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Abstract

This chapter presents a new paradigm for sustainable data-driven language learning systems design in higher education that draws on qualitative reflections spanning a decade (2012–2022) with stakeholders from an ongoing global research study with the FLAX (Flexible Language Acquisition) and F-Lingo projects at the University of Waikato in Aotearoa New Zealand (Fitzgerald (2019) A new paradigm for open data-driven language learning systems design in higher education; König et al. (2022) *Smart CALL*). Design considerations are presented for remixing domain-specific open access content into Open Educational Resources (OER) for academic English language provision across formal and non-formal higher education contexts. Primary stakeholders in the research collaboration include the following three groups: (1) Knowledge organisations that provide open access to academic content—libraries and archives, including the British Library and the Oxford Text Archive, universities in collaboration with MOOC providers and the CORE (COnnecting REpositories) open access aggregation service at the UK Open University; (2) Researchers who mine and remix academic content into corpora and open data-driven language learning systems—converging from the fields of open education, computer science and applied corpus linguistics; (3) Knowledge users who re-use and remix academic content into OER—English for Academic Purposes (EAP) practitioners from university language centres. Automated content analysis was carried out on a corpus of interview and focus discussion data with the three stakeholder groups in this research. We discuss themes arising from the research data that reflect the different stakeholders' experiences of remixing open access research content that has been produced within the academy for re-use as open educational content for teaching and learning features of academic language within open data-driven language learning systems. These open learning systems have been specifically designed to scale with OER expansion and traction in mind for their sustainable uptake both within and beyond the brick and mortar of the traditional university. The new paradigm presented in this chapter challenges, as the OER movement must, established business models and deeply embedded cultural or institutional norms that present obstacles to OER expansion and traction and the sustainability of the movement. One persistent challenge concerns the lack of open education policy across the higher education sector for full open

	access (for use, modification, adaptation) via Creative Commons licensing to content produced within the academy. Thus, while this research has theoretical and practical implications in applied linguistics, computer science, language teaching and learning and open education, more generally, it also has significant cultural, business model and policy implications for higher education.
Keywords (separated by '-')	Data-driven learning - Design-based research - English for academic purposes (EAP) - Higher education - Massive open online courses (MOOCs) - Open access - Open educational practices - Open educational resources (OER) - Systems design

Chapter 6
Reflections on Remixing Open Access Content into Open Educational Resources: A New Paradigm for Sustainable Data-Driven Language Learning Systems Design in Higher Education

Alannah Fitzgerald, Shaoqun Wu, Jemma König, Steven Shaw, and Ian H. Witten

Abstract This chapter presents a new paradigm for sustainable data-driven language learning systems design in higher education that draws on qualitative reflections spanning a decade (2012–2022) with stakeholders from an ongoing global research study with the FLAX (Flexible Language Acquisition) and F-Lingo projects at the University of Waikato in Aotearoa New Zealand (Fitzgerald (2019) A new paradigm for open data-driven language learning systems design in higher education; König et al. (2022) *Smart CALL*). Design considerations are presented for remixing domain-specific open access content into Open Educational Resources (OER) for academic English language provision across formal and non-formal higher education contexts. Primary stakeholders in the research collaboration include the following three groups: (1) Knowledge organisations that provide open access to academic content—libraries

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and archives, including the British Library and the Oxford Text Archive, universities in collaboration with MOOC providers and the CORE (COnnecting REpositories) open access aggregation service at the UK Open University; (2) Researchers who mine and remix academic content into corpora and open data-driven language learning systems—converging from the fields of open education, computer science and applied corpus linguistics; (3) Knowledge users who re-use and remix academic content into OER—English for Academic Purposes (EAP) practitioners from university language centres. Automated content analysis was carried out on a corpus of interview and focus discussion data with the three stakeholder groups in this research. We discuss themes arising from the research data that reflect the different stakeholders' experiences of remixing open access research content that has been produced within the academy for re-use as open educational content for teaching and learning features of academic language within open data-driven language learning systems. These open learning systems have been specifically designed to scale with OER expansion and traction in mind for their sustainable uptake both within and beyond the brick and mortar of the traditional university. The new paradigm presented in this chapter challenges, as the OER movement must, established business models and deeply embedded cultural or institutional norms that present obstacles to OER expansion and traction and the sustainability of the movement. One persistent challenge concerns the lack of open education policy across the higher education sector for full open access (for use, modification, adaptation) via Creative Commons licensing to content produced within the academy. Thus, while this research has theoretical and practical implications in applied linguistics, computer science, language teaching and learning and open education, more generally, it also has significant cultural, business model and policy implications for higher education.

Keywords Data-driven learning · Design-based research · English for academic purposes (EAP) · Higher education · Massive open online courses (MOOCs) · Open access · Open educational practices · Open educational resources (OER) · Systems design

6.1 Introduction

In this chapter section, we present a new research paradigm for sustainable data-driven language learning systems design in higher education. This research paradigm provides a theoretical and conceptual framework supported by a review of the relevant literature from intersecting fields in this research. As we progress through the chapter, the paradigm will be unpacked in greater detail in the subsequent sections as we drill down into the specifics of the research contexts, materials and methods that have been employed in the research with the three stakeholder groups. Reflections on remixing open access content into OER for teaching and learning features of academic English, along with the affordances and challenges encountered by the stakeholder groups, will be presented in the final discussion section of this chapter.

6.1.1 Research Paradigm

A basic premise underpinning the new research paradigm presented in this chapter is that open data-driven language learning systems design as an approach is learner-centric and operates with the interface to the learner. Whether the learner is operating fully online in non-formal or informal learning mode or in a blended modality that is based both within and beyond the formal university language classroom, this approach requires that the tools and interfaces, and indeed the academic language corpora, be openly accessible and remixable for development or adaptation to meet this specific learner requirement. This method is different from existing Data-Driven Learning (DDL) approaches which assume specialised knowledge or experience with DDL tools, interfaces and strategies, operating on mostly inaccessible corpora in terms of cost or design, or assuming training to, hopefully, compensate for this lack of knowledge and experience (Fitzgerald, 2019; Pérez-Paredes et al., 2018).

The term DDL was coined by corpus linguistics and EAP pioneer, Tim Johns, to refer to a computer-driven language learning support approach with linguistic content that has been automatically analysed, enriched and transformed into a data-mined resource that learners can browse and query (Johns, 1991a). Johns envisioned every language learner as "a Sherlock Holmes" with direct access to the evidence of real-world language data (Johns, 2002, p. 108). In a similar vein to contemporary advocates for using and developing a broad spectrum of data literacies with open data in higher education (Atenas et al., 2015), Johns also envisioned DDL as developing data literacies for understanding and interpreting linguistic data for direct applications in language learning, specifically in the context of higher education (Johns, 2002; Pérez-Paredes et al., 2018).

From a research and development (R&D) standpoint, the paradigm presented here also operates with the interface to knowledge organisations (universities, libraries, archives) and researchers who are engaging with open educational practices to push at the parameters of open policy for the non-commercial re-use and remix of authentic research and pedagogic content that is increasingly abundant in digital open access format for text and data mining (TDM) purposes. This open access content is highly relevant to learning features of specialist varieties of English from across the academy but is otherwise off-limits for development into proprietary learning materials by the commercial education publishing industry (Fitzgerald et al., 2015, 2017; Wu et al., 2018). Indeed, the open corpus development work presented in this chapter would not have been possible had it not been for the campaigners for copyright reform, the Internet activists, the open policymakers, the open-source software developers and the advocates for open access, open data and open education that have made these resources available for re-use and remix.

This paradigm leads down several paths, including research into understanding how users actually perceive, appropriate and use the approach based on the open tools and resources provided. This inquiry informs their design and development in an R&D process that is presented here through the methodological lens of design-based research (Fitzgerald, 2019). This approach will be fundamentally different than if we

assume the user is actually a DDL or linguistics expert or that such an expert will be the learner's interface to the system by preparing output for the learner to experience and learn from (Johns, 1991b). This approach will necessarily also be different than if we assume the user is always a formally registered student at a university with access to EAP support that may or may not offer DDL or linguistics expertise for learning the language features of specific discourse communities from across the academy. The assumption behind this new paradigm that the right tools and resources can allow the end-learner to drive the processes autonomously is fundamentally revolutionary. This premise goes to the original contribution to the knowledge of this research but also challenges and directs researchers and practitioners in the field to consider and take up this new direction with open data-driven language learning systems design for applications that can be scaled in higher education to meet the increasing numbers of learners who are coming online in increasingly uncertain times (Fitzgerald, 2019; König et al., 2022).

The focus on domain-specific language learning support via data-driven approaches is, of course, also decidedly different from the current English for Academic Purposes (EAP) paradigm, which in mainstream practice has been steadily evolving away from its roots in English for Specific Purposes (ESP), domain specificity and DDL processes towards the generic skills and knowledge programs currently in vogue that are arguably being steered by generic EAP coursebook publications from the commercial education publishing industry (Gillett, 2018). Thus, this is also a new paradigm based on DDL approaches, driving domain-specific language learning support for EAP across formal, non-formal and informal learning modalities in higher education. It will transform, potentially, the focus of DDL systems design developments in language support and learning in general towards the non-specialist end-learner but also hopefully help re-establish the centrality of language specificity to the field of EAP (Anthony, 2018).

