8.1.3. Methodological approaches in the review corpus

Approach	Frequency
Empirical study (new data)	39
Empirical study (secondary data)	28
Theoretical inquiry or argument (including philosophical)	22
Practitioner/ experiential account	16
Review of prior research	10
Historical account	9
Total	124

Table 8.1.4. Methods for data collection, organisation and analysis

Method	Frequency
Interviews	23
Documentary analysis	21
Reviews	17

Historical accounts	15
Survey	14
Case study	12
Bibliometrics	11
Secondary/ administrative data analysis	7
Philosophical and conceptual	7
Digital/ website analysis	7
Comparative	5
Focus group	5
Action research	3
Discourse analysis	3
Biographical research	2
Ethnography and observation	2
Essays (reflective, critical)	24
Other	5

The average quality rating in our corpus was 3.2, and the median was similar. Note that 13 papers were not rated. The lowest scores (14 outputs scored between 1 and 2) included some under-developed literature reviews and several systematic reviews that failed to provide the necessary detail on the methodology followed; some small scale studies that used interviews, survey and documentary analysis without adequately specifying their methods and samples; as well as some reflective commentaries. Publications that scored above average adopted a range of approaches and methods, including interviews, surveys, network analysis, action research, bibliometric studies, documentary and secondary analysis, evidence syntheses, comparative, historical and philosophical approaches, as well as a number of tightly argued critical essays. The highest scoring publications (n=43) had breadth and depth, included well-reasoned interpretations, showed awareness of the wider context and of critical bodies of literature, and were rigorous in their methods, including analysis.

8.2. GAPS IN RESEARCH ON EDUCATIONAL RESEARCH

Whole-field research across the UK and research on established sub-fields such as comparative education, higher education, science education, practitioner research or school effectiveness enjoyed relatively wide coverage in the field, as well as a diversity of methods and approaches. Methodologically, comparative and historical studies, qualitative empirical research, discourse and content analysis, descriptive analyses of administrative data and action research were very well represented; while several emergent approaches were also clearly establishing themselves, such as bibliometric, linguistic, network and digital media analyses.

In contrast, areas of research that were less represented in our corpus included:

- Research on educational research in each of the home countries of the UK

- Research that considers UK educational research in the context of wider intellectual traditions and global research trends
- Systematic reviews and other rigorous syntheses of research in subject areas and disciplines
- Systematic reviews and other rigorous syntheses of pedagogical research in different areas of professional education
- Advanced quantitative analyses, large-scale and longitudinal studies
- Ethnographic research
- High-risk research that experiments with methodological and conceptual innovations
- Critical research that draws on open dialogue with multiple stakeholders.

8.3. AGENDA AND PRIORITIES

The literature was divided between prioritizing a coordinated or a grassroots approach to setting the future agenda for educational research. The theme of coordination, including the determination of strategic priorities for funding, often arose in response to criticisms of educational research as being overly fragmented among communities, sectors, traditions, disciplines and paradigms. The grassroots approach was based on ideas of diversity, collegiality and collaboration, and responded to concerns about politicization of research agendas, managerialism, censorship and audit. Overall, 41 documents in the study (with an average quality rating of 3.4) provided explicit discussion of agendas for educational research, but many others also touched on this topic very briefly or implied it.

In terms of setting the agenda and priorities for the future of educational research, the literature about educational research in the UK clustered around the following themes: adopting a principled view on what matters in educational research; learning from past experience and models; ensuring a balance of priorities and approaches; cultivating (inter/multi)disciplinarity; improving dissemination and impact and raising the profile of educational research; and developing and sustaining 'capacity' for engagement with and in research.

ADOPTING A PRINCIPLED VIEW ON WHAT MATTERS IN EDUCATIONAL RESEARCH

Six of the papers reviewed mounted strong arguments, echoed more briefly in most of the other papers, for the importance of articulating and upholding clear principles for the governance, conduct and use of educational research. Such principles, echoed across the corpus in a range of papers, included:

- Commitment to ethical and responsible approaches to educational research
- Sustaining and enhancing the quality of educational research
- Cultivating equity, diversity and inclusion in both the substance and the organization of research, including challenging inequalities in what counts as relevant knowledge and valuable impact
- Collaboration among disciplines, stakeholder groups, researchers, and across geographical regions (particularly in light of the uneven geographical distribution of educational research production across the UK)

- Sustaining the independence of research, with funding bodies keeping restrictions on research (e.g. on research problems, methods, dissemination, conclusions, theorizing) to a minimum, including in commissioned research.

LEARNING FROM PAST EXPERIENCE AND MODELS

Nine papers in the corpus were historical studies of educational research in the UK. 15 others offered accounts from unique stakeholder perspectives or evaluations of past initiatives aimed at understanding and developing the field, including, for example, the Teaching and Learning Research Programme (TLRP), the Strategic Forum for Research in Education, the Applied Educational Research Scheme (in Scotland), the Welsh Educational Research Network, WISERDEducation (also in Wales), the BERA Observatory, the Centres for Excellence in Teaching and Learning Programme (in higher education), or the BA/RS Harnessing Educational Research project. For example, papers on the experience of the TLRP emphasized its dual commitment to combining authentic user engagement with high quality science; while work arising from the SFRE argued for a comprehensive knowledge development and mobilization system for educational research across all countries of the UK (origination and planning, creation and production, assessment and validation, collection and interpretation, mediation and brokerage, use and impact). Across this literature, a clear common message was that policy making and funding strategies for educational research should take into account lessons from past experience (and the extent to which that work had been embedded in institutions) as well as considering the current pressures in the system.

BALANCING PRIORITIES AND APPROACHES

A common theme was the need to strike a balance in setting the agenda for educational research between user-defined priority needs and a more open research agenda aimed at advancing scholarly knowledge. This balance, it is argued, should translate into a mix of more strategic and policy/practice-oriented research, on the one hand, and more ‘blue skies’, conceptual, exploratory, high-risk, and critical research, on the other. In addition, and importantly, some papers argued that educational research should also aim for balance in its impact aspirations, between global and local priorities; and in its frames of reference, between Anglophone and Eurocentric, and international traditions of educational thought.

CULTIVATING (INTER/MULTI)DISCIPLINARITY

A long-standing debate within research on educational research has been that around the epistemic and sociological make-up of the field, in terms of its being a combination of ‘foundational’ disciplines, a discipline in its own right, or a multi- or interdisciplinary field. Indeed, a study of research projects included in the review found that three quarters of UK-based educational research projects were multi-disciplinary, compared to one third in Germany (although the term ‘discipline’ has a different meaning in the two contexts). Several documents argued at length for the need to understand the different intellectual traditions that make up the field in the UK and also in relation to international contexts. Work in the ‘foundational’ disciplines (such as sociology, philosophy, psychology, history, economics, and also geography, anthropology etc.) of educational research was found to continue apace, augmented by pedagogical research drawing on subjects represented in teacher education courses (e.g. in our corpus: mathematics, languages, science, arts, drama, sports and physical education, history, geography, English, religious education), and also in other areas of higher education-based professional training (e.g. medical, nurse, dentistry, law, social work, accounting, engineering, chemistry education). For both these bodies of research, a priority identified in the literature reviewed was the need to collaborate more with other disciplines of

education, but also with their 'parent' or 'subject' disciplines, in order to ensure both relevance to broader educational issues, and depth of specialist expertise.

At the same time, the corpus includes accounts of sub-fields of research that are seen as emerging disciplines or interdisciplinary fields in their own right (in our corpus, examples include higher education research and comparative and international research, but also teacher education research, educational technology research and school effectiveness research) and as such mirror some of the debates about the status of knowledge and profile of research that characterize educational research more widely. On a smaller scale, the literature also identified special interest groups which are epistemologically and methodologically eclectic but have a strong sense of purpose and coherence of focus (such as, for example, autism education research or educational administration research), as well as communities of practice arising around multi-institutional or inter/multidisciplinary projects, for example on educational inequalities, or decoloniality and anti-racism in education. In all of the latter cases, barriers were identified to how multi/interdisciplinary educational research may be conducted, disseminated, and recognized.

IMPROVING DISSEMINATION AND IMPACT AND RAISING THE PROFILE OF EDUCATIONAL RESEARCH

An ongoing theme in research on educational research, arising from survey and interview studies in particular, is that of the need to improve the visibility and raise the profile of educational research and of its subfields (including pedagogical research in fields such as accounting, engineering or medical education). To do so, it was suggested that funding bodies and professional societies could engage in dialogue, articulate the need for high-quality and diverse research on education, and also foster collaboration and constructive criticism and debate.

While in prior decades (particularly late 1990s- early 2000s) the literature about educational research was dominated by criticisms of its quality, and therefore the key to raising its profile was seen to be investment in improving rigour, particularly in quantitative research, the literature of the recent decade notes clear improvement on all these counts and, with some exceptions, no longer identifies methodological rigour as the major area for improvement. Instead, it continues the other key theme from the 1990s-2000s, which was that of relevance to practice and policy in each devolved administration, through a great deal of emphasis on: improving the infrastructure for dissemination of and access to educational research; supporting practitioners in engaging with research; creating the conditions for strong partnerships to thrive; and enabling impacts. Each of these areas of priority is conceptualized in a range of ways. For example, the literature offers thoughtful accounts of how improving dissemination and access may range from simple 'translation' of research findings into practice-oriented formats, to 'knowledge transformation' arising from joint interpretation, critique and validation of findings. Similarly, practitioner engagement may include both a consumer and a participant role, with relevant capacity and 'literacies' being developed for both. Partnerships may encompass various models, from demand-driven provision of syntheses of independent evidence, to 'upstream engagement' that enables researchers to define the user and beneficiary groups for planned research and thus to devise focused means of reaching them, and to 'respectful alliances' across stakeholder groups that may involve co-production of research and open flows of information between research and policy actors. The perspectives on impact in the literature reviewed were somewhat more divided; while there was clear shared appreciation of the contribution of educational research to both policy and practice, a consistent concern was expressed around reducing that contribution to narrow indicators and to areas where impact is easier to capture for audit purposes.

DEVELOPING AND SUSTAINING 'CAPACITY'

Documents in the corpus point out clearly that the educational research workforce in the UK is very diverse, coming from several sectors (universities, further education colleges, schools and other educational settings, government agencies, commercial organisations and independent consultancies, charities and NGOs, international organisations and so on). At the same time, the papers point out that the infrastructure, knowledge and skills and organisational conditions for engaging in high-quality, independent and useable research are unevenly distributed across regions and sectors. They also indicate that historically women, BME, and researchers with a practitioner background in particular (as well as researchers with other characteristics) have been under-represented in the field's definitions of 'research active' staff and in its research leadership structures. Equity, diversity and inclusion are thus identified as an important priority in the corpus.

Continuing themes from the prior decades, the literature argues for the need to develop a wide range of research skills, both through masters' and doctoral research, and through professional development activities aimed at practitioners in all sectors, including in higher education. Quantitative skills continue to be mentioned, but other advanced methodological and theoretical skills (such as those involved in mixed-method longitudinal research, or in secondary analysis of large data), as well as transferable skills involved in interpreting, communicating and critically evaluating research, are mentioned. Note that, like in the case of impact, the discourse around priorities for developing research cultures and research capacity also includes a critical strand, which aims to reveal the 'power entrapments' of the discourse of 'capacity building', usually seen as 'benign and altruistic'.

Two other areas of priority are also important to mention here. First, across the corpus, many papers pointed out the value of encouraging collaborative research cultures and practices, as opposed to an excessive focus on competitiveness inside and among institutions. Second, funding arrangements were seen as essential to sustaining a critical base for research in education; particularly in relation to education departments in higher education institutions, fluctuations of funding that reduce capacity below optimum levels across different segments of the field (for example by prompting restructuring, voluntary redundancies and casualisation) are likely to have serious long-term consequences.

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APPENDICES

INTERVIEWS AND WORKSHOPS

APPENDIX 1: INTERVIEW SCHEDULE

1. [Following an initial discussion of the particularities of the interviewee's work on educational research]: In the light of your prior research on the topic and experience of the field, what are your views on
 - its current state
 - its projections for the future?

2. In particular, in your view:
 - What are the main themes/topics associated with educational research in the UK in the period 2010-20? What evidence has been sought and obtained through recent educational research? What are the strengths of the evidence produced in the past decade? What are the weaknesses?
 - What designs and methodologies, types of methods and data have been most prevalent in educational research? Is this the right mix? What is missing, if anything?
 - What disciplinary and interdisciplinary expertise has been employed in such research? What disciplines have led and participated in educational research studies? Is this the right balance?
 - Who are the prominent producers of educational research? Has this landscape been changing? How? Is this a desirable change? What are the challenges, if any?
 - What channels have been most prevalently used to share the findings of this research with policy makers and practitioners? What is the direction of travel here? Anything particularly innovative/ worthwhile? Anything missing?
 - Who are the key target audiences of recent educational research outputs? What tends to be the main expected purpose for deploying research? Has the field got this balance right? What are the strengths/ weaknesses?
 - What are the distinctive features of recent educational research in the four countries of the UK?

3. On balance, what should educational research policy and campaigning prioritize over the next three years? What would be the key recommendation you would make, drawing on your research and experience?

4. Is there anything that we have not included in the scope of this project and that you think should have been included?

APPENDIX 2: WORKSHOP SCHEDULE

1. Introduction, reminder of recording (oral consent), and the scope, purpose and funding arrangements for the project.
2. Presentation of interim findings followed by questions as a whole group.
3. Breakout groups facilitated by team members addressing the following key questions:
 - a. The interim findings
 - i. How well do these findings reflect your perception of the field and its ecosystem? Why?
 - ii. What is well represented? What else should be included?
 - b. Further discussion...
 - i. What are the strengths of the educational research produced in the past decade (scope, coverage, interdisciplinarity, methodologies)? What are the weaknesses?
 - ii. Who do you see as the main producers of educational research?
 - iii. Is the ecosystem of educational research in the UK functioning optimally? Why/why not?
 - iv. What channels have been most prevalently used to share the findings of this research policy makers and practitioners? What are the strengths/ weaknesses?
 - v. Who are the key target audiences of recent educational research outputs? What tends to be the main expected purpose for deploying research? Has the field got this balance right?
4. Final plenary and close
 - i. What should educational research policy and campaigning prioritize over the next three years?
 - ii. Is there anything that we have not included in the scope of this project and that you think should have been included?

Bibliographic information:

Check against the information from paper

Author/s affiliation:

Check against information from paper

Funder:

Type from paper if applicable

Type of output: (select from drop-down list)

- Book
- Chapter
- Article
- Report
- Other

Focus/topic (drop-down): (select from drop-down list)

- Whole field in UK or at least two home countries
- Whole field in home country
- Whole field in international comparison
- Sub-field (discipline) - for example, reviews of the state of geography education research; teacher education research
- Sub-field (paradigm) - for example, reviews of the state of comparative educational research; or of action research etc
- Sub-field (sector) - for example, reviews of the state of educational research produced by think tanks; FE colleges and schools; government agencies etc
- Other

Approach and warrant (drop-down): (select best fit from drop-down list)

- Empirical study (new data)
- Empirical study (secondary data)
- Theoretical inquiry or argument (including philosophical)
- Practitioner/ experiential account
- Historical account
- Review of prior research
- Other

Problem statement and/or question/s:

Enter the research question/s from the paper and/ or its problem statement, or statement of aim.

Approach and sample:

Enter brief note on the approach/ methodology, datasets and sample/s that underpin the paper reviewed itself

Key findings

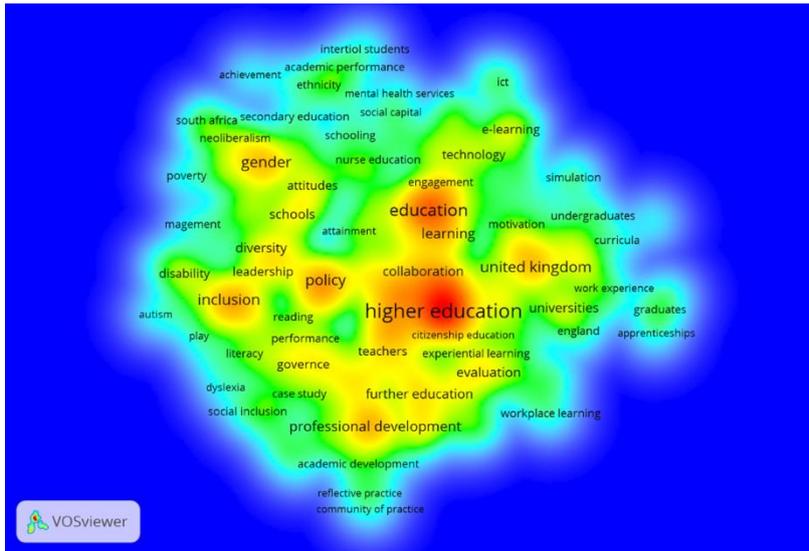
Findings: Focus/ scope/ coverage of educational research/	Enter findings and key arguments made in the paper about the focus and topics (and gaps) of UK educational research across the field and its sub-fields.
Findings: Future research priorities/ agenda/ needs	Enter findings and key arguments made in the paper about the future agenda, current and future needs, and existing or desired priorities (and priority-setting processes) for UK educational research across the field and its sub-fields.
Findings: Funding	Enter findings and key arguments made in the paper about key funders, funder arrangements, funding distribution, volume of funding and other funding-related topics UK educational research across the field and its sub-fields.
Findings: Capacity	Enter findings and key arguments made in the paper about the breadth, depth and distribution of educational research capacity in the UK and about capacity building processes and initiatives/ programmes
Findings: Outputs /publications/ volume	Enter findings and key arguments made in the paper about the volume, distribution, types, format, patterns of citation, visibility and authorship, open access productivity, and other output-related issues concerning UK educational research across the field and its sub-fields.

Findings: methodologies	Enter findings and key arguments made in the paper about designs, paradigms, methodologies, approaches (including theoretical), methods, strategies and techniques used in UK educational research across the field and its sub-fields.
Findings: Impact/use/dissemination	Enter findings and key arguments made in the paper about processes, agents and outcomes of impact, dissemination, use and engagement activities connected with UK educational research across the field and its sub-fields.
Findings: Institutional base	Enter findings and key arguments made in the paper about the types of institutions producing and sharing educational research, about organisational set-up, mechanisms, and cultures, and about organisational governance and networks - connected with UK educational research across the field and its sub-fields.
Findings: research assessment	Enter findings and key arguments made in the paper about the research assessment processes (incl. REF/RAE), patterns, challenges, opportunities that apply to UK educational research across the field and its sub-fields.
Findings: System and policies	Enter findings and key arguments made in the paper about the policies, national and regional governance arrangements and systemic and infrastructural challenges and opportunities <u>affecting UK educational research</u> across the field and its sub-fields.
Findings: Other	Enter any findings and key arguments made in the paper that are within scope of our systematic review (see the RQs and the RS/BA project) but do not fit in any of the columns above.

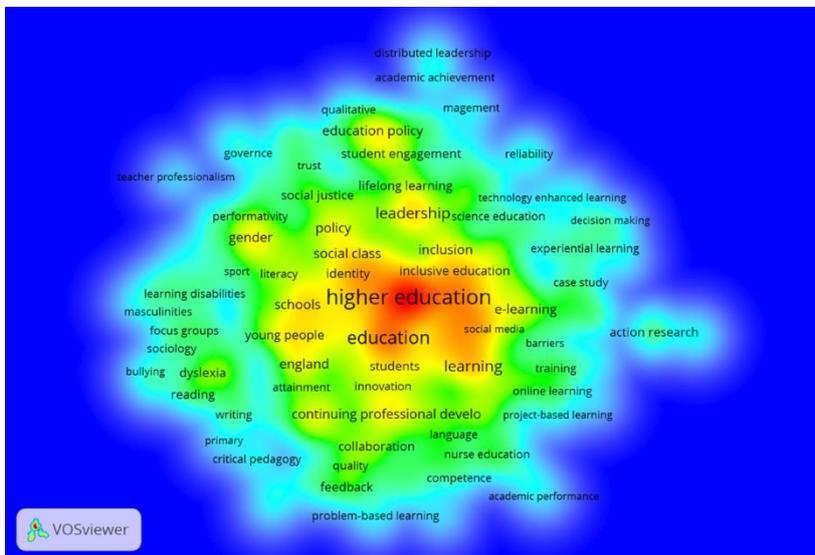
Recommendations made in the paper reviewed for educational research as a field/ sub-field in the UK:

APPENDIX 4: QUALITY ASSESSMENT TEMPLATE FOR THE SYSTEMATIC REVIEW

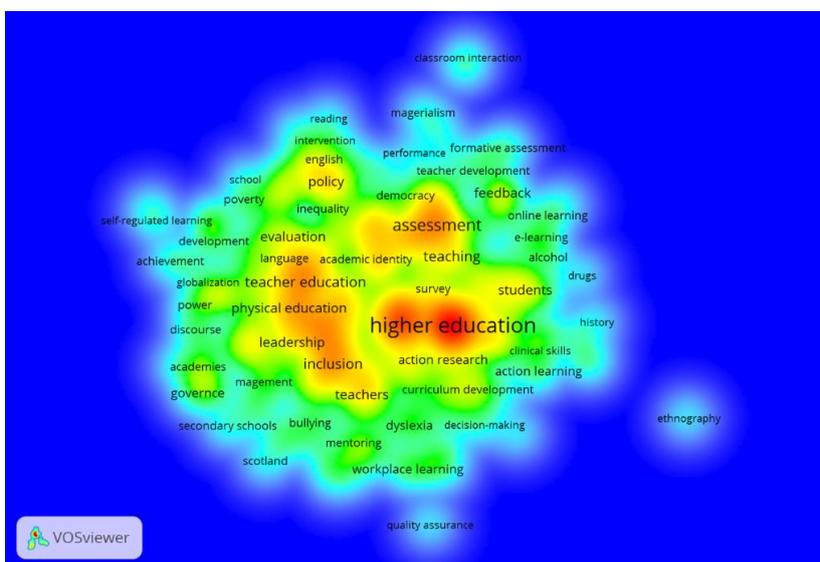
Criterion	Definition	Score:
Strength of conceptualisation/theory	Nuanced and critical, in-depth engagement with the concepts – no uncritical use of terminology	4 – <i>criterion fully met;</i> 3 – <i>criterion mostly met, though with some weaknesses;</i> 2- <i>criterion only partly met, with several or serious weaknesses;</i> 1 – <i>criterion largely not met</i>
Rigour in argument/ empirical study	Systematic, detailed and critical presentation of the warrant for the research – methods, data, theories, argumentation etc	
Appropriateness of approach	Methods and analysis (including non-empirical approaches) fit the questions, objectives and problems addressed	
Well-grounded conclusions and recommendations	Conclusions and recommendations are clearly arising from the evidence and argument presented – no guesswork and undue extrapolation	
Thoughtful discussion/ insight of experiential account	Richness of insight and experience, including coming from (potentially unique) understanding of the field	
OVERALL		