This new paradigm is necessarily rooted in greater multi- or trans-disciplinarity (Colpaert, 2004, 2018). Given the goal of facilitating, in particular, the increasing number of learners who are coming online in these uncertain times, and users of large-scale MOOC platforms who are trying to function in domain-specific subject areas that are invariably offered in the English language, the approach requires collaboration and cooperation among platform providers, subject academics and instructors, educational technologists, software developers, educational researchers, EAP practitioners, linguists with expertise in corpus-based and DDL approaches and policymakers in knowledge organisations (libraries, universities, archives). It has to be remarked, also, that the value and significance of this multi-disciplinary work is amplified by our current situation in higher education with the pandemic, which has seen a massive, urgent push to move learning online with an accompanying impetus to identify, adapt and leverage learning content worldwide and to exploit open educational resources, in particular.

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6.2 Research Context

The open access movement in research and higher education has bolstered unprecedented access to artefacts of the academy in the form of published research articles, in addition to online platforms and services for accessing unpublished theses and pedagogic materials. One example is open access to transcribed video lectures and course reading content from the world's leading universities and institutions with an expanding provision in MOOCs. A further example is an open access to a growing corpus of over half a million PhD theses from universities across the UK with the British Library's Electronic Theses Online Service (EThOS). Both of these examples will feature for discussion in this chapter with respect to the nuanced meanings of openness and the tensions around human and machine re-use of content; the latter of which involves computational processes whereby texts and data are crawled and mined by software to build on and create new knowledge and derivative resources. Specifically, the research presented in this chapter is concerned with stakeholder reflections on a new paradigm for the co-design and co-development of data-driven language learning systems derived from open access content.

A definition for open access appeared for the first time in the declaration of the Budapest Open Access Initiative (BOAI):

> By "open access" to [peer-reviewed research literature], we mean its free availability on the public internet, permitting any users to read, download, copy, distribute, print, search, or link to the full texts of these articles, crawl them for indexing, pass them as data to software, or use them for any other lawful purpose, without financial, legal, or technical barriers other than those inseparable from gaining access to the internet itself. The only constraint on reproduction and distribution, and the only role for copyright in this domain, should be to give authors control over the integrity of their work and the right to be properly acknowledged and cited (BOAI, 2002).

Colpaert (2016) from the field of Computer Assisted Language Learning (CALL) divides uses for data in language education into two main categories depending on divergent goals for re-use: data as content and data as information. The former data category includes authentic content found on the Web, including open access content that makes up the primary focus of this chapter. In contrast, the latter category includes information about data, otherwise known as metadata, which we also make use of in our research and refer to in this chapter.

Corpus linguistics researchers have demonstrated the importance of viewing language as data (Anthony, 2014; Hunston, 2002; McEnery et al., 2006; Sinclair, 2004). By way of extension, DDL can be viewed as a means for language teachers and learners to obtain, organise and study authentic language data derived from corpora in language education (Boulton & Cobb, 2017; Boulton & Pérez-Paredes, 2014; Boulton & Thomas, 2012; Chang, 2014; Cobb & Boulton, 2015; Vyatkina, 2016). There remains a persistent lack of exposure to and use of corpus-based systems and Natural Language Processing (NLP) tools by language practitioners in mainstream language education, however:

> Many of the 15 million English teachers in the world today, according to the British Council Annual Report (2010), have never heard of corpora, while many who are familiar with their use by lexicographers and grammarians are not aware that they can use them themselves, as could their students. (Thomas, 2017, p. 17)

For this R&D project, we identified a range of open, authentic domain-specific text and data sources that are of perceived value to the EAP community yet are off-limits for commercial re-use and development by the English language content publishing industry. In this chapter, we will share reflections on our work with representatives from knowledge organisations that manage and curate digital open access content, such as the British Library, who are working at the cutting edge of reforms in UK copyright law to create open access policy within their Research and Reuse Committee. In line with the Fair Use Doctrine, which is a limitation to US copyright law, an important exception and limitation to UK copyright law for TDM was introduced in 2014, whereby permissions were established for the non-commercial re-use of digital research content following an independent government report (Hargreaves, 2011).

One of the aims of this research has been to bring corpus linguistics researchers and EAP practitioners to the interface of data-driven language learning systems design for higher education through open initiatives in software development, research, education and publishing that support the co-design, co-creation and distribution of such systems. A further aim of this research has been to explore the potential of working with open, authentic academic texts that afford language specificity (Hyland, 2002; Strevens, 1988) in the development of teaching and learning resources for EAP that reflect the specific language and discourse features from target academic communities.

We will discuss the perceived value that EAP researchers, teachers and managers place on the efficacy of utilising authentic open access academic texts and corpora in data-driven approaches for blended learning. These perceived educational values will be weighed against the perceived risks held by knowledge organisations and the individuals working therein, such as curators, subject academics and educational technologists, regarding the remix and re-use of digital open access content and collections for non-commercial research and education purposes. For the scope of this chapter, we will explore the following research questions:

(1) To what extent can open access content foster open educational practices among academic English language stakeholders for designing, developing and evaluating data-driven language learning resources?
(2) What impact do the underlying business models and cultural practices of institutions and organisations have on open educational practices for remixing open access content in the design, development, implementation and dissemination of resources for EAP in higher education?

6.2.1 *Research Materials*

With this research, we have placed particular emphasis on co-designing and co-creating language learning systems for pedagogic purposes rather than for corpus linguistics research purposes. Drawing on the concept of knowledge mobilisation (Levin, 2011), our goal is to engage relevant stakeholders in moving available knowledge from research in corpus linguistics, open education and computer science (NLP and TDM) towards knowledge users, namely EAP practitioners and learners. The goal is for knowledge users to not only benefit from the research but to collaborate directly in an iterative design-based research process. Intermediaries working in knowledge organisations have acted as brokers and open education champions in this research by creating access to knowledge artefacts that are valued for re-use in EAP via initiatives in open access policy and reforms in copyright law.

Although the findings from this research are tied to issues with designing and developing open access content into data-driven learning systems, wider issues vis-à-vis the re-use and remix of open access content in language materials development practices will also be discussed as they apply to both classroom teaching and online learning. The Appendix at the end of this chapter provides an overview of our work to date. It identifies the knowledge organisations, researchers and knowledge users who have collaborated on the design and development of open data-driven systems for learning aspects of academic English in formal and non-formal higher education contexts with the FLAX[1] and F-Lingo[2] projects.

6.3 Research Methods and Results

Methods for collecting data from different participant groups in different locations over a period of years included: focus discussions, face-2-face and Skype interviews and email exchanges stemming from project meetings on observations and evaluations shared in this situated research. Three knowledge organisations have participated in the research (The British Library, The Oxford Text Archive and the Connected Repositories research group at the UK Open University). Eight researchers working in the area of corpus and computational linguistics and open education have participated in the research from higher education institutions in Aotearoa, New Zealand, Spain, Canada and the United Kingdom. Seven knowledge users working in EAP teaching and management from two UK universities have also participated in the research. Automated content analysis (ACA) was carried out on the complete corpus employing the Leximancer software version 4.5, and then on sub-corpora corresponding to data from the three stakeholder groups engaged in this research—knowledge organisations, researchers and knowledge users. Results from the ACA in this study were checked and then triangulated with participants

[1] http://flax.nzdl.org/greenstone3/flax.

[2] https://chrome.google.com/webstore/search/flingo.

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in this qualitative research to create opportunities for participants to comment on transcripts and emerging findings. Thematic and conceptual findings in the datasets were then confirmed with participants as they pertain to reflections on the iterative design processes for designing open data-driven systems for academic English. The complete corpus and ACA visualisation maps of key themes and concepts from this R&D project are available for viewing on the Open Science Foundation[3] data platform.

6.3.1 Design-Based Research

Action research is a widely employed methodology in English language education research and teacher training programmes (Burns, 2009) and shares many of the same principles as design-based research (DBR). Pragmatism is central to both approaches, often employing mixed methods of inquiry to arrive at tangible solutions to educational problems. Within action research cycles, individual teaching practitioners carry out classroom teaching interventions to observe, record and reflect on the impact of these interventions over time to inform and improve their classroom and online teaching practice (Reason & Bradbury, 2007). In design-based research, another layer exists that requires educational practitioners to collaborate with research and design teams (Anderson & Shattuck, 2012).

Although DBR has sustained great interest from researchers and practitioners within the instructional design and educational technology milieu, it is nevertheless a long-term and very resource-intensive exploratory research method with goals and outcomes that are difficult to define. The literature on DBR attests to "a series of approaches, with the intent of producing new theories, artefacts, and practices" (Barab & Squire, 2004, p. 2). More specifically, these approaches have been defined as multiple research cycles that include numerous iterations of analysis, design, development, evaluation and revision (Burkhardt, 2006; Walker, 2006; Amiel & Reeves, 2008; Hakkarainen, 2009; McKenney & Reeves, 2012). Data are collected over a minimum of several weeks but, in most cases, are collected over several months or years (Herrington et al., 2007) as has been the case with our research, which has been ongoing for over a decade now (Fitzgerald, 2019).