2012

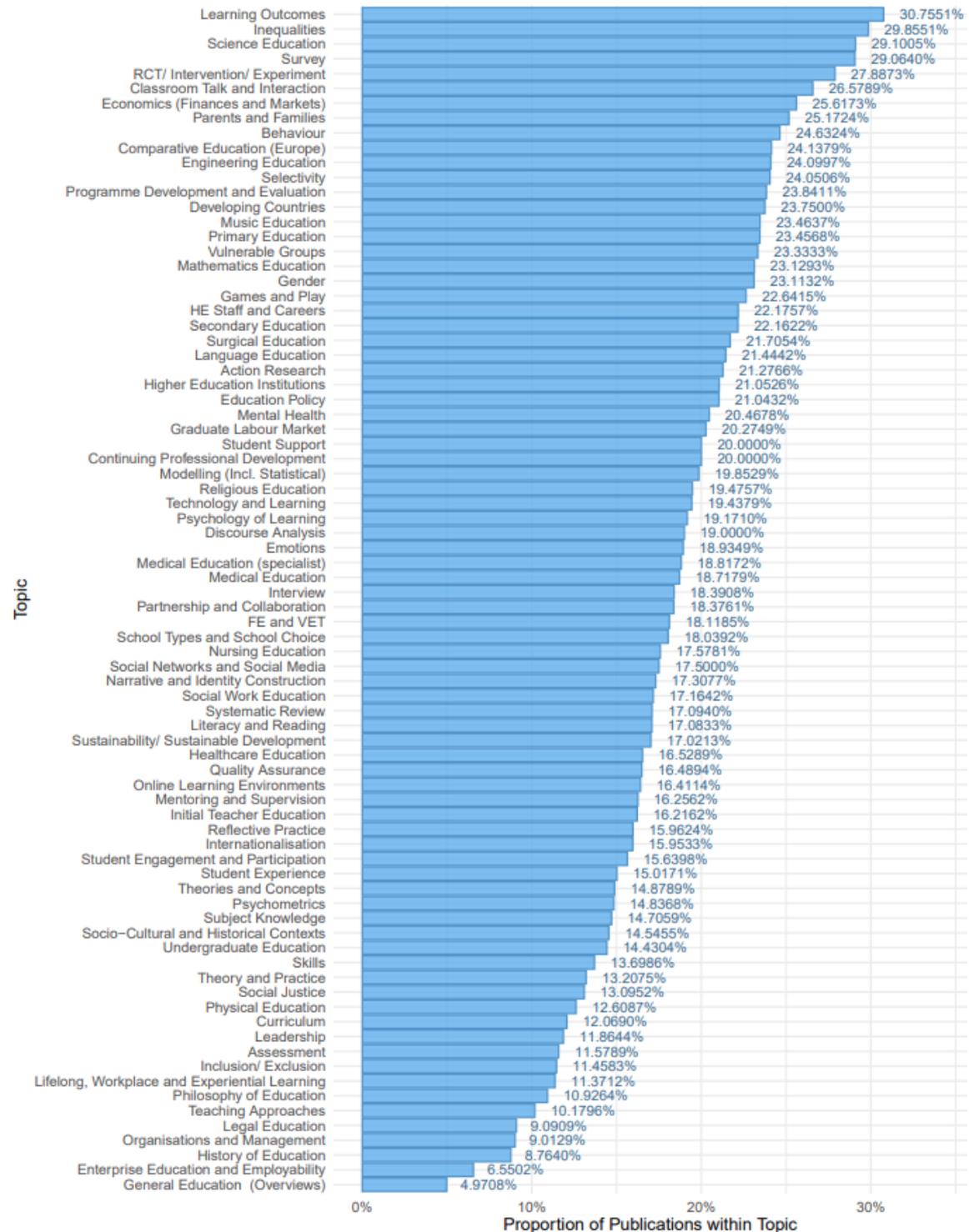


2013



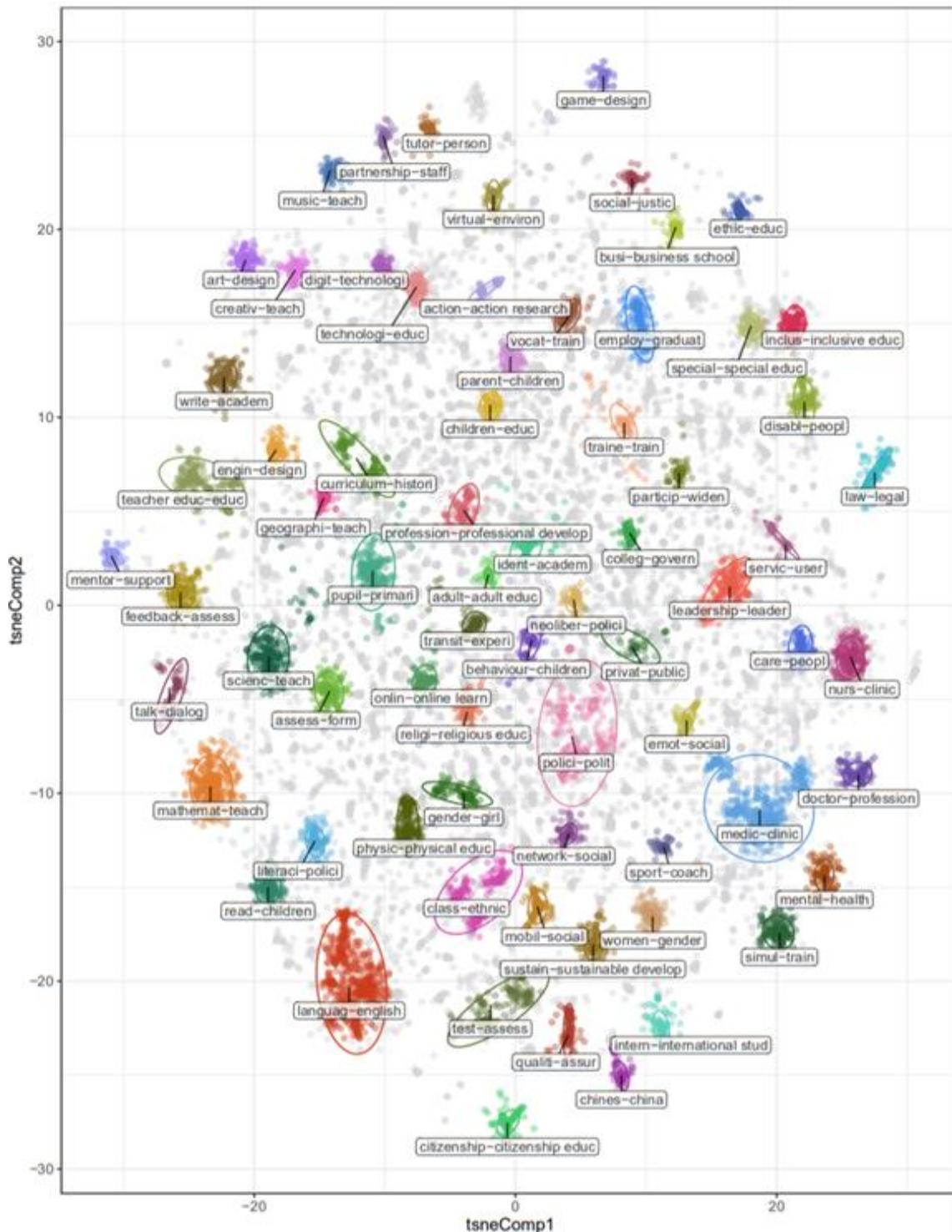
APPENDIX 6. PROPORTION OF RESEARCH OUTPUTS WITHIN EACH TOPIC INDICATING FUNDING

Proportion of research outputs within each topic (based on allocation of documents to the most prominent topic therein) indicating funding (i.e. acknowledging a funding body) during the period of interest (2010 to 2020)



APPENDIX 7: 2-DIMENSIONAL SCATTERPLOT VISUALISING HDBSCAN CLUSTERING OF DOCUMENTS (71 CLUSTERS) IN THE PUBLICATIONS CORPUS

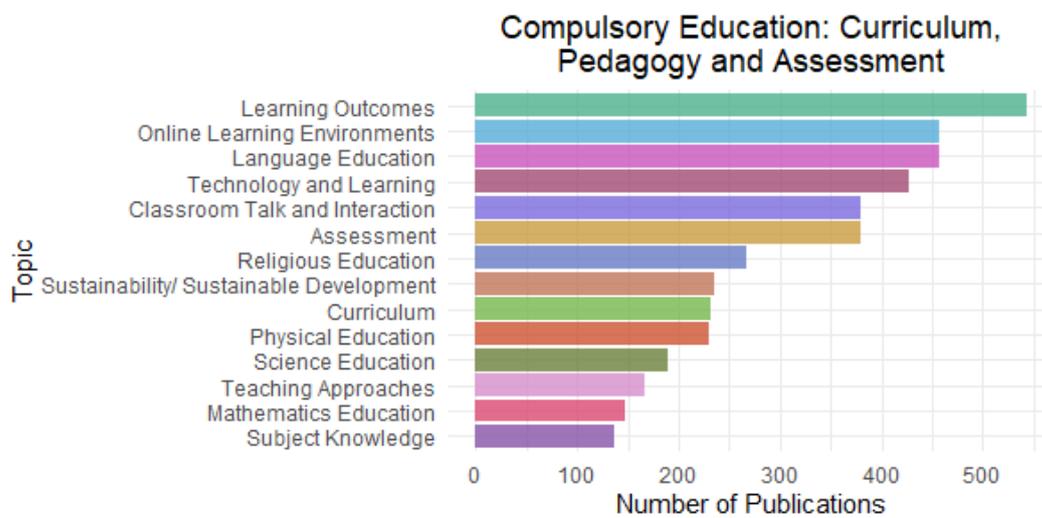
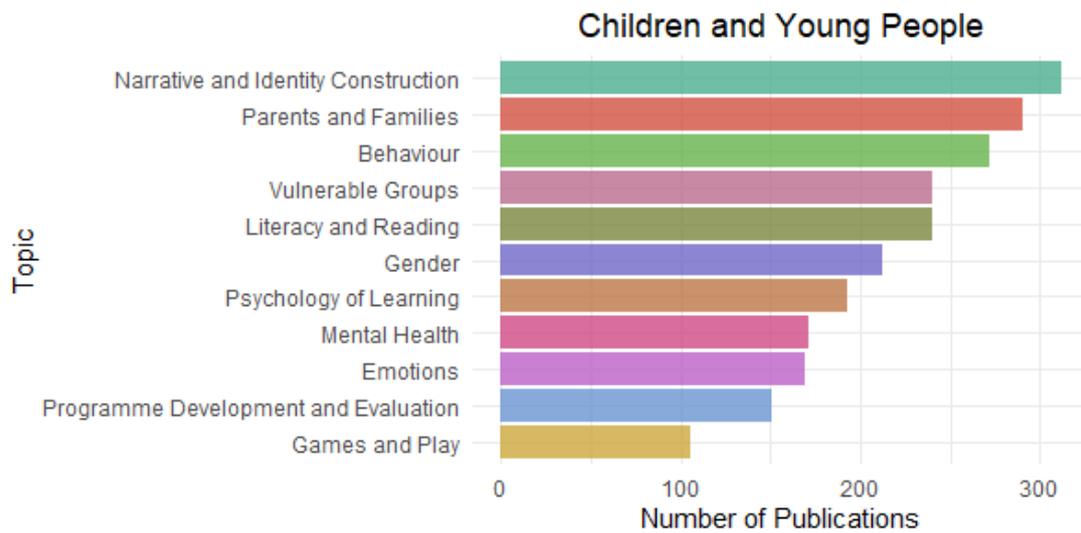
Noise points (i.e. documents not clustered; 11,496 documents) are in grey. Cluster labels are based on the two terms with the greatest importance (tf-idf) throughout documents within clusters, and do not reflect any subjective interpretation or judgement of content therein.



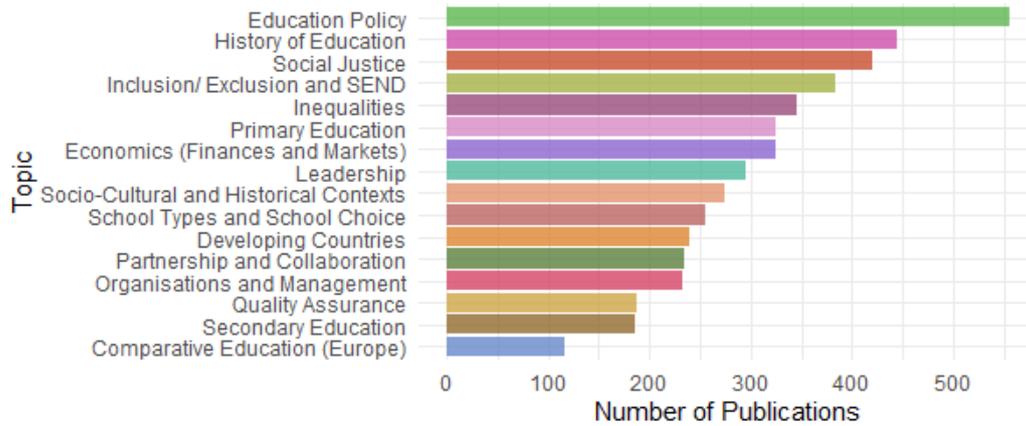
Note, whilst t-SNE dimensionality reduction preserves local neighbourhoods, this method fails to preserve global structure or distances. As such, distances between clusters are not necessarily reflective of the degree of similarity between topics.

APPENDIX 8: NUMBER OF PUBLISHED RESEARCH OUTPUT DOCUMENTS IDENTIFIED AS PRIMARILY ADDRESSING EACH OF THE GENERATED TOPICS

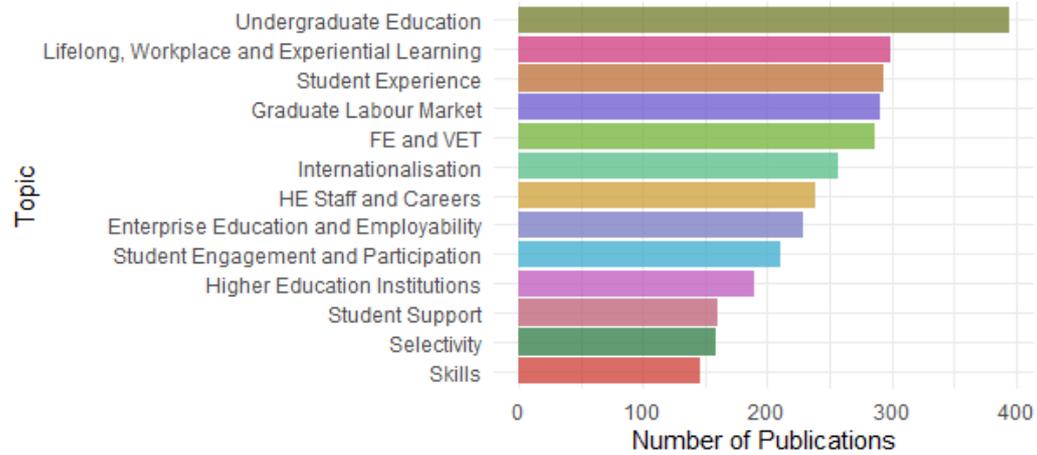
Here, for purposes of clarity, topics in the publications corpus are presented across several plots which reflect general thematic domains which emerged through inspection of topic content and results of hierarchical clustering of topics.

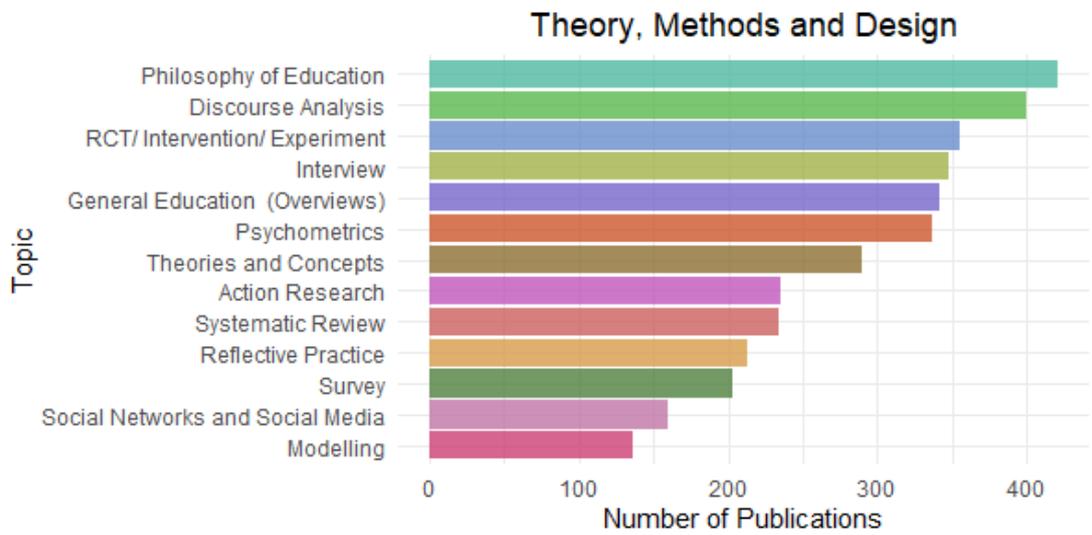
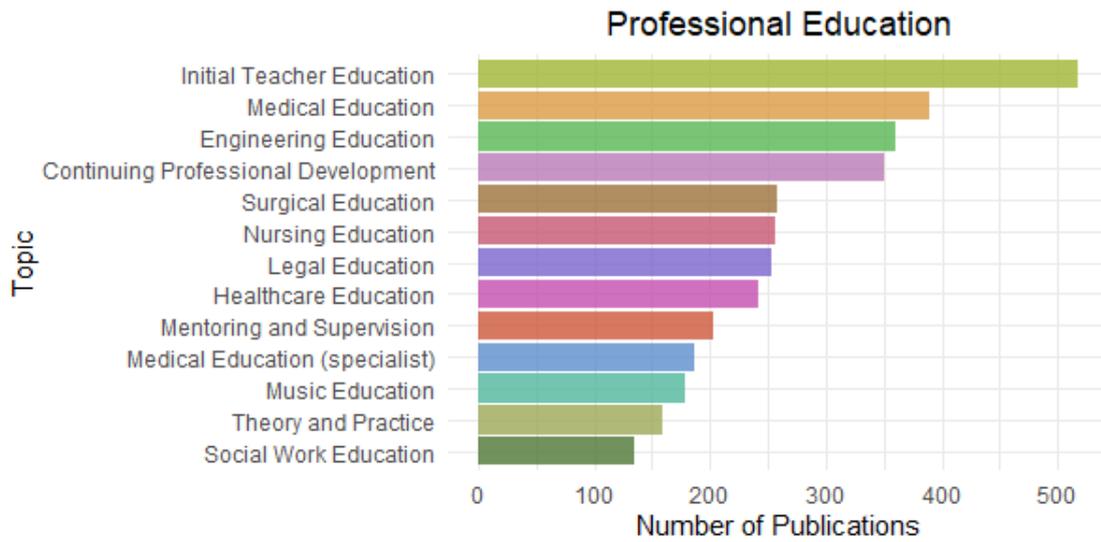