6.3.2 Automated Content Analysis

Automated Content Analysis (ACA) is situated within the framework of computational social sciences. It refers to a range of algorithms that employ probabilistic models, namely topic models and concept mapping models (Blei, 2012a, b), that iteratively infer the themes and concepts present within a corpus. ACA can be traced back

[3] https://osf.io/gbkzp/.

to the theoretical underpinnings of Latent Semantic Indexing (LSI; Papadimitriou et al., 1998), leading to the three-level Bayesian model of Latent Dirichlet Allocation (LDA; Blei et al., 2003). The current state of the art with ACA models involves the identification and analysis of higher levels of complexity found within thematic structures (Blei, 2012b). Current ACA systems include features for analysing "syntax, concept hierarchies, document networks and temporal trends in themes, furthering our ability to visualize and explore the literature" (Nunez-Mir et al., 2016). ACA is primarily used to automatically analyse text in digital format but also, increasingly, media content, e.g., images (Boumans & Trilling, 2016).

In this section, we look through the analytical lens offered by ACA at the different themes and concepts from each of the three participant groups in this study: knowledge organisations, researchers and knowledge users. Due to the limited scope of this publication, we will only be looking at the results of the top four themes in each sub-dataset for the three participant groups in this research. Where we present a summary and discussion of results from all three sub-datasets, themes and concepts from the data will be italicised.

Our reasons for employing the Leximancer ACA software to analyse the qualitative datasets were two-fold: to increase validity and to determine the lexical co-occurrence of information extracted from natural language into semantic or conceptual patterns using automated methods. Leximancer has been designed to mitigate subjectivity and researcher bias in the traditional content analysis processes of manual text analysis, coding and intercoder reliability testing (Weber, 1990). Through powerful automated methods, Leximancer is devised to make the human analyst aware of "the global context and significance of concepts and to help avoid fixation on particular anecdotal evidence" (Smith & Humphreys, 2006, p. 262). Leximancer performs two types of analysis on a ranked list of lexical terms found in a unified body of text or corpus: conceptual analysis and relational analysis. The conceptual analysis measures the presence and frequency of concepts in a document set by extracting words, phrases, or collections of words that represent a concept. The relational analysis is concerned with measuring the co-occurrence of concepts within a document set, extracting these co-occurring concepts to show their relationship.

The design principles that underpin the Leximancer software are founded on observations from the fields of corpus linguistics, computational linguistics and psycholinguistics, resulting in the development of the semantic and relational Leximancer algorithms that are employed in both stages of the software's co-occurrence information extraction technique (see Smith, 2000a, b, 2003). Leximancer was employed to mine the total qualitative dataset and sub-datasets for each participant group, resulting in a thesaurus of words identified within each corpus analysed along with their related meanings and surrounding words or collocates. The complete corpus and ACA visualisation maps of key themes and concepts from this R&D project are available for viewing on the Open Science Foundation[4] data platform.

As shown in Fig. 6.1, closely related words from the complete qualitative dataset in this study are identified by the ACA software as concepts and are represented as dots

[4] https://osf.io/gbkzp/.

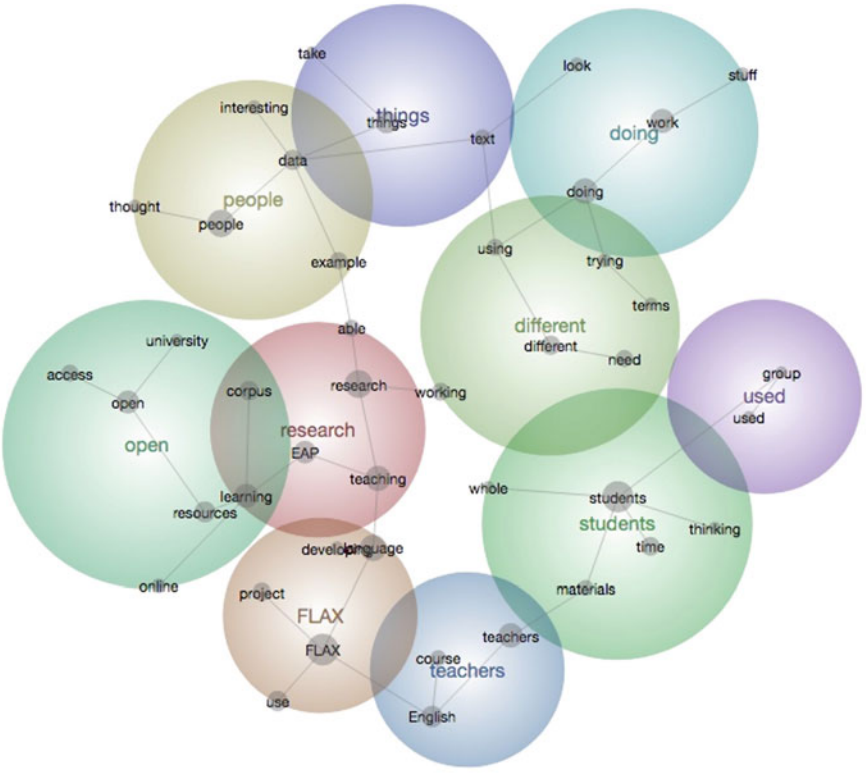
within thematic circles of interrelated concepts on a concept map. The key below the map indicates how many times the central themes occurred in the corpus. Important themes are mapped with warm colours. For example, *research* and FLAX appear in red and brown on the concept map (Angus et al., 2013). These two dominant themes are represented as tightly packed circles containing concept dots in close proximity to one another. The spatial alignment of these dots indicates how closely related concepts are within each key theme (Smith & Humphreys, 2006). For instance, *research*, *corpus*, *able*, *EAP*, *teaching* and *learning* are closely related concepts within the dominant *research* theme. Thematic circles are sometimes shown as overlapping with one another when concepts occur close to or across neighbouring themes, such as the concepts for *corpus* and *learning* within the *open* and *research* themes, which are central to this ongoing design-based research with the FLAX project and will provide a basis for the discussion section of this chapter.

6.3.2.1 Knowledge Organisations

The Leximancer analysis of data from the knowledge organisations group reveals *text* as the major theme. The concepts within this key theme of *text* emphasise *experiment*ation with *corpora* and *stuff*, with one frequent example in the dataset being the *EThOS* (Electronic Thesis Online Service) PhD thesis content at the British Library, in addition to the *terms* around *re-use*, and what you are *able* to do when *using* texts with *text* and *data mining*. The second most prominent theme is *work* with concepts reflecting the importance of *doing work* in the *open* as central to this design-based research with knowledge organisations. In close orbit to the *text* theme are the overlapping themes of *trying* and *example,* representing the third and fourth most frequent themes in the dataset, coming in closely behind the *work* theme. Of note in the *trying* theme are the connected concepts of *people trying* to do *things. Re-use* is the concept shared between the overlapping *text* and *example* themes. Also apparent in the *theme are the key interlinked concepts of example, collections and metadata for what can probably be looked at with respect* to research and development that focus on the *re-use* of *text* and their *metadata* from digital *collections*. In the discussion section, we will explore these themes and concepts further with reference to the terms and conditions around open access content re-use in this research with knowledge organisations.

6.3.2.2 Researchers

We now turn to interview data with education researchers who have worked with the FLAX project. The first researcher interviewed was Researcher 4, a legal English corpus researcher at the University of Murcia in Spain who developed the British Law Reports Corpus (BLaRC) with judicial hearings from around the world that subscribe to the English common law system. The corpus was made available with an open access government licence from the British and Irish Legal Institute (BAILI).



Theme	Hits
research	363
FLAX	359
people	276
doing	249
students	245
teachers	194
open	137
different	125
things	108
used	42

Fig. 6.1 Concept map and key derived from automated content analysis of the complete qualitative dataset

Researcher 6 also conducted doctoral research into lexical bundles with the FLAX project, focusing on the Chinese and New Zealand EAP contexts.

When we look at the Leximancer conceptual analysis for the researchers' group, of note are four prominent and overlapping themes: *FLAX, students, teachers* and *time.* Moreover, the concepts of *access, different, research, online, language* and *learning* appear in the overlapping foci areas of these top four central themes. In this section, we will summarise the findings from these concepts, which will form the basis for the discussion section of this researcher participant group later in the chapter. The *access* concept in particular, which appears in the overlap between the *FLAX* and *students* themes in the ACA, is expressed in the data as issues related to conducting *research* that provides students with *access* to and *use* of *different corpora, data* and *systems* in *FLAX* that can support their *online language learning* with formal language *courses* and non-formal *MOOCs.* Of interest, the *access* concept is also expressed in the data in relation to the issue of gaining *access* to *students* through *working* with *language teachers* to conduct *research* into the *use* of the *FLAX system.* This last point on *access* is further extended into the sixth most frequent theme in the dataset, *study*, with concepts expressing the *need* for *user studies* on the uptake of *FLAX*. In addition, the issue of *access* is further expressed by how *teachers* may be *interested* in *working* with the *FLAX project* but are limited in terms of the fourth most frequent theme, *time,* due to the heavy emphasis placed on *teaching* and *learning* and not on conducting *research* at their institutions.