Compulsory Education: Policy, Organisations and Systems

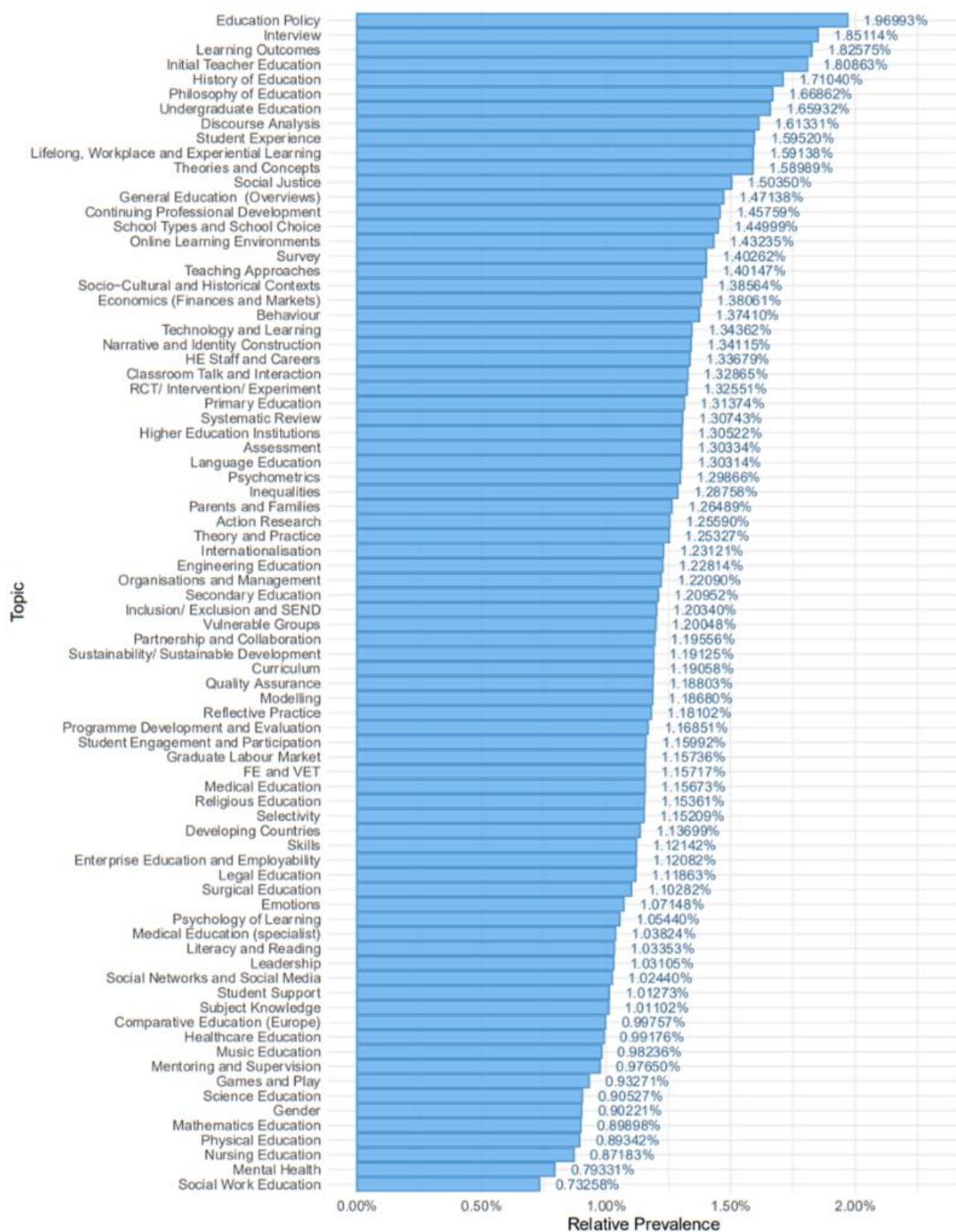


Post-Compulsory Education





APPENDIX 9: RELATIVE PREVALENCE OF TOPICS THROUGHOUT PUBLISHED RESEARCH OUTPUT CORPUS



APPENDIX 10: LDA TOPIC LABELS AND ASSOCIATED TERMS IN THE PUBLICATIONS CORPUS

Topic Label	Terms Related to Topic
Action Research	project, action, develop, action_research, research_project, learn, particip, process, base, report
Assessment	assess, feedback, format, mark, examin, student, process, learn, perform, improv
Behaviour	attitud, factor, behaviour, influenc, posit, adolesc, perceiv, behavior, intent, relationship
Classroom Talk and Interaction	teacher, classroom, lesson, teach, interact, observ, talk, dialogu, dialog, practic
Comparative Education (Europe)	unit, european, kingdom, unit_kingdom, countri, europ, nation, uk, union, compar
Continuing Professional Development	profession, develop, profession_develop, continu, profession_learn, practic, learn, continu_profession, teacher_profession, educ_profession
Curriculum	curriculum, art, develop, nation, curricula, design, subject, curricular, nation_curriculum, curriculum_develop
Developing Countries	citizenship, south, region, develop, communiti, rural, africa, conflict, urban, countri
Discourse Analysis	discours, power, critic, analysi, neoliber, polici, resist, domin, construct, subject
Economics (Finances and Markets)	public, market, privat, govern, sector, fund, econom, cost, increas, financi
Education Policy	polici, educ_polici, govern, reform, maker, england, polici_practic, nation, polici_maker, scotland
Emotions	emot, psycholog, cognit, anxieti, stress, affect, behaviour, intellig, resili, relat
Engineering Education	design, engin, program, comput, base, student, stem, industri, develop, evalu
Enterprise Education and Employability	methodolog, implic, design, find, origin, practic, methodolog_approach, design_methodolog, limit, practic_implic
FE and VET	colleg, vocat, qualif, level, england, degre, post, cours, sector, train
Games and Play	role, play, game, develop, relationship, role_play, understand, base, context, activ
Gender	gender, women, girl, femal, male, boy, differ, equal, age, cultur
General Education (Overvicreativ, rang, geographi, includ, key, wide, practic, offer, idea, debat ews)	
Graduate Labour Market	employ, graduat, career, labour, job, market, skill, labour_market, degre, uk
HE Staff and Careers	academ, staff, univers, institut, uk, faculti, staff_student, impact, academ_staff, disciplin
Healthcare Education	care, patient, health, healthcar, profession, safeti, health_care, centr, hospit, provid, practic
Higher Education Institutions	univers, uk, student, institut, chines, uk_univers, china, univers_student, academ, uk_educ
History of Education	histori, centuri, chang, time, histor, world, past, polit, futur, contemporari
Inclusion/ Exclusion and SEND	inclus, disabl, special, special_educ, mainstream, inclus_educ, support, intellectu, provis, difficulti

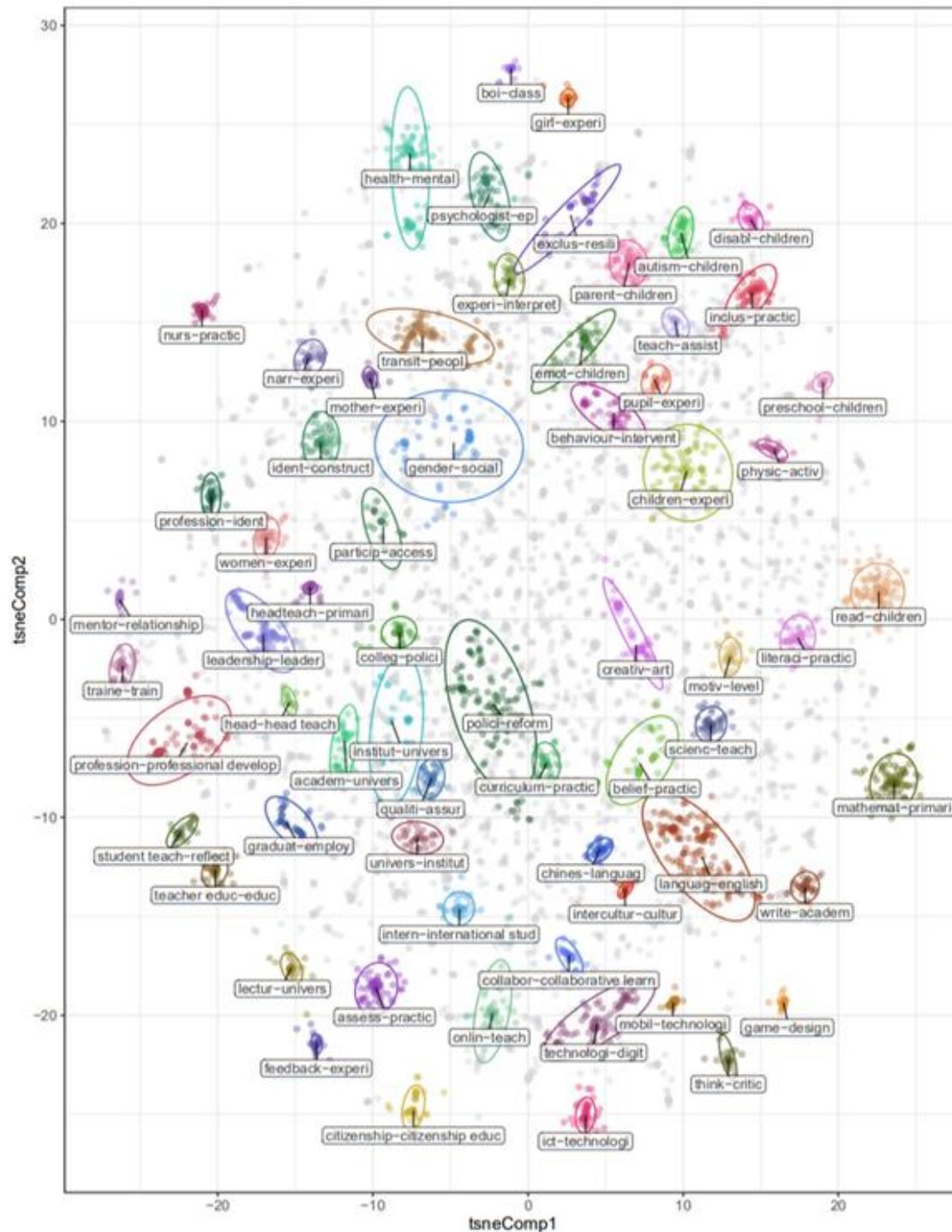
Inequalities	class, social, ethnic, econom, inequ, socio, minor, aspir, white, race
Initial Teacher Education	teacher, teacher_educ, teach, student_teacher, initi, initi_teacher, educ_teacher, school, profession, england
Internationalisation	intern, global, countri, nation, intern_student, develop, world, cultur, compar, mobil
Interview	interview, qualit, analysi, structur, particip, find, semi, semi_structur, structur_interview, conduct
Language Education	languag, english, learner, linguist, languag_learn, foreign, english_languag, foreign_languag, learn, speak
Leadership	leadership, school, leader, manag, school_leader, princip, develop, role, head, improv
Learning Outcomes	perform, achiev, effect, student, academ, examin, grade, attain, level, predict
Legal Education	ethic, law, legal, account, moral, respons, dilemma, concern, regul, code
Lifelong, Workplace and Experiential Learning	learn, base, base_learn, learner, lifelong, outcom, workplac, lifelong_learn, learn_outcom, activ
Literacy and Reading	read, literaci, write, text, word, comprehens, develop, reader, skill, process
Mathematics Education	mathemat, communiti, practic, communiti_practic, develop, learn, particip, solv, support, activ
Medical Education	medic, clinic, student, medic_student, medic_educ, medic_school, doctor, medicin, undergradu, school
Medical Education (specialist)	train, traine, postgradu, educ_train, uk, time, experi, survey, teacher_train, consult, questionnair
Mental Health	health, mental, risk, mental_health, promot, peopl, prevent, adolesc, intervent, relat
Mentoring and Supervision	transit, mentor, doctor, support, experi, supervis, induct, scheme, time, newli
Modelling	model, process, integr, develop, structur, base, framework, construct, dynam, propos
Music Education	adult, music, visual, represent, imag, interpret, event, draw, experi, particip
Narrative and Identity Construction	ident, narrat, profession, experi, stori, construct, profession_ident, explor, person, context
Nursing Education	nurs, student, placement, clinic, pre, nurs_educ, nurs_student, registr, practic, experi
Online Learning Environments	learn, onlin, environ, virtual, learn_environ, distanc, learner, resourc, design, interact
Organisations and Management	manag, busi, chang, organis, strategi, innov, plan, challeng, implement, process
Parents and Families	children, parent, famili, child, home, school, age, support, childhood, involv
Partnership and Collaboration	collabor, partnership, share, develop, activ, initi, support, involv, opportun, learn
Philosophy of Education	pedagogi, pedagog, critic, philosophi, practic, transform, question, disciplin, theori, concept
Physical Education	physic, physic_educ, sport, activ, ireland, northern, northern_ireland, bodi, experi, particip
Primary Education	primari, school, primari_school, children, pupil, teacher, primari_educ, classroom, age, england

Programme Development and Evaluation	programm, evalu, develop, impact, master, postgradu, educ_programm, degre, design, level
Psychology of Learning	motiv, learner, efficaci, goal, task, belief, achiev, orient, learn, strategi
Psychometrics	test, measur, valid, score, assess, scale, examin, reliabl, item, instrument
Quality Assurance	system, qualiti, educ_system, standard, improv, assur, qualiti_assur, institut, process, develop
RCT/ Intervention/ Experiment	intervent, effect, control, improv, post, evalu, pre, outcom, trial, test
Reflective Practice	reflect, critic, practic, develop, experi, person, process, reflex, reflect_practic, learn
Religious Education	author, valu, local, religi, govern, school, england, religion, academi, british
School Types and School Choice	school, pupil, school_base, attend, effect, base, england, evid, school_educ, improv
Science Education	scienc, scientif, inquiri, scienc_educ, social_scienc, understand, natur, argument, relat, discuss
Secondary Education	school, secondari, secondari_school, england, secondari_educ, primari_secondari, english, pupil, school_student, primari
Selectivity	choic, decis, question, inform, reason, process, prefer, influenc, type, applic
Skills	skill, develop, compet, communic, knowledg, knowledg_skill, requir, abil, skill_develop, confid
Social Justice	social, human, polit, justic, capit, social_justic, liber, societi, democrat, critic
Social Networks and Social Media	social, network, media, social_network, worker, social_educ, relat, analysi, site, capit
Social Work Education	servic, user, pre, pre_servic, involv, servic_teacher, experi, provid, provis, develop
Socio-Cultural and Historical Contexts	cultur, space, divers, context, agenc, complex, understand, differ, explor, perspect
Student Engagement and Participation	student, engag, particip, activ, student_engag, widen, widen_particip, increas, access, engag_student
Student Experience	student, experi, student_experi, univers, learn_experi, student_learn, learn, expect, enhanc, experi_student
Student Support	support, student, peer, tutor, person, provid, assist, support_student, staff, learn
Subject Knowledge	knowledg, subject, content, transfer, relat, understand, expertis, product, base, expert
Surgical Education	simul, perform, video, team, train, skill, session, particip, base, assess
Survey	survey, level, report, differ, rate, compar, analysi, statist, cross, find, particip
Sustainability/ Sustainable Development	institut, sustain, develop, educ_institut, hei, environment, chang, univers, challeng, climat
Systematic Review	review, evid, literatur, base, identifi, systemat, evid_base, search, inform, includ
Teaching Approaches	teach, learn, teach_learn, learn_teach, practic, pedagog, approach_teach, lectur, teach_practic, teacher
Technology and Learning	technolog, learn, digit, mobil, inform, enhanc, tool, devic, support, communic
Theories and Concepts	concept, framework, theori, understand, theoret, conceptu, analysi, develop, map, perspect

Theory and Practice	practic, theori, practition, base, practic_educ, educ_practic, theori_practic, profession, set, translat
Undergraduate Education	student, undergradu, percept, lectur, univers, student_percept, modul, questionnair, confid, undergradu_student, perceiv
Vulnerable Groups	peopl, life, particip, live, experi, youth, voic, age, person, generat

APPENDIX 11: 2-DIMENSIONAL SCATTERPLOT VISUALISING HDBSCAN CLUSTERING OF DOCUMENTS (65 CLUSTERS) IN THE DOCTORAL THESES CORPUS

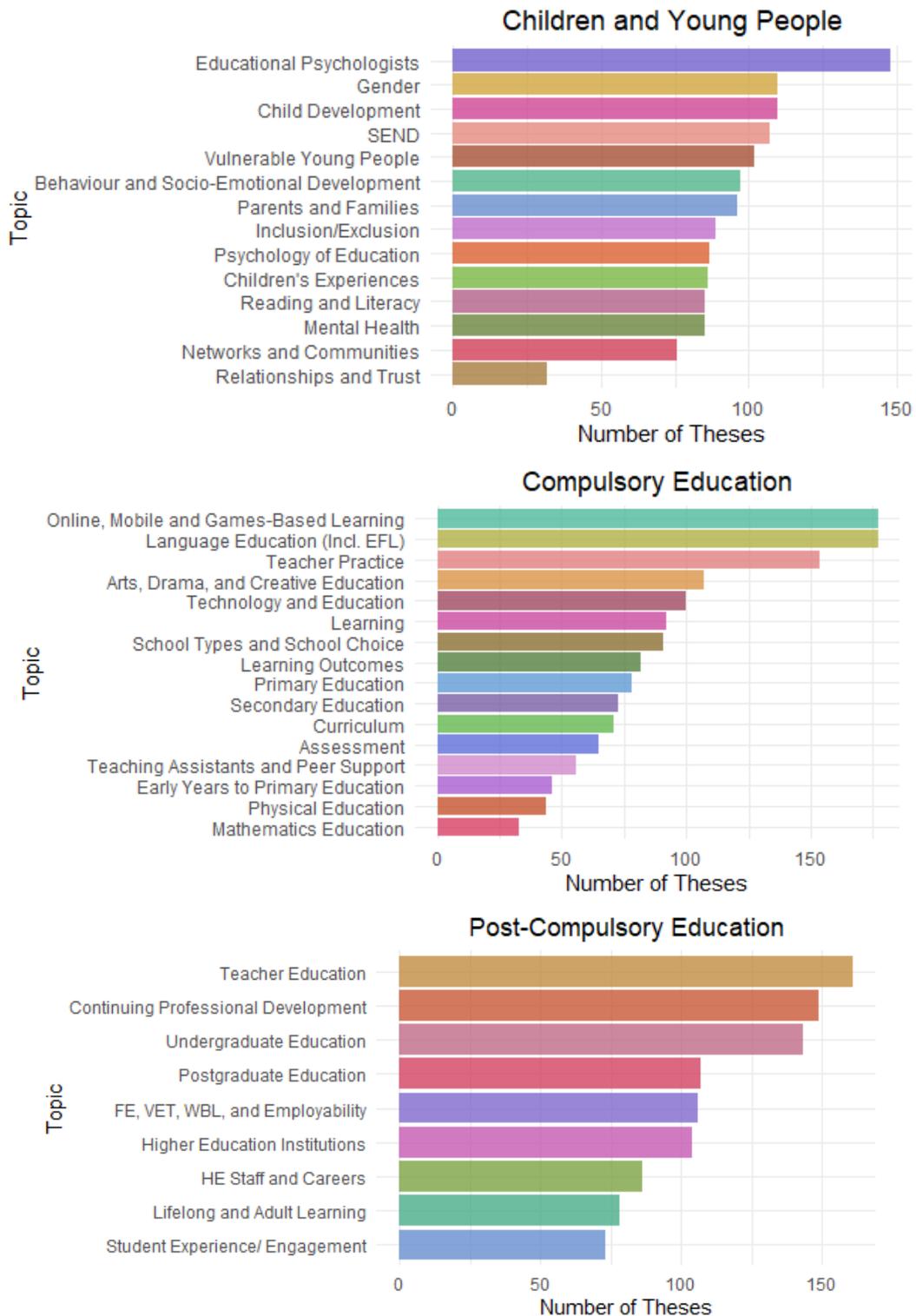
Noise points (i.e. documents not clustered; 3,168 documents) are in grey. Cluster labels are based on the two terms with the greatest importance (tf-idf) throughout documents within clusters, and do not reflect any subjective interpretation or judgement of content therein.



Note, whilst t-SNE dimensionality reduction preserves local neighbourhoods, this method fails to preserve global structure or distances. As such, distances between clusters are not necessarily reflective of the degree of similarity between topics.

APPENDIX 12: NUMBER OF DOCTORAL THESES IDENTIFIED AS PRIMARILY ADDRESSING EACH OF THE GENERATED TOPICS

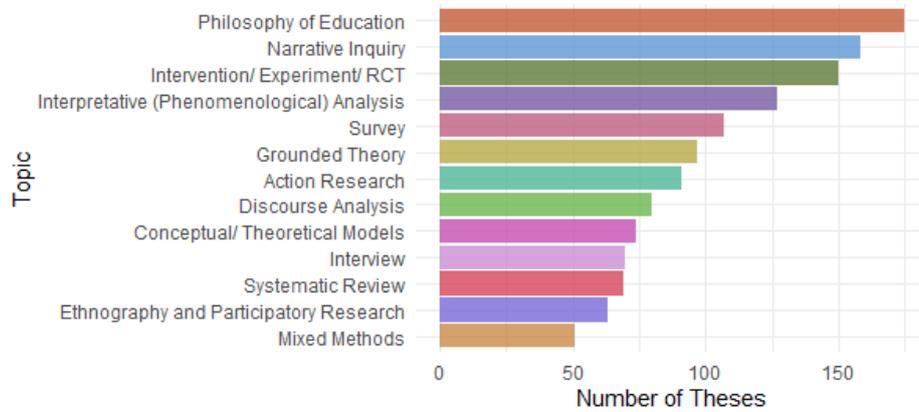
Here, for purposes of clarity, topics are presented across several plots which reflect general thematic domains which emerged through inspection of topic content and results of hierarchical clustering of topics.



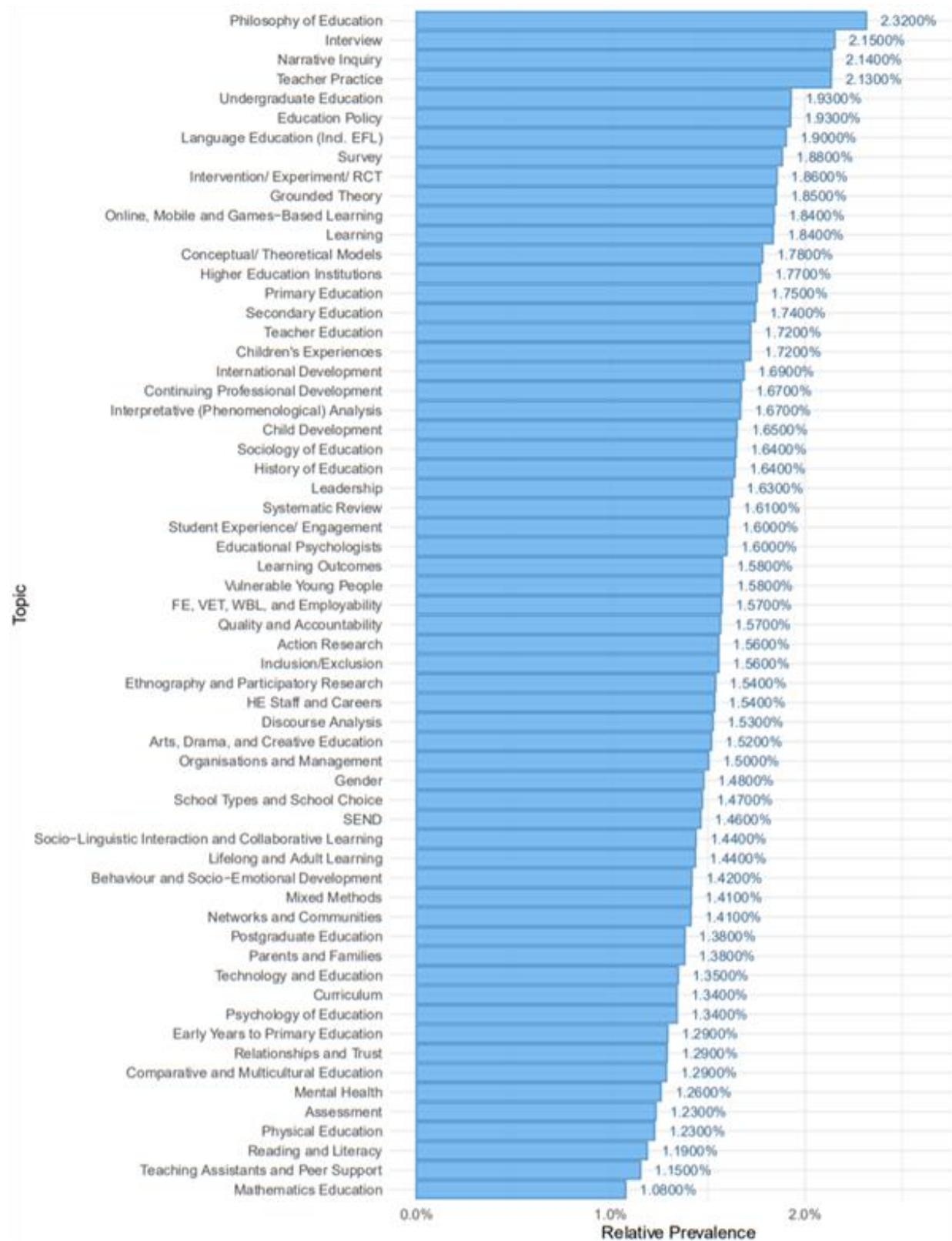
Education Systems, Institutions and Policies



Theory, Methods and Design



APPENDIX 13: RELATIVE PREVALENCE OF TOPICS THROUGHOUT THE DOCTORAL THESES' CORPUS



APPENDIX 14: LDA TOPIC LABELS AND ASSOCIATED TERMS IN THE DOCTORAL THESES CORPUS

Topic Label	Terms Related to Topic
Action Research	project, action, develop, collabor, action_research, practic, reflect, research_project, methodolog, involv
Arts, Drama, and Creative Education	creativ, pedagogi, critic, practic, art, inquiri, pedagog, continu, space, base
Assessment	assess, feedback, practic, tutor, continu, learn, format, student, explor, process
Behaviour and Socio-Emotional Development	behaviour, emot, social, difficulti, social_emot, children, challeng, emot_behaviour, behaviour_difficulti, attach
Child Development	test, perform, task, measur, abil, cognit, word, differ, effect, continu
Children's Experiences	children, age, child, childhood, school, develop, school_children, continu, children_age, children_learn
Comparative and Multicultural Education	cultur, chines, china, compar, valu, differ, ethnic, cross, context, divers
Conceptual/Theoretical Models	model, framework, develop, theori, theoret, conceptu, base, process, understand, context
Continuing Professional Development	profession, teacher, develop, profession_develop, nurs, practic, cpd, continu, teacher_profession, profession_ident
Curriculum	curriculum, scienc, reform, implement, teach, subject, teacher, educ_reform, nation, includ, develop
Discourse Analysis	discours, write, critic, analysi, text, construct, discours_analysi, english, power, practic
Early Years to Primary Education	practition, key, stage, set, al, identifi, scotland, practic, key_stage, scottish
Education Policy	polici, govern, educ_polici, nation, reform, analysi, implement, polici_practic, context, process
Educational Psychologists	ep, psychologist, servic, educ_psychologist, support, practic, psycholog, role, profession, staff
Ethnography and Participatory Research	particip, observ, ethnograph, interview, practic, south, ethnograph_studi, understand, collect, particip_observ
FE, VET, WBL, and Employability	colleg, skill, employ, graduat, programm, fe, vocat, sector, train, degre
Gender	gender, women, femal, girl, class, career, boy, male, experi, continu