6.3.2.3 Knowledge Users

Of the seven EAP practitioners who participated in the research, only one (Knowledge User 1) from Queen Mary University of London (hereafter referred to as QMUL), had extensive experience with using corpus tools in his classroom teaching, namely the Sketch Engine[5] suite of tools for querying and sketching corpora. The three other participants at QMUL (Knowledge User 2, Knowledge User 3 and Knowledge User 4) all had a background in CALL for developing online EAP resources, most notably Academic English Online.[6] The three EAP teachers at Durham University who are former EAP teaching colleagues of Researcher 1 (Knowledge User 5, Knowledge User 6 and Knowledge User 7), were early adopters and advocates for using open-source software and OERs in their classroom teaching as a means of ensuring that their students had access to high-quality free and open online teaching and learning resources during and after their courses had finished. The EAP practitioners in this study expressed that the motivation to adopt open educational practices as they apply to academic practice in higher education was a motivating factor for participating in the research with the FLAX project.

The dominant themes arising from the Leximancer analysis of interviews and focus discussions from project meetings with knowledge users—EAP teachers and

[5] https://www.sketchengine.eu/.

[6] http://aeo.sllf.qmul.ac.uk/.

course managers—are *EAP* followed closely by *students, things* and *people*. In summary, results from the ACA of this sub-dataset point to issues concerned with the concepts of *EAP* and the *teaching* of *academic English language* from the largest theme, *EAP*. The second-largest theme in the data, *students*, reveals issues around *materials* for *teaching students* that *teachers* are developing themselves or those *materials* that have been developed by commercial publishers and reflections on what does and does not *work* in practice. The third most frequent theme in the dataset, *things*, is representative of concepts related to what *needs* to be done with *research* using *things* and *materials*. In the fourth most frequent theme, *people*, an interesting interplay of concepts are revealed in reference to *people* as being those EAP teachers working in universities who do or do not create *access* to *open resources* for *education*, and also in reference to *people* outside of the university who can and cannot *access open resources* for education. The themes and concepts outlined here in this section will be explored in more depth in the corresponding discussion section of this paper on knowledge users.

The work at Durham University took the form of an OER cascade training project with the participating EAP practitioners and their students that introduced them to four online data-driven text analysis language learning systems: Lextutor,[7] AntConc,[8] Word and Phrase[9] and FLAX. This OER cascade training work led to collaborative evaluations and further development iterations of the Learning Collocations collection in FLAX with the addition of the open access British Academic Written English (BAWE) corpus managed by the Oxford Text Archive for a specific focus on academic English collocations. It was written up as a case study for the UK Higher Education Academy (Fitzgerald, 2013). This work at Durham also resulted in the development of the full-text BAWE collections in FLAX that focused on novel ways to search and browse augmented academic texts that represented different genre types from across the disciplines of the arts and humanities, the social sciences, the physical sciences and the life sciences (Wu & Witten, 2016).

The work at QMUL focused on design collaborations with open access PhD thesis abstract content managed by the British Library for the development of domain-specific micro-corpora and interactive games with Android mobile apps for uptake on QMUL's pre-sessional EAP programmes (Fitzgerald et al., 2014). The work with QMUL led to a further design iteration with the development of the much larger PhD Abstract collections in FLAX of 9.8 million words (Wu et al., 2018).

6.4 Discussion

This section discusses prominent themes and interrelated concepts from the ACA of the qualitative datasets. We drill further down into the data that captured reflections

[7] https://www.lextutor.ca/.

[8] http://www.laurenceanthony.net/software.html.

[9] https://www.wordandphrase.info/.

from participants in the research to present relevant themes and concepts identified in transcriptions. Where we refer to actual data for discussion, themes and concepts will be italicised.

6.4.1 The Four Pillars of Re-Use in Knowledge Organisations

Our research with knowledge organisations in developing open corpora for EAP shows that it often comes down to those individuals working on the inside who are reasonably au fait with copyright law as it pertains to open access and open educational practices and who are willing to champion the re-use of resources and encourage the development of open policies within their organisations. We have seen this type of open access policy championship with the EThOS service team manager and the British Library Labs project manager. The progress with policy development for open access and re-use that enable TDM approaches with digital collections at public knowledge organisations such as the British Library is contrasted with the absence of open education policy in higher education institutions, where there has been less progress made with the re-use of educational content. Open access, in most cases, to read-only research publications and, in lesser cases, to pedagogic content has become the default re-use position of most universities and mainstream MOOC providers.

Once again, those individuals who are already open education practitioners who have openly licensed their educational resources with Creative Commons licenses have enabled the FLAX team to develop derivative language learning collections. Open licensing supports their wider practices in open digital scholarship (Weller, 2011)—via blogs, public lectures, MOOCs, networked courses etcetera—to widely promote the subjects they are passionate about. Notably, Professor Fisher of the CopyrightX micro-networked course has deliberately applied his expertise in understanding the ins and outs of copyright law by licensing his teaching and learning content as CC-BY with Creative Commons "to maximise the number and variety of educational projects and derivative works that can be built (directly or indirectly) on our foundation—and thus the set of students who might benefit from our efforts". (Fisher, 2014, p. 17).

The participating knowledge organisations in this research differ regarding policies and practices around re-use. British Library Labs (BL Labs) is an Andrew Mellon Foundation-funded initiative that supports the remix and re-use of the British Library's digital collections and data for research and educational purposes. In an interview with the project manager of BL Labs (Knowledge Organisation Representative 1 in the transcript corpus), we discussed the FLAX project research with the EThOS PhD theses dataset for the development of the PhD Abstract collections, wherein he identified four pillars for the re-use of this dataset that can be broadly applied to the re-use of other digital collections at the British Library:

(1) "Do we have an expert with curatorial knowledge of a particular *collection* who is on board with *re-use*? Some curators are not concerned about that at all. All they care about is the preservation and not about who *uses* it.
(2) Do we know where it, the collection, is? A description of something is one thing but who actually has the digital files? Can they be accessed?
(3) Is there any *metadata*? That obviously helps enormously because it means that you can then release the *metadata*, normally. But even *metadata* has licenses as well… so, who owns that *metadata*?
(4) Is the *collection* close to being copyright-cleared? And what I mean by that, I actually mean, is it, could it potentially, easily, be available under an *open* licence?"

(Interview with BL Labs Manager, British Library, London, UK)

With the harvested PhD theses in EThOS at the British Library, the provenance is very mixed, whereby there is no one set of terms and conditions for re-use of the open access content found therein. This phenomenon is largely a reflection of the different universities where the research was carried out and is dependent on whether or not there were industry investments in the research, for example, which would result in copyright stakes. Due to this mixed provenance, the British Library has undertaken measures to balance any possible research instances of re-use with any identifiable potential risks such as mass copying, misrepresenting and misquoting of the EThOS dataset. As with the Oxford Text Archive, a cautious approach has been adopted at the British Library with respect to TDM, whereby collections are only available for non-commercial re-use purposes on a request-only basis. The BL Labs manager does, however, acknowledge the iterative nature of research and encourages the practice of "dogfooding" at the British Library, whereby collections management teams, such as the EThOS team, engage in internal research on the re-use and remix of collections to anticipate affordances and hindrances with conducting research:

> Knowledge Organisation Rep 1: First, to *work* with a collection it's important to ensure that there's a human being who can tell you the story of that collection because you don't know what may be lurking in there and it may not be about legal issues. It could be political. It could be financial. But that information isn't always documented.
>
> Researcher 1: Sorry to interrupt you there, but were there any issues around *EThOS*?
>
> Knowledge Organisation Rep 1: Well, I think there are still issues really because the problem of *doing* this work is because the intellectual property is going to be dependent on the institution and their relationship with their students. It seems that that is not straightforward with all the different institutions. So, if you do a PhD at an institution, you're under the IPR for that *work*, and I think that different universities have different views and policies.
>
> Researcher 1: So, it's not always automatically the student's *work*? I thought it was.
>
> Knowledge Organisation Rep 1: All I know is that some *work*, some PhD *work*, is embargoed because it has commercial sensitivities in there. So, for *example*, somebody might…
>
> Researcher 1: Because they've been funded by…?

Knowledge Organisation Rep 1: Yeah, because they've been funded by Panasonic, for *example*.

Researcher 1: Yeah, I get that.

Knowledge Organisation Rep 1: There could be, depending on the PhD and the funding stream, so it could not only be the university, it could be the funder, the funder might have certain requirements. It could be commercial. It could be a funding council. What you're getting is a harvested bunch of stuff in *EThOS* where the provenance is very mixed, and I think the team have decided to take a very cautious approach in terms of being *able* to do things like *text* and *text* and *data mining*, so, you know, it's on a request only basis. Because, especially, you know, about the possibility that there could be commercial *re-use*.

Researcher 1: Yes, I think that's getting back to your original point about the library wanting to know what your research questions were before *doing* the *work*.

Knowledge Organisation Rep 1: Exactly.

Researcher 1: And that's when somebody puts in a request, for *example*. We want to *re-use* these *text*s for these purposes, and this is what the end result will *look* like kind of.

Knowledge Organisation Rep 1: Yeah, but the problem with that is, in our experience, is that research doesn't *work* like that. With research you don't know what you're going to get. You might know your research questions, but the whole point and nature of research is that it's iterative. You know, you *experiment*.