Grounded Theory	analysi, theori, interview, qualit, collect, ground, ground_theori, data_collect, find, process
HE Staff and Careers	academ, univers, staff, institut, unit, kingdom, uk, faculti, unit_kingdom, interview
Higher Education Institutions	institut, univers, public, sector, manag, educ_institut, privat, fund, busi, market
History of Education	histori, polit, citizenship, societi, continu, conflict, histor, religi, examin, centuri
Inclusion/Exclusion	pupil, school, staff, exclus, attend, age, experi, mainstream, continu, teacher_pupil
International Development	develop, countri, global, intern, world, nation, region, econom, knowledg, govern
Interpretative (Phenomenological) Analysis	experi, interpret, phenomenolog, analysi, live, particip, interpret_phenomenolog, explor, phenomenolog_analysi
Intervention/Experiment/RCT	intervent, evalu, programm, effect, base, design, impact, skill, implement, improv
Interview	structur, semi, semi_structur, structur_interview, interview, particip, analysi, qualit, conduct, explor
Language Education (Incl. EFL)	languag, english, efl, english_languag, foreign, learner, foreign_languag, communic, languag_learn, speak
Leadership	leadership, school, leader, head, headteach, princip, head_teacher, manag, role, senior
Learning	learn, teach, teach_learn, student_learn, experi, learn_experi, learn_teach, effect, activ, learn_studi, environ
Learning Outcomes	achiev, academ, effect, attain, outcom, level, examin, perform, improv, success
Lifelong and Adult Learning	learn, learner, adult, engag, inform, develop, experi, distanc, lifelong, continu
Mathematics Education	mathemat, strategi, ireland, examin, irish, northern, solv, primari, level, reveal
Mental Health	health, mental, mental_health, adolesc, wellb, stress, peopl, mind, risk, care
Mixed Methods	phase, mix, mix_method, design, questionnair, adopt, exploratori, interview, current, survey
Narrative Inquiry	ident, narrat, construct, stori, experi, explor, person, life, continu, individu
Networks and Communities	social, communiti, practic, network, media, engag, onlin, explor, develop, communiti_practic, justic
No Label (Excluded, "Junk", Topic)	question, knowledg, research_question, address, contribut, process, answer, continu, literatur
No Label (Excluded, "Junk", Topic)	factor, influenc, attitud, affect, factor_influenc, success, level, barrier, understand, percept

Online, Mobile and Games-Based Learning	learn, environ, design, onlin, base, game, comput, collabor, learn_environ, system
Organisations and Management	chang, organis, process, manag, develop, implement, sustain, plan, partnership, initi
Parents and Families	parent, children, school, famili, child, home, involv, parent_teacher, mother, experi
Philosophy of Education	concept, understand, practic, theori, continu, human, person, subject, natur, moral
Physical Education	activ, physic, time, transfer, knowledg, relat, engag, movement, continu, particip
Postgraduate Education	student, intern, uk, experi, univers, intern_student, intercultur, academ, cultur, postgradu
Primary Education	school, primari, primari_school, teacher, school_teacher, primari_educ, continu, classroom, school_studi, cyprus
Psychology of Education	motiv, efficaci, relationship, satisfact, relat, level, resili, job, measur, questionnair
Quality and Accountability	system, qualiti, educ_system, improv, continu, stakehold, manag, provis, enhanc, challeng
Reading and Literacy	read, literaci, skill, comprehens, develop, text, visual, continu, adult, instruct
Relationships and Trust	role, relationship, play, relat, examin, develop, understand, explor, context, trust, suggest
School Types and School Choice	school, local, author, decis, choic, england, local_author, rural, academi, continu
Secondary Education	school, secondari, secondari_school, secondari_educ, primari_secondari, school_base, school_studi, concern, teacher, england
SEND	inclus, special, disabl, mainstream, autism, special_educ, school, difficulti, sen, children
Socio-Linguistic Interaction and Collaborative Learning	interact, classroom, communic, video, observ, talk, record, class, social, analysi
Sociology of Education	cultur, social, socio, context, theori, capit, econom, perspect, framework, socio_cultur
Student Experience/Engagement	student, engag, percept, teacher_student, student_teacher, teacher, student_percept, student_engag, school_student, view, examin
Survey	questionnair, quantit, collect, qualit, mix, interview, data_collect, mix_method, analysi, survey
Systematic Review	literatur, review, empir, literatur_review, systemat, explor, paper, chapter, methodolog, evid
Teacher Education	teacher, train, teacher_educ, teach, traine, student_teacher, initi, servic, pre, programm
Teacher Practice	teacher, teach, classroom, practic, belief, observ, lesson, interview, explor, teach_practic

Teaching Assistants and Peer Support support, assist, peer, teach, mentor, role, teach_assist, provid, explor, continu

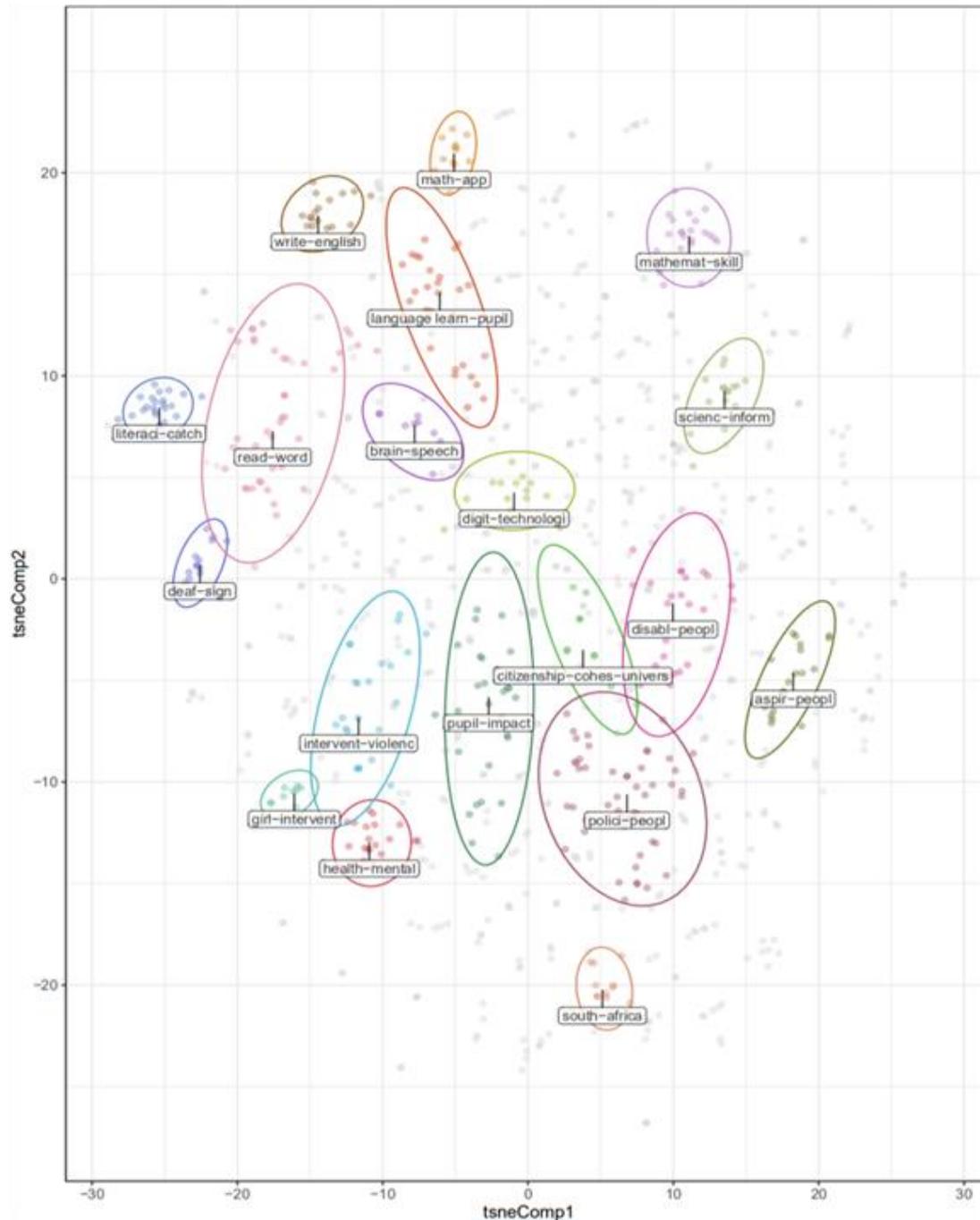
Technology and Education technolog, ict, digit, learn, inform, mobil, integr, communic, support, innov

Undergraduate Education student, univers, undergradu, experi, lectur, univers_student, student_experi, academ, undergradu_student, institut

Vulnerable Young People peopl, transit, experi, social, aspir, continu, particip, youth, post, children_peopl

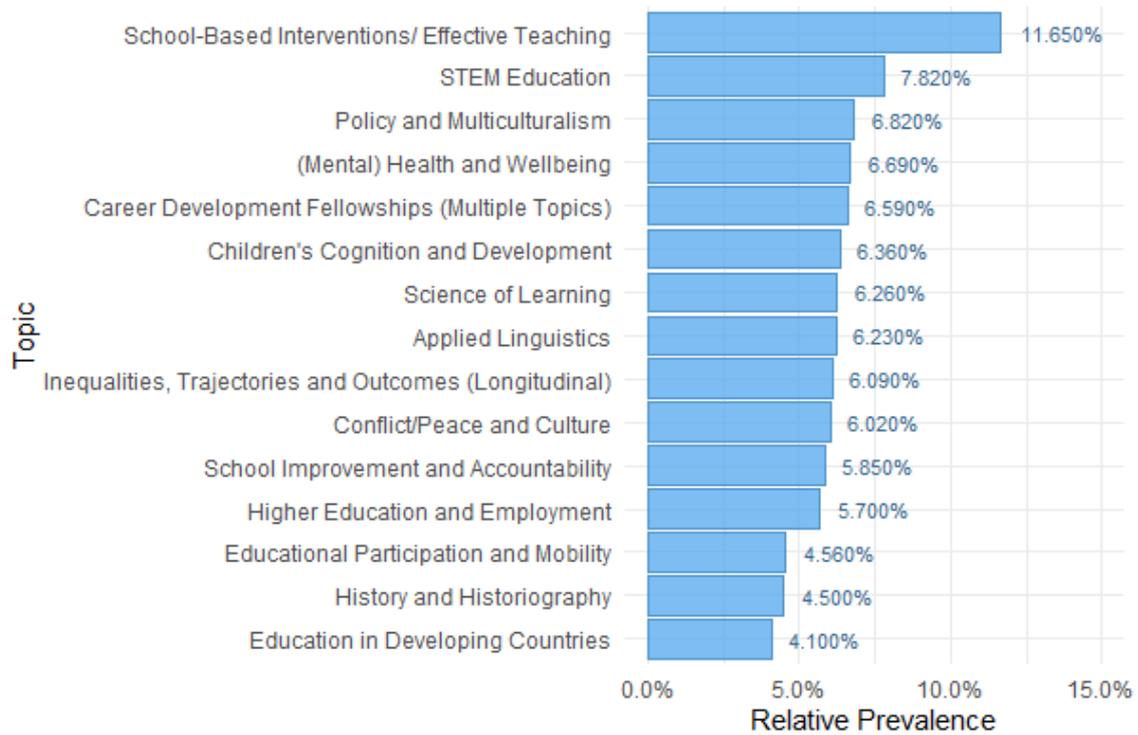
APPENDIX 15: 2-DIMENSIONAL SCATTERPLOT VISUALISING HDBSCAN CLUSTERING OF DOCUMENTS (19 CLUSTERS) IN THE RESEARCH GRANTS CORPUS

Noise points (i.e. documents not clustered; 572 documents) are in grey. Cluster labels are based on the two terms with the greatest importance (tf-idf) throughout documents within clusters, and do not reflect any subjective interpretation or judgement of content therein.