Researcher 1: I'm glad to hear you say that because, you know, that was our experience with the Oxford Text Archive when we requested the BAWE *corpus*. Because we didn't know in advance that we'd be Wikifying whole *text*s but then we had the technology to do it. In particular, I mean, all the prior *work* we had done with Wikipedia *mining* at the Digital Library Lab at Waikato. And, we thought, well, Wikification may well be useful for language learning so let's add this functionality for learners. So, the BAWE *collections* became our first Wikified *collections*, and you can see this feature in our subsequent *collections*, including the PhD Abstract *collections* with *EThOS metadata*. But this *work* with Wikification wasn't in our initial request to the OTA, which was instead very general in terms of what we were proposing to do.

Knowledge Organisation Rep 1: Yeah, I think in general, I understand why there needs to be this clarity but unfortunately, it's a complete misunderstanding of the whole scholarly process. The scholarly process is actually incredibly creative, and you know, you don't know by the very nature of research, that you don't know what you're going to find. And, you know, it's surprising what comes along the way. Ideas will come along the way, and that's just the nature of research. So, we have found that really challenging. And, what we've decided to do, I think, is to be *work*ing on research questions where they can be sort of dealt with on a case-by-case basis, and also to agree on what the outcomes are going to be. So that, like, if *people* want to publish *work*, what actually can be published, and what can't be published because of the sensitivities at the moment. We're also having quite a lot of requests to do *text* and *data mining work* with our non-print legal deposit *stuff*.

(Interview excerpt with BL Labs Manager, British Library, London, UK)

6.4.2 *Issues of Access in DDL Research*

The automated content analysis of the entire qualitative dataset reveals a direct link between the knowledge organisations and researchers' sub-groups with overlapping themes of *access*. Put simply, access to digital collections that can be re-used by researchers, in this case, corpus linguistics and open education researchers, is due in no small part to the open access and open education policies adopted by knowledge organisations and the gatekeepers working within those organisations who implement these policies to promote open access and re-use.

We turn first to a discussion with Researcher 4 in this study on the perceived affordances of re-using and remixing open access publications for open data-driven learning in DDL research with reference to the BLaRC of 8.85 million words (Marín et al., 2014), which is derived from open access judicial hearings licensed with a government license and available from the BAILII online service. Marín developed the BLaRC due to the lack of relevant, authentic materials for teaching the specific area of legal English in EAP. We invited her to include her corpus on the FLAX website so that it would be openly accessible for data-driven language learning in addition to corpus linguistics research. Researcher 4 was interviewed about the making of the BLaRC, which highlights the affordance of the *access* concept as a prominent concept in the interview data with applied corpus linguistics researchers, and how this had enabled the development of legal English resources from open access content in comparison with proprietary legal content services that require licence subscriptions:

> Researcher 1: You know, my next question: Could you even have built the BLaRC without those open government licenses on all of those documents, those judicial hearings in the BAILII (British and Irish Legal Information Institute)?
>
> Researcher 4: No, that's the thing, that's the thing. The amazing discovery was the BAILII […] I was *thinking* about buying a licence for LexisNexis, I think it's called. There are a couple of them, which cost a fortune, a fortune. I'm not sure but I think law firms, they pay, I don't know, four or five thousand pounds a year for having that kind of *thing*, which is amazing […]
>
> Researcher 4: Actually, the University of Murcia doesn't have *access* to that database because one of my colleagues was in Madrid, she was a visiting researcher there, and she downloaded like a hundred thousand texts from LexisNexis because she didn't know that the BAILII existed. So, when she came here, and we were talking, and I said, *look* there's this site [the BAILII] and they have added a lot of overseas legal documents, including United States documents. They have the whole planet in there. It's amazing how much stuff you can find. So, to me it was a huge, huge discovery. That was the best thing that could have happened to me. That's why I started my *research* on legal *corpora*. I mean that was one of the reasons.
>
> Researcher 1: *Access* is so key, isn't it? And I'm sure that's a big part of why the BAILII exists as well because they knew people couldn't *access* LexisNexis.
>
> (Interview excerpt with Researcher 4, via Skype from Murcia, Spain)

The experience of Researcher 6 in this study regarding attempts to carry out DDL research with language teachers and learners in China highlights another aspect of

the *access* concept as it intercepts with the dominant themes for *FLAX, students* and *teachers* within the qualitative dataset. Her greatest challenges were with securing *access* to research sites with *students* and *teachers* in China to test out the efficacy of the Learning Collocations collection in the FLAX system. She and Researcher 1, both of whom come from the field of education, discussed the role of *use* or user *studies*—prevalent concepts within the data—with tools and projects like FLAX that stem from computer science as they are applied to the *students* theme for educational researchers:

> Researcher 1: They talk a lot about *user studies* in computer science, don't they?
>
> Researcher 6: Yeah, but those *user studies* are only to prove that the tool works.
>
> Researcher 1: Right, the focus is not to prove that *learning* has occurred with use of the tool.
>
> Researcher 6: No, the purpose of such *user studies* in computer science is not to promote the application of the tool. So, for them the end of their *project* is that the tool has been developed successfully but for *English teachers* with *English language learning* tools, that is the beginning. But between the end of computer scientists completing the development of a *learning* tool and the beginning of *English language teachers* adopting a *learning* tool in their *teaching* there is a gap.
>
> (Interview excerpt with Researcher 6, University of Waikato NZ)

The importance of user studies in this design-based research leads into our final section of analysis on the data collected with knowledge users, EAP teachers and managers at two UK universities, Durham and Queen Mary.

6.4.3 Barriers to Remixing Texts in Data-Driven EAP Materials Development

Collaborative work with Durham and Queen Mary revealed that data-driven approaches are not embedded within materials development and classroom teaching practices at these two UK universities. However, online corpus-based resources have a valued place as supplementary EAP materials. Most DDL tools and corpus-based systems were viewed by the majority of participants at Durham and QMUL as stand-alone web-based reference resources for students to explore outside of classroom teaching time.

Issues stemming from the design-based research carried out with Durham and QMUL include the limited amount of time EAP teachers have in the classroom with students to focus on discrete language items and the infeasibility of shepherding large groups of students in developing and mining personalised domain-specific corpora for focused help with dissertation and thesis writing, for example. This is despite some promising findings from research into DDL approaches with smaller, more tailored EAP classes for building Do-It-Yourself digital corpora with students to help with PhD thesis writing (Charles, 2012, 2015).

The focus-group discussions with managers at QMUL on the increased availability of open access content point to what EAP practitioners are now *able* to do with *academic things*, *resources* and *materials* for *use/using* with *students* as they emerge in this sub-dataset for the top four themes related to knowledge users: *EAP, students, things* and *people.* Knowledge User 2, manager of multimedia language support at QMUL, describes the approach of developing transferable skills in EAP materials development with revising and repurposing open access research publications as being one that is closer to traditional approaches with the re-use of authentic language content for classroom teaching purposes:

> Knowledge User 2: You know, I think the thing about *open* educational *resources*, the question here, or part of the question here, which we discovered in this *project*, for example, is if you *take* a text, a raw text, which is not adapted for *teaching* like an article, it has *EAP* potential because it's an authentic *academic* article. Then the *ability* to use that and to put it into *materials*, or adapt it, modify it, or change it under the Creative Commons thing is the revelation. Because we've all been doing it for years anyway, from copying it from a book or something when we've not supposed to have been adapting it, changing it, or whatever.
>
> (Knowledge User 2, focus-group discussion excerpt, Queen Mary University of London UK)

From the same focus discussion, the pre-sessional course director at QMUL, Knowledge User 3, talks about the barriers to people working in universities from openly sharing EAP materials across institutions and how they are tied to each university's business model with the aim of promoting their particular brand of EAP courses and materials as a unique selling feature. He also discusses the rise in influence of commercially produced EAP publications and the re-use of third-party materials from these publications as seeping into university EAP course materials development practices, which in turn creates a further barrier to sharing due to copyright infringement:

> Knowledge User 3: There is a certain degree of *open*ness but there is also this desire for everything to be branded, and a certain amount of clutching to your chest, especially about pre-sessional *materials.* […] This is Queen Mary *material*, this is Southampton *material*, this is Durham *material*. But I think when you get back to the institutional level, those are where the real barriers lie because *people* are, and that comes down to the cut n paste culture that means a lot of third-party *materials* end up in our *materials* and are branded as being in-house but a lot of them are not really. You know, the ideas come from published *materials* and they're probably not properly acknowledged anyway because they're only being used internally. And part of that barrier to sharing more *open*ly is raising an awareness of our existing practices and this means they don't want to share between institutions because they're worried that *people* will see just how much cut n paste is going into those *materials.* And I think the loser is the *student*, you know, because if *people* were really producing and sharing the best that they could amongst institutions to then create the best *EAP* pre-sessionals then the *students* would obviously benefit.
>
> (Knowledge User 3, focus-group discussion excerpt, Queen Mary University of London UK)

From a meeting with QMUL EAP teacher, Knowledge User 1, the concepts of *open* and *access*, which congregate in the *people* theme, relate to frequent references in the data of how people outside the university can also benefit from *education* and *resources* that are openly accessible via the Internet:

Knowledge User 1: This *open*-source software and *open access* approach to data-driven *learning resources* does threaten current business models in *EAP* provision, doesn't it? This idea of yours to re-use the artefacts of the academy. This really bucks some *people* in academia.

Researcher 1: Tell me more about that because that's what I think is important to be doing in higher education, but I realise that this isn't everyone's priority.

Knowledge User 1: That's what I think is important as well. It's the ivory tower, isn't it? It's the secret garden behind the firewall of the ivory tower.

[…]

Knowledge User 1: Now, yes, I need *people* within this higher education environment [Queen Mary] to re-use these *academic* texts but I also *need people* to come into this *FLAX* environment, *people* who *need* to interface with this environment for whatever *academic English need* they have, and that's what *FLAX* does for them in a manageable way. It makes it *access*ible not only to *people* who are using it in situ within the privileged brick-n-mortar of the academy but for *people* who, like I say, *need* to interface with that in some way outside of the academy, and, oh, that matters. The *resource* is not just locked inside our intranet-based VLE [Virtual Learning Environment] where I have developed *learning resources* with links out to *FLAX* on the web, which is really a Mickey Mouse version of *FLAX* in here.

(Meeting excerpt with Knowledge User 1, Cutty Sark pub in Greenwich, London, UK)

6.4.4 A Crisis in EAP Identity

An emerging tension in formal EAP is the issue of EAP practitioner identity in the neoliberal university (Ding & Bruce, 2017; Hadley, 2015; Hyland, 2002). Where are EAP service units placed in universities, and more importantly, how are they received and perceived by the wider academy? At its best, EAP is viewed as drawing on and contributing to a rich knowledge base from research in systemic functional linguistics, genre theory, corpus linguistics, academic literacies and critical EAP (Ding & Bruce, 2017). At its worst, EAP has been conceived as having "accepted the role as an economic and intellectual short-cut… [with] maximum throughput of students with minimum attainment levels in the language in the shortest possible time". (Turner, 2004, pp. 96–97).

There has been an upswing in commercially produced EAP publications with a notable shift in focus towards generic academic skills and processes. The increasing prominence of generic EAP publications can be seen to exacerbate the growing fissure in EAP practitioner identity with the emergence of two opposing camps: English for General Academic Purposes (EGAP) versus English for Specific Academic Purposes (ESAP). The received definitions and understandings from the literature indicate that EAP is a subset of English for Specific Purposes (ESP) (see ETIC, 1975; Widdowson, 1983; Swales, 1985; Flowerdew & Peacock, 2001; Howatt, 2004; Belcher, 2010; Charles & Pecorari, 2016; Anthony, 2018). However, this understanding of EAP as being concerned with the teaching and learning of domain-specific language appears to have become conflated and confused as the popularity of generic skills-based

EAP textbooks, subscription-based supplementary online resources and programmes continues to rise (Gillett, 2018).

The absence of data-driven approaches in the design of EAP classroom teaching and online materials is a recurring theme in the sub-dataset from knowledge users. In a focus-group discussion with former teaching colleagues at Durham (Knowledge User 5 and Knowledge User 6), reflections turned towards collaborative work that involved trialling corpora and data-driven approaches for EAP (Fitzgerald, 2013). The discussion drew comparisons between the explicit focus on the teaching and learning of domain-specific language against a growing perception that the culture and practice of EAP are moving away from a focus on language towards generic skills, and the implications that this shift in focus might have for teachers and students:

> Knowledge User 6: I think one major, major, major issue with *EAP* is that it has become so un-*language* focused. It's moved so far away from *teaching language*. And, *students*, of course, can't understand this because that's what they think they're paying for. They think we're there to *teach* them the *English*. *I* think I'm there to *teach* them the *English* but the powers that be think that we're there to *teach* them *EAP*.
>
> Researcher 1: I mean we didn't do any, there was no *time* in the timetables for *language*, right?
>
> Knowledge User 6: No, for *language*, nothing. It's all just skills.
>
> Knowledge User 5: I couldn't believe it when I started *teaching EAP*.
>
> Knowledge User 6: Skills and process. And this is so deeply concerning when they don't have the *language* to express their ideas.
>
> Knowledge User 5: I think that's why when they started this redundancy thing, oh well, I didn't fight it because I'm not *teaching language* in *EAP* and I enjoy *teaching language*.
>
> (Focus-group discussion excerpt with Knowledge User 5 & Knowledge User 6, Café Nero, Durham UK)

Corpora provide teachers and learners with access to linguistic data that show how language is used across a variety of real-world communication contexts. There have been many successful commercial language coursebook publications that are informed by corpora. However, many more coursebook publications appear to fly in the face of evidence-based approaches to materials writing for meeting the demands of an English language education content industry that seems to be driven, first and foremost, by market research rather than research into whether or not materials have positively influenced teaching, learning and language acquisition. A meeting with EAP teacher, Knowledge User 1, highlights some of the issues with EAP materials writing with commercial publishers. Despite materials not always drawing on evidence of how language actually works, they are still widely marketed for sales distribution and consumption:

> Knowledge User 1: What I saw with him [EAP materials writer with Oxford University Press] was, with his presentation at IATEFL [International Association for Teaching English as a Foreign Language] was, that it was no more or less like really saying that THESE *materials* he is selling are THE exponents that we *need* to *teach students*. And it was still

very much along the lines of we *need* to *teach* them yet more fixed phrases. And I was like sitting there and thinking some yes, some no, but prove it. I can—Can you? And he was putting up his *examples*, and I had my tablet *open* using *FLAX*, and I was going that *example* of his *works*, and that *works*, that doesn't *work*, that *works*, that doesn't *work*. But he's just basing it on his own judgement. And I'm just sitting there testing. Just right in front of him, testing his *materials*.

Researcher 1: And, you would have thought that he would have tested his *examples* with a corpus-informed approach before presenting them at IATEFL let alone publishing them with OUP. You have to wonder where the quality control lies if at all.

[…]

Knowledge User 1: The vast majority of my colleagues at Queen Mary have been pretty *open*-minded, and they've been looking at *FLAX* and they can see that it's real *academic language* data. It's the authenticity of it.

Researcher 1: Yes, that always wins out, doesn't it?

Knowledge User 1: Of course, it does but first of all they *need* to know that these non-commercial data-driven systems exist and that's where the commercial publishers have the upper hand.

(Meeting excerpt with Knowledge User 1, Cutty Sark pub in Greenwich, London UK)

6.5 Conclusion

With initiatives in open access and the changes to copyright legislation that have brought about TDM limitations and exceptions, we have seen the greatest distance travelled with this design-based research, resulting in the co-creation of the following language learning collections that remix open access content for learning features of academic English: the largest English language collocations collections used by learners online (Wu et al., 2021), the full-text BAWE collections in collaboration with EAP teachers at Durham University, the EThOS PhD abstract corpora with participating EAP practitioners from Queen Mary University of London, the legal English BLaRC collection by Dr Maria Jose Marín from the University of Murcia, and the Academic Collocations in English (ACE) corpora with the COnnecting REpositories (CORE) aggregation and Application Programming Interface (API) services at the UK Open University. There is a growing sense that knowledge organisations such as the British Library and the Oxford Text Archive and aggregation and API services such as CORE are interested in non-commercial educational re-use applications of open access content that are aligned with the Budapest Open Access Initiative. Indeed, by far the biggest impact of openness in the higher education sector has been with open access, showing the importance of knowledge organisations in promoting accessible and reusable research (Finch Group, 2012).

The research presented on remixing MOOC content with TDM approaches provides proof of concept for the importance of licensing MOOC content openly for much-needed data-driven support with domain-specific language in non-formal

education that has re-use value in formal EAP education (Fitzgerald et al., 2017). This increased value from open language learning online is echoed by the upswing in the enrolment in language MOOCs that have emerged during the pandemic (Martín-Monje & Borthwick, 2021). However, findings from our research point to a current problem with the scalability of developing derivative OERs from MOOC content, with the example presented here of providing data-driven language support in the MOOC context. This problem is apparent in current mainstream MOOC provision where current business models do not anticipate a need for the open licensing of course content, and where open educational practices are mostly limited to those subject academics and learning technologists who were already open digital scholars before engaging in MOOC and networked learning pedagogy. Rather, current MOOC business models appear to focus on charging learners for increased access to learning content. This phenomenon has been presented here as an issue that open education policy makers, in collaboration with Creative Commons, are actively lobbying to address. As a work-around solution for embedding the functions and open corpora of FLAX directly into a MOOC platform interface, research is currently being carried out by Dr Jemma König at the University of Waikato with the development of F-Lingo, a Chrome extension. F-Lingo works on top of the FutureLearn platform to support content-based learning of domain-specific terminology and concepts for academic and professional English. Nonetheless, this work with F-Lingo would still require higher education institutions to allow the traversing and re-use of All Rights Reserved course content for the R&D of automated language learning support in the MOOC context (Fitzgerald et al., 2019; König et al., 2022).

The observed absence of data-driven approaches to support EAP provision at two UK universities, and the apparent shift away from language teaching, as noted in focus-group discussions with teachers and managers, give pause for understanding current practices with EAP materials development for classroom and online learning in a time of increased uptake of generic EAP course books from commercial publishers. By drawing attention to the underlying business models and cultural practices that higher education institutions and organisations adopt, we also arrive at a closer understanding of the values placed on research, or lack thereof, with online and classroom materials development and teaching in the field of EAP.

The new paradigm for open data-driven language learning systems design presented through this research has also argued for greater access to and re-use of the artefacts of the academy and professional domains such as law, for example, that are taught and studied at higher education institutions. In this chapter, we have demonstrated the perceived value that corpus linguistics researchers and knowledge users working within EAP place on pedagogic, professional and research texts that can be mined for aspects of domain-specific language with data-driven learning systems. In addition to the value placed on open educational practices that can be fostered to re-use, remix and redistribute EAP resources for uptake across formal and non-formal higher education in increasingly uncertain times.