Note, whilst t-SNE dimensionality reduction preserves local neighbourhoods, this method fails to preserve global structure or distances. As such, distances between clusters are not necessarily reflective of the degree of similarity between topics.

APPENDIX 16: RELATIVE PREVALENCE OF TOPICS THROUGHOUT RESEARCH GRANTS' CORPUS

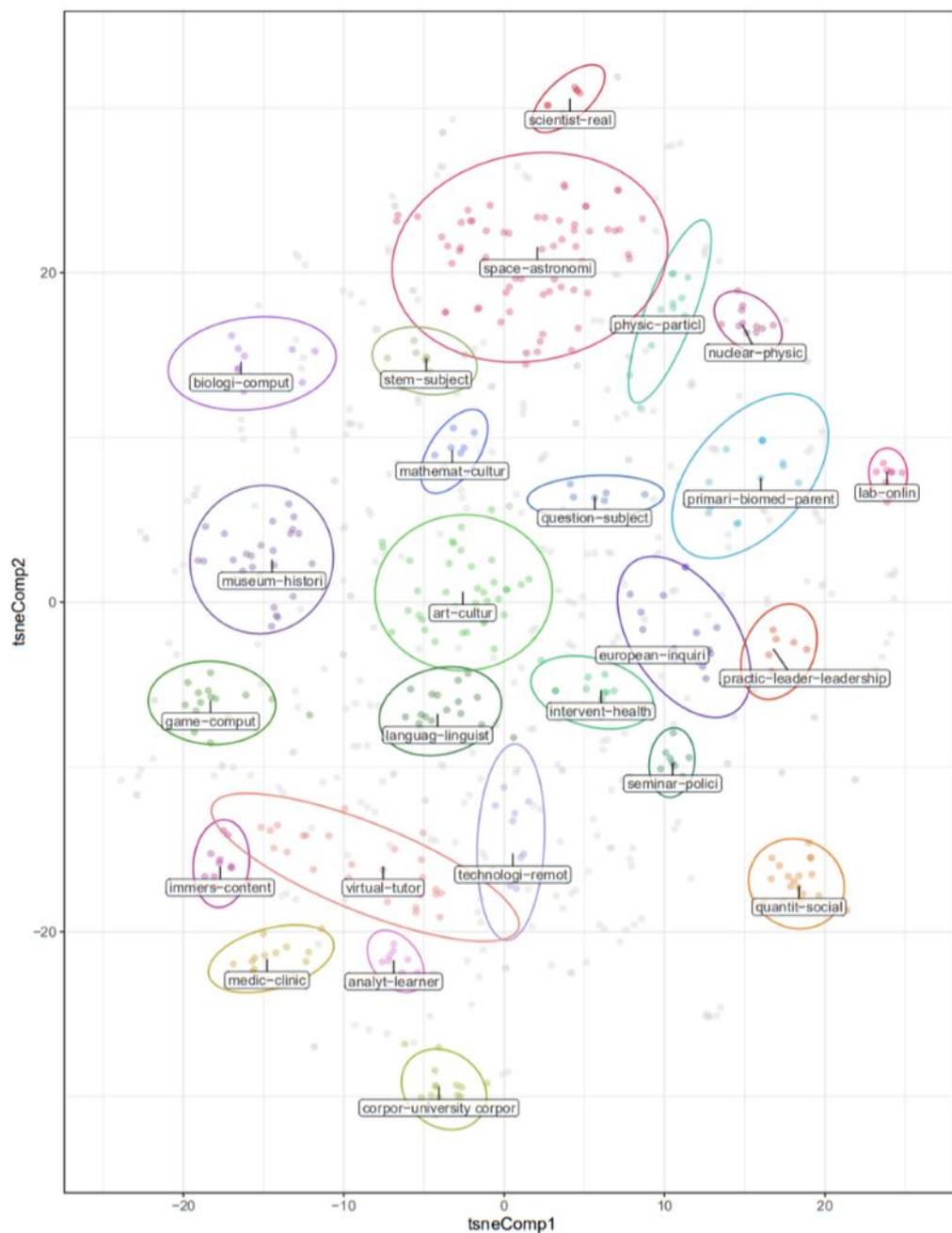


APPENDIX 17: LDA TOPIC LABELS AND ASSOCIATED TERMS IN THE RESEARCH GRANTS CORPUS

Topic Label	Terms Related to Topic
Applied Linguistics	languag, read, word, learn, english, deaf, develop, children, vocabulari, learner
Career Development Fellowships (Multiple Topics)	develop, academ, polici, public, network, practic, intern, impact, practition, includ
Children's Cognition and Development	children, develop, parent, school, age, child, abil, skill, famili, mathemat
Conflict/Peace and Culture	communiti, local, cultur, develop, knowledg, peopl, network, art, practic, creativ
Education in Developing Countries	learn, countri, school, south, outcom, africa, system, qualiti, india, rural
Educational Participation and Mobility	social, uk, mobil, govern, chines, student, univers, nation, compar, region
Higher Education and Employment	student, univers, market, labour, polici, econom, skill, labour_market, access, countri
History and Historiography	write, histori, teach, student, cultur, understand, develop, centuri, text, nation
Inequalities, Trajectories and Outcomes (Longitudinal)	peopl, social, aspir, age, uk, understand, famili, cohort, survey, school
(Mental) Health and Wellbeing	school, intervent, health, mental, mental_health, effect, trial, improv, adolesc, student
No Label (Excluded, "Junk", Topic)	social, school, inclus, practic, learn, involv, music, student, develop, contribut
Policy and Multiculturalism	polici, social, polit, youth, divers, citizenship, develop, context, promot, examin
School Improvement and Accountability	school, pupil, secondari, secondari_school, england, primari, govern, academi, local, account
School-Based Interventions/ Effective Teaching	teacher, teach, programm, train, improv, impact, test, effect, literaci, classroom
Science of Learning	learn, inform, test, experi, effect, individu, process, observ, behaviour, cognit
STEM Education	scienc, technolog, learn, develop, student, digit, teach, knowledg, base, skill

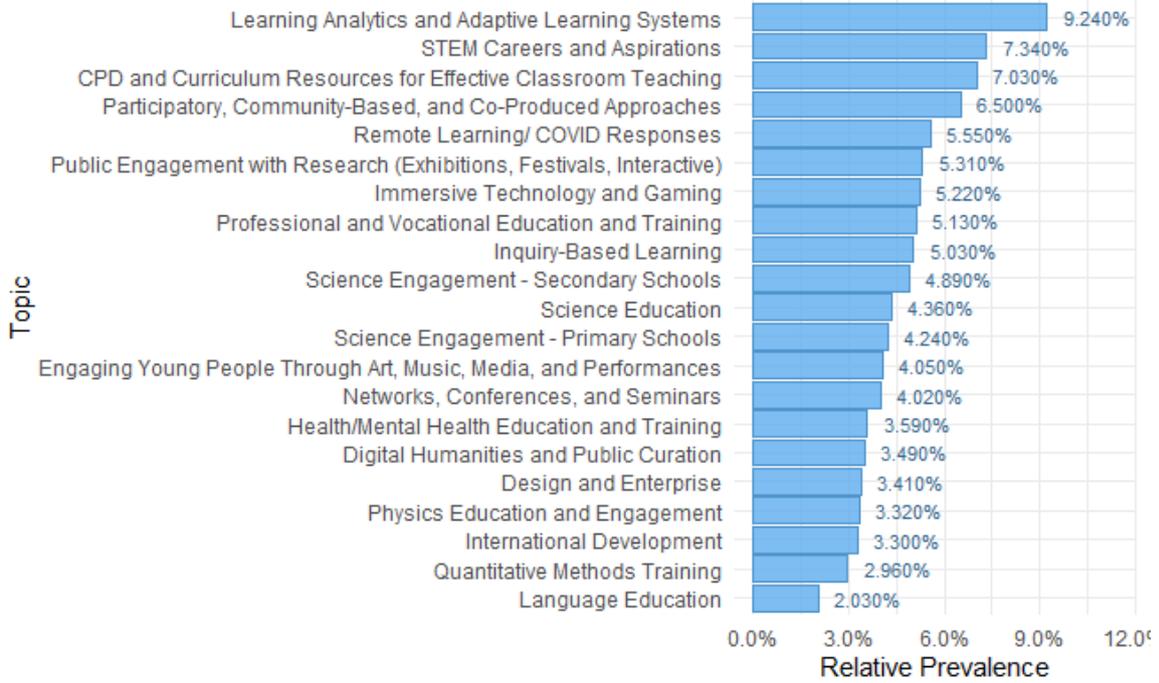
APPENDIX 18: 2-DIMENSIONAL SCATTERPLOT VISUALISING HDBSCAN CLUSTERING OF DOCUMENTS (25 CLUSTERS) IN THE KEI GRANTS CORPUS

Noise points (i.e. documents not clustered; 353 documents) are in grey. Cluster labels are based on the two terms with the greatest importance (tf-idf) throughout documents within clusters, and do not reflect any subjective interpretation or judgement of content therein.



Note, whilst t-SNE dimensionality reduction preserves local neighbourhoods, this method fails to preserve global structure or distances. As such, distances between clusters are not necessarily reflective of the degree of similarity between topics.

APPENDIX 19: RELATIVE PREVALENCE OF TOPICS THROUGHOUT THE KEI GRANTS' CORPUS



APPENDIX 20: LDA TOPIC LABELS AND ASSOCIATED TERMS IN THE KEI GRANTS CORPUS

Topic Label	Terms Related to Topic
CPD and Curriculum Resources for Effective Classroom Teaching	teacher, school, teach, develop, pupil, resourc, learn, curriculum, classroom, primari
Design and Enterprise	design, digit, creativ, prison, skill, busi, industri, engag, inclus, school
Digital Humanities and Public Curation	histori, museum, heritag, cultur, memori, archiv, engag, collect, digit, public
Engaging Young People Through Art, Music, Media, and Performances	resourc, music, peopl, film, video, perform, creat, websit, engag, includ
Health/Mental Health Education and Training	health, peopl, intervent, school, care, evalu, disabl, effect, support, base
Immersive Technology and Gaming	game, technolog, develop, learn, experi, virtual, immers, comput, interact, user
Inquiry-Based Learning	european, scienc, europ, innov, train, implement, base, support, inquiri, model
International Development	countri, develop, conflict, youth, network, africa, cultur, south, peac, gender
Language Education	languag, english, translat, linguist, literatur, multilingu, read, text, cultur, languag_learn
Learning Analytics and Adaptive Learning Systems	learn, develop, learner, technolog, base, tool, system, assess, content, feedback
Networks, Conferences, and Seminars	seminar, learn, polici, seri, intern, cultur, practic, academ, particip, understand
Participatory, Community-Based, and Co-Produced Approaches	network, communiti, art, knowledg, develop, academ, learn, practic, sustain, collabor
Physics Education and Engagement	physic, school, uk, nuclear, energi, univers, develop, workshop, particl, experi
Professional and Vocational Education and Training	train, system, develop, univers, medic, institut, provid, lead, manag, staff
Public Engagement with Research (Exhibitions, Festivals, Interactive)	public, school, univers, event, programm, activ, fund, resourc, workshop, centr
Quantitative Methods Training	teach, quantit, student, social, undergradu, quantit_method, qm, univers, social_scienc, scienc
Remote Learning/ COVID Responses	learn, student, provid, school, time, onlin, platform, remot, home, deliv
Science Education	scienc, school, scientif, learn, understand, pupil, biolog, engag, lab, scientist
Science Engagement - Primary Schools	children, school, parent, famili, primari, support, age, child, social, develop
Science Engagement - Secondary Schools	student, school, scienc, engag, scientist, teacher, activ, real, school_student, experi
STEM Careers and Aspirations	scienc, stem, space, stfc, career, engag, astronomi, engin, inspir, technolog