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Appendix

Open Collections in FLAX: Content and Collaborators

Learning collocations system in FLAX (2009–2022)	
Content	• Wikipedia corpus of contemporary English derived from three million Wikipedia articles comprising three billion words (Wu & Witten, 2016; Wu et al., 2021) • British National Corpus (BNC) of 100 million words (BNC Consortium, 2007) • British Academic Written English (BAWE) corpus of 2500 pieces of assessed university student writing from across the disciplines • Academic Collocations in English (ACE) corpora of harvested open access content and metadata from 135 million articles residing in open journals and open repositories
Knowledge organisations	Wikimedia Foundation (Wikipedia corpus); Oxford Text Archive and the UK Higher Education Academy OER International Programme with the University of Oxford (BNC and BAWE corpora); CORE (COnnecting REpositories)[10] team, UK Open University (ACE corpora)
Researchers	FLAX team
Knowledge users	Waikato University computer science students; Durham University EAP teachers and students; University of Oxford OER International stakeholders
British Academic Written English (BAWE) collections in FLAX (2012)	
Content	Full texts of the BAWE corpus divided into four sub-collections: Arts & Humanities, Social Sciences, Life Sciences, Physical Sciences
Knowledge organisations	The Oxford Text Archive; UK Higher Education Academy
Researchers	FLAX team
Knowledge users	Durham University EAP teachers and students; University of Oxford OER International stakeholders
British Law Report Corpus (BLaRC) in FLAX (2014)	

(continued)

[10] https://core.ac.uk/about#mission.

(continued)

Content	8.85 million-word corpus of full-text judicial hearings derived from free legal sources at the British and Irish Legal Information Institute (BAILII)[11] aggregation website
Knowledge organisations	BAILII
Researchers	Universidad Murcia; FLAX team
Knowledge users	Law MOOC learners
MOOC/micro-networked course collections in FLAX (2014–2016)	
Content	MOOC / Micro-Networked Course lecture transcripts and videos (streamed via YouTube or Vimeo) and case law that reside in the public domain
Knowledge organisations	MOOC host institutions (Harvard University; University of London; Columbia University) with edX and Coursera MOOC providers
Researchers	FLAX team; Universidad Murcia
Knowledge users	MOOC learners and MOOC subject matter experts; legal English translation studies teachers, and students at the University of Murcia
PhD micro-abstract corpora with FLAX mobile activities (2014–2015)	
Content	Domain-specific micro abstract corpora in the areas of Law, Water Politics and Tourism Studies. Developed in collaboration with EAP teachers at Queen Mary University of London for use on summer EAP pre-sessional courses. Developed with web-based and mobile language learning activities using the suite of mobile applications for Android from FLAX
Knowledge organisations	British Library Labs[12] and EThOS[13] at the British Library
Researchers	FLAX team
Knowledge users	EAP teachers and learners at Queen Mary University of London
PhD abstract corpora in FLAX (2015–2016)	
Content	9.8 million-word corpus derived from the metadata, including the abstracts, of over 500,000 PhD theses awarded by UK universities and managed by the Electronic Thesis Online Service (EThOS) at the British Library
Knowledge organisations	British Library Labs and EThOS at the British Library
Researchers	FLAX and F-Lingo teams
Knowledge users	EAP teachers and managers at Queen Mary University of London; Current research with MOOC learners via F-Lingo Chrome extension and FutureLearn platform
Academic Collocations in English (ACE) collections in FLAX (2018–2022)	
Content	Harvested open access content from open journals and open repositories divided into four sub-collections: Arts & Humanities, Social Sciences, Life Sciences, Physical Sciences

(continued)

[11] http://ials.sas.ac.uk/digital/bailii.

[12] https://www.bl.uk/projects/british-library-labs.

[13] http://ethos.bl.uk/Home.do.

(continued)

Knowledge organisations	CORE (COnnecting REpositories) team, UK Open University
Researchers	FLAX and F-Lingo teams
Knowledge users	• User query data analysis research with the FLAX LC system learners worldwide • Research with MOOC learners via F-Lingo Chrome extension and FutureLearn platform

References

Amiel, T., & Reeves, T. C. (2008). Design-based research and educational technology: Rethinking technology and the research agenda. *Educational Technology & Society, 11*(4), 29–40.

Anderson, T., & Shattuck, J. (2012). Design-based research: A decade of progress in education research? *Educational Researcher, 41*(1), 16–25.

Angus, D., Rintel, S., & Wiles, J. (2013). Making sense of big text: A visual-first approach for analyzing text data using Leximancer and Discursis. *International Journal of Social Research Methodology, 16*(3), 261–267.

Anthony, L. (2014, July). A view to the future in corpus tools development. In *11th Teaching and Language Corpora Conference (TALC 11) Keynote Address*. Lancaster University, UK.

Anthony, L. (2018). *Introducing English for specific purposes*. Routledge.

Atenas, J., Havemann, L., & Priego, E. (2015). Open data as open educational resources: Towards transversal skills and global citizenship. *Open Praxis, 7*(4), 377–389.

Barab, S., & Squire, L. (2004). Design-based research: Putting a stake in the ground. *The Journal of the Learning Sciences, 13*(1), 1–14.

Belcher, D. (2010). What ESP is and can be: An introduction. In D. Belcher (Ed.), *English for specific purposes in theory and practice* (pp. 1–20). University of Michigan Press.

Blei, D. (2012a). Probabilistic topic models. *Communications of the ACM, 55*, 77–84.

Blei, D. (2012b). Topic modelling and digital humanities. *Journal of Digital Humanities, 2*, 8–11.

Blei, D. M., Ng, A. Y., & Jordan, M. I. (2003). Latent Dirichlet allocation. *Journal of Machine Learning Research, 3*, 993–1022.

Boulton, A., & Thomas, J. (2012). Corpus language input, corpus processes in learning, learner corpus product. Introduction to J. Thomas & A. Boulton (Eds.), *Input, process and product: Developments in teaching and language corpora* (pp. 7–34). Masaryk University Press.

Boulton, A., & Cobb, T. (2017). Corpus use in language learning: A meta-analysis. *Language Learning, 67*(2), 348–393.

Boulton, A., & Pérez-Paredes, P. (2014). ReCALL special issue: Researching uses of corpora for language teaching and learning editorial researching uses of corpora for language teaching and learning. *ReCALL, 26*(2), 121–127.

Boumans, J. W., & Trilling, D. (2016). Taking stock of the toolkit: An overview of relevant automated content analysis approaches and techniques for digital journalism scholars. *Digital Journalism, 4*(1), 8–23.

British Library. (n.d.). EThOS Toolkit | Re-use by external services: EThOS as a data provider: Metadata. Retrieved from http://ethostoolkit.cranfield.ac.uk/tiki-index.php?page=Re-use+by+external+services

Budapest Open Access Initiative (BOAI). (2002). BOAI declaration. Retrieved from http://www.budapestopenaccessinitiative.org/read

Burns, A. (2009). *Doing action research in English language teaching*. Routledge.

Chang, J.-Y. (2014). The use of general and specialized corpora as reference sources for academic English writing: A case study. *ReCALL, 26*(2), 243–259.

Charles, M. (2012). Proper vocabulary and juicy collocations: EAP students evaluate do-it-yourself corpus-building. *English for Specific Purposes, 31*(2), 93–102.

Charles, M. (2015). Same task, different corpus: The role of personal corpora in EAP classes. In A. Lenko-Szymanska & A. Boulton (Eds.), *Multiple affordances of language corpora for data-driven learning* (pp. 131–153). John Benjamins.

Charles, M., & Pecorari, D. (2016). *Introducing English for academic purposes.* Routledge.

Cobb, T., & Boulton, A. (2015). Classroom applications of corpus analysis. In D. Biber & R. Reppen (Eds.), *Cambridge handbook of English corpus linguistics* (pp. 478–497). Cambridge University Press.

Colpaert, J. (2016). Big content in an educational engineering approach. *Journal of Technology and Chinese Language Teaching, 7*(1), 1–14. Retrieved from http://tclt.us/journal/2016v7n1/colpaert.pdf

Colpaert, J. (2004). Transdisciplinarity. *Computer Assisted Language Learning, 17*(5), 459–472.

Colpaert, J. (2018). Transdisciplinarity revisited. *Computer Assisted Language Learning, 31*(5–6), 483–489.

COnnectedREpositories (CORE): Aggregating the world's open access papers. (n.d.). Retrieved from https://core.ac.uk/

Ding, A., & Bruce, I. (2017). *The English for academic purposes practitioner: Operating on the edge of academia.* Palgrave Macmillan.

ETIC. (1975). *English for academic study: Problems and perspectives.* British Council.

Finch Group. (2012). Accessibility, sustainability, excellence: How to expand access to research publications. *Report of the Working Group on Expanding Access to Published Research Findings.* Retrieved from http://www.researchinfonet.org/publish/finch/

Fitzgerald, A. (2013). *Openness in English for academic purposes.* Open Educational Resources Case Study: Pedagogical development from OER practice. Commissioned by the Higher Education Academy (HEA) and the Joint Information Systems Committee (JISC), United Kingdom, 20 pages.

Fitzgerald, A., Wu, S., & Barge, M. (2014). Investigating an open methodology for designing domain-specific language collections. In S. Jager, L. Bradley, E. J. Meima & S. Thouësny (Eds.), CALL design: Principles and practice. In *Proceedings of the 2014 EUROCALL Conference* (pp. 88–95). Groningen, The Netherlands. Dublin: Research-publishing.net. https://doi.org/10.14705/rpnet.2014.000200.

Fitzgerald, A., Wu, S. & Marin, M.J. (2015). FLAX—Flexible and open corpus-based language collections development. In K. Borthwick, E. Corradini & A. Dickens (Eds.), *10 years of the Languages, Linguistics & Area Studies (LLAS) eLearning symposium: case studies in good practice* (pp. 215–227). Research-publishing.net. https://doi.org/10.14705/rpnet.2015.000281

Fitzgerald, A., Marín, M. J., Wu, S., & Witten, I. H. (2017). Evaluating the efficacy of the digital commons for scaling data-driven learning. In M. Carrier, R. Damerow & K. Bailey (Eds.), *Digital language learning and teaching: Research, theory and practice* (pp. 38–51). Global Research on Teaching and Learning English Series. Routledge, Taylor & Francis.

Fitzgerald, A., König, J., & Witten, I. H. (2019). F-Lingo: Integrating lexical feature identification into MOOC platforms for learning professional and academic English. In R. Meir, J. Sluss, E. Tovar & M. Castro (Eds.), *Proceedings of the 6th Conference on Learning with MOOCs: Enhancing Workforce Diversity and Inclusion* (pp. 101–104). Institute of Electrical and Electronics Engineers (IEEE) Education Society.

Fitzgerald, A. (2019). *A new paradigm for open data-driven language learning systems design in higher education.* Unpublished doctoral thesis. Concordia University, Canada.

Flowerdew, J., & Peacock, M. (2001). Issues in EAP: A preliminary perspective. In J. Flowerdew & M. Peacock (Eds.), *Research perspectives on English for academic purposes* (pp. 8–24). Cambridge University Press.

Gillett, A. (2018, April 13). Is EAP ESP? [Blog post] *Uefap*. Retrieved from http://www.uefap.net/blog/?p=933

Hadley, G. (2015). *English for academic purposes in neoliberal universities: A critical grounded theory* (Vol. 22). Springer International Publishing.

Hakkarainen, P. (2009). Designing and implementing a PBL course on educational digital video production: Lessons learned from a design-based research. *Educational Technology, Research and Development, 57*(2), 211–228. https://doi.org/10.1007/s11423-007-9039-4

Hargreaves, I. (2011). *Digital opportunity—A review of intellectual property and growth.* HM Government. Retrieved from https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/32563/ipreview-finalreport.pdf

Herrington, J., McKenney, S., Reeves, C. T., & Oliver, R. (2007). Design-based research and doctoral students: Guidelines for preparing a dissertation proposal. Retrieved from http://ro.ecu.edu.au/cgi/viewcontent.cgi?article=2611&context=ecuworks

Howatt, A. P. R. (2004). *A history of English language teaching* (2nd ed.). Oxford University Press.

Hunston, S. (2002). *Corpora in applied linguistics*. Cambridge University Press.

Hyland, K. (2002). Specificity revisited: How far should we go now? *English for Specific Purposes, 21*, 385–395.

IT Services, University of Oxford, 13 Banbury Road. (n.d.). [Oxford Text Archive] [*BAWE* Terms and Conditions Text]. Retrieved from http://ota.ox.ac.uk/scripts/download.php?otaid=2539

Johns, T. (1991b). From printout to handout: Grammar and vocabulary teaching in the context of data-driven learning. In T. Johns & P. King (Eds.), *Classroom concordancing. English Language Research Journal, 4*, 27–45.

Johns, T. (1991a). Should you be persuaded: two examples of data-driven learning. In T. Johns & P. King (Eds.), Classroom concordancing. *English Language Research Journal, 4*, 1–16.

Johns, T. (2002). Data-driven learning: The perpetual challenge. In B. Kettemann & G. Marko (Eds.), *Teaching and learning by doing corpus analysis. Proceedings of the Fourth International Conference on Teaching and Language Corpora, Graz 19–24 July 2000* (pp. 107–117). Rodopi.

König, J., Wu, S., Fitzgerald, A., Franken, M., & Witten, I. H. (2022). F-Lingo: Leveraging smart CALL for massive open online courses. In J. Colpaert & G. Stockwell (Eds.), *Smart CALL*, Waseda University.

Levin, B. (2011). Mobilising research knowledge in education. *London Review of Education, 9*(1), 15–26.

Marín, M. J., & Rea, C. (2014). Assessing four automatic term recognition methods: Are they domain-dependent? *English for Specific Purposes World, 42*(15), 1–27.

Martín-Monje, E., & Borthwick, K. (2021). Researching massive open online courses for language teaching and learning. *ReCALL, 33*(2), 107–110.

McEnery, T., Xiao, R., & Tono, Y. (2006). *Corpus-based language studies: An advanced resource book*. Routledge.

McKenney, S., & Reeves, T. (2012). *Conducting educational design research.* Routledge.

Nunez-Mir, G. C., Iannone, B. V., Pijanowski, B. C., Kong, N., & Fei, S. (2016). Automated content analysis: Addressing the big literature challenge in ecology and evolution. *Methods in Ecology and Evolution, 7*(11), 1262–1272.

Papadimitriou, C. H., Tamaki, H., Raghavan, P., & Vempala, S. (1998). Latent semantic indexing: A probabilistic analysis. In *Proceedings of the Seventeenth ACM SIGACT-SIGMOD-SIGART Symposium on Principles of Database Systems* (pp. 159–168). Seattle, Washington.

Pérez-Paredes, P., Ordoñana Guillamón, C., & Aguado Jiménez, P. (2018). Language teachers' perceptions on the use of OER language processing technologies in MALL. *Computer Assisted Language Learning, 31*(5–6), 522–545.

Reason, P., & Bradbury, H. (2007). *Handbook of Action Research* (2nd ed.). Sage.

Sinclair, J. M. (2004). *Trust the text: Language, corpus and discourse.* Routledge.

Smith, A. E. (2000b). Machine mapping of document collections: The Leximancer system. In *Proceedings of the Fifth Australasian Document Computing Symposium.* DSTC.

Smith, A. E. (2000a). Machine learning of well-defined thesaurus concepts. In A.-H. Tan & P. S. Yu (Eds.), *Proceedings of the International Workshop on Text and Web Mining (PRICAI 2000a)* (pp. 72–79). PRICAI.

Smith, A. E. (2003). Automatic extraction of semantic networks from text using Leximancer. In *HLT-NAACL 2003 Human Language Technology Conference of the North American Chapter of the Association for Computational Linguistics: Companion Volume* (pp. Demo23–Demo24). ACL.

Smith, A. E., & Humphreys, M. S. (2006). Evaluation of unsupervised semantic mapping of natural language with Leximancer concept mapping. *Behavior Research Methods, 38*(2), 262–279.

Strevens, P. (1988). ESP after twenty years: A reappraisal. In M. Tickoo (Ed.), *ESP: State of the art* (pp. 1–13). SEAMEO Regional Language Centre.

Swales, J. M. (1985). *Episodes in ESP*. Pergamon Press.

Thomas, J. (2017). *Discovering English with sketch engine* (2nd ed.). Versatile.

Turner, J. (2004). Language as academic purpose. *Journal of English for Academic Purposes, 3*, 95–109.

Vyatkina, N. (2016). Data-driven learning of collocations: Learning performance, proficiency, and perceptions. *Language Learning & Technology, 20*(3), 159–179.

Walker, D. (2006). Towards productive design studies. In J. van den Akker, K. Gravemeijer, S. McKenney, & N. Nieeven (Eds.), *Educational design research* (pp. 9–18). Routledge.

Weller, M. (2011). *The digital scholar: How technology is changing scholarly practice*. Bloomsbury Academic.

Widdowson, H. G. (1983). *Learning purpose and language use*. Oxford University Press.

Wu, S., Fitzgerald, A., Witten, I. H., & Yu, A. (2018). Automatically augmenting academic text for language learning: PhD abstract corpora with the British Library. In B. Zou & M. Thomas (Eds.), *Integrating technology into contemporary language learning and teaching* (pp. 512–537), IGI Global.

Wu, S., Fitzgerald, A., Yu, A., & Chen, Z. (2021). What are language learners looking for in a collocation consultation system? Identifying collocation look-up patterns with user query data. *ReCALL, 33*(3), 229–247.

Wu, S., & Witten, I. H. (2016). Transcending concordance: Augmenting academic text for L2 writing. *International Journal of Computer-Assisted Language Learning and Teaching, 6*(2), 1–18.

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Author Queries

Chapter 6

Query Refs.	Details Required	Author's response
AQ1	Please note that the footnote has been set in the following sentence "It identifies the knowledge organisations,…", as footnotes are not allowed in abstracts.	
AQ2	References "Burkhardt (2006), Weber (1990), Fisher (2014), BNC Consortium (2007)" are cited in the text but not provided in the reference list. Please provide the respective references in the list or delete these citations.	